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43：ECRL 牵引供电设备运行维护管理办法

43: ECRL Operation and Maintenance Management Measures for Traction Power Supply Equipment  
43: ECRL traction power supply equipment operation, maintenance and management methods

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第一部分 总 则

Part I General Provisions  
Part 1 General principles

1. ERCL 是指马来西亚东海岸铁路。

ERCL refers to the East Coast Railway of Malaysia.  
ERCL refers to Malaysia's East Coast Railway.

1. 本办法适用于牵引变电所、接触网的运行、检修和试验。牵引变电所、接触网设备的一切作业，均必须按本办法的规定严格执行。

These Measures are applicable to the operation, maintenance and test of traction substation and catenary. All operations of traction substation and catenary equipment must be strictly implemented in accordance with the provisions of these Measures.  
These Measures are applicable to the operation, maintenance and testing of traction substations and catenaries. All operations of traction substation and catenary equipment must be strictly implemented in accordance with the provisions of these Measures.

1. 接触网运行维修应坚持“预防为主、重检慎修”的方针，按照“定期检测、状态维修、寿命管理”的原则，遵循专业化、机械化、集约化维修方式，依靠铁路供电安全检测监测系统等手段，建立信息资源共享平台，实行“运行、检测、维修” 分开的组织模式，确保接触网运行品质和安全可靠性。

OCS operation and maintenance should adhere to the principle of "prevention first, re-inspection and careful repair", follow the principle of "regular inspection, condition-based maintenance and life management", follow the professional, mechanized and intensive maintenance mode, rely on railway power supply safety inspection and monitoring system and other means, establish an information resource sharing platform, and implement the separate organization mode of "operation, inspection and maintenance" to ensure the operation quality, safety and reliability of OCS.  
The operation and maintenance of the catenary should adhere to the policy of "putting prevention first, re-inspection and careful maintenance", follow the principles of "regular inspection, condition-based maintenance, and life management", follow professional, mechanized and intensive maintenance methods, and rely on railway power supply safety inspection and monitoring systems and other means to establish an information resource sharing platform, implement a separate organizational model of "operation, testing, and maintenance" to ensure the operation quality, safety and reliability of the catenary.

1. 本办法适用于工频单相 25kV 交流电，列车运行速度 160km/h 以下铁路的接触网检修工作。

This method is applicable to the overhaul of catenary of railway with single-phase 25kV AC power frequency and train running speed below 160km/h.  
This method is applicable to the catenary maintenance work of railways with power frequency single-phase 25kV AC power and train running speeds below 160km/h.

1. 本办法在马来西亚东海岸铁路联营公司内执行。

These Measures shall be implemented in Malaysia East Coast Railway Associated Company.  
These Measures shall be implemented within the Malaysian East Coast Railway Joint Venture Company.

第二部分 牵引变电所设备运行维护管理

The second part is the operation and maintenance management of traction substation equipment  
Part 2 Operation, Maintenance and Management of Traction Substation Equipment

# 第一章 一般检修管理规定

# Chapter I General Maintenance Management Provisions Chapter 1 General Maintenance Management Provisions

1. 本办法是依据在线、实时监测，周期、状态检修相结合的原则编制。牵引变电所的运行、检修应贯彻“预防为主、严检慎修”的方针。遵循“全面养护、寿命管理”的原则，实现“实时监测、科学诊断、精细维修、寿命管理”目标。

This method is compiled according to the principle of combining online and real-time monitoring, periodic and condition-based maintenance. The operation and maintenance of traction substation should implement the policy of "putting prevention first, strict inspection and careful repair". Follow the principle of "comprehensive maintenance and life management" and realize the goal of "real-time monitoring, scientific diagnosis, fine maintenance and life management".  
This method is prepared based on the principle of combining online, real-time monitoring, periodic and condition-based maintenance. The operation and maintenance of traction substations should implement the policy of "prevention first, strict inspection and careful maintenance". Follow the principle of "comprehensive maintenance and life management" and achieve the goals of "real-time monitoring, scientific diagnosis, fine maintenance, and life management".

1. 为保证牵引变电所安全可靠供电，各级部门要认真建立健全各级岗位职责制，抓好各项基础工作，科学管理，改革修制，依靠科技进步，积极采用新技术、新工艺、新材料，不断改善牵引变电所的技术状态，提高供电工作质量。

In order to ensure the safe and reliable power supply of traction substation, departments at all levels should conscientiously establish and improve the post responsibility system at all levels, do a good job in various basic work, scientifically manage, reform and repair the system, rely on scientific and technological progress, actively adopt new technologies, new processes and new materials, and constantly improve the technical status of traction substation and improve the quality of power supply.  
In order to ensure the safe and reliable power supply of traction substations, departments at all levels must conscientiously establish and improve job responsibility systems at all levels, do a good job in various basic work, manage scientifically, reform and repair systems, rely on scientific and technological progress, and actively adopt new technologies, new processes, and new materials, Continuously improve the technical status of traction substations and improve the quality of power supply work.

1. 牵引变电所的增设、迁移、拆除、封闭和启封由基础部审批，并报联营公司备案。

The addition, relocation, dismantling, closure and unsealing of traction substations shall be examined and approved by the Foundation Department and reported to the associated company for the record.  
The addition, relocation, demolition, closure and unsealing of traction substations shall be approved by the Foundation Department and reported to the joint venture company for filing.

1. 因牵引变电所的设备改造、变化而引起牵引供电设备运行方式变更时，须经联营公司审批。牵引变电所属于下列情况的技术改造，须经基础部审批，并报联营公司核备。

When the operation mode of traction power supply equipment is changed due to the equipment transformation or change of traction substation, it must be examined and approved by the associated company. The technical transformation of traction substation under the following circumstances shall be examined and approved by the basic department and reported to the associated company for verification and preparation.  
When the operating mode of traction power supply equipment is changed due to equipment renovation or changes in the traction substation, it must be approved by the associated company. Technical transformation of traction substation under the following circumstances must be approved by the Basic Department and reported to the joint venture company for review and preparation.

1. 改变电源和主接线时。

When changing the power supply and main wiring.  
When changing the power supply and main wiring.

1. 变更主变压器、断路器的容量和型号时。

When changing the capacity and model of main transformer and circuit breaker.  
When changing the capacity and model of the main transformer and circuit breaker.

1. 变更保护型式、控制和测量方式时。

When changing protection type, control and measurement mode.  
When changing the protection type, control and measurement method.

1. 为保证电气化铁路的可靠供电，牵引变电所不得引接非牵引负荷。

In order to ensure reliable power supply of electrified railway, non-traction load shall not be connected to traction substation.  
In order to ensure reliable power supply for electrified railways, traction substations are not allowed to connect non-traction loads.

# 第二章 交接验收管理规定

# Chapter II Administrative Provisions on Handover and Acceptance Chapter 2 Provisions on Handover and Acceptance Management

1. 牵引变电所竣工后，应按规定对工程进行检查和交接试验及全部馈线的短路试验，经验收合格方可投入运行。

After the completion of the traction substation, the project shall be inspected, handed over tested and short-circuit tested for all feeders according to regulations, and can be put into operation only after passing the acceptance test.  
After the completion of the traction substation, the project shall be inspected and handed over tests and short circuit tests on all feeders in accordance with regulations, and can be put into operation only after passing the acceptance.

1. 牵引变电所工程交接验收前 10 天，建设单位应向运行单位提交完整齐备的竣工图纸（包括电子版）、记录、说明书、合格证、试验报告等竣工资料。

Ten days before the handover and acceptance of the traction substation project, the construction unit shall submit complete and complete completion drawings (including electronic version), records, instructions, certificates of conformity, test reports and other completion data to the operation unit.  
10 days before the handover and acceptance of the traction substation project, the construction unit shall submit complete and complete completion materials such as as-built drawings (including electronic versions), records, instructions, certificates of conformity, and test reports to the operating unit.

1. 牵引变电所投入运行前，基础部要制定好运行方式，配齐并训练运行、检修人员，组织学习和熟悉有关设备、规章、制度并经考试合格；备齐检修用的工装、机具、仪器、材料、零部件及安全用具等。

Before the traction substation is put into operation, the basic department shall formulate the operation mode, complete and train the operation and maintenance personnel, organize the study and familiarity with relevant equipment, rules and regulations, and pass the examination; Prepare tooling, machines, instruments, materials, parts and safety appliances for maintenance.  
Before the traction substation is put into operation, the basic department must formulate the operation method, equip and train the operation and maintenance personnel, organize the study and familiarity with relevant equipment, rules and systems and pass the examination; prepare all tools, machines and tools for maintenance, instruments, materials, parts and safety appliances, etc.

1. 在牵引变电所投入运行时要建立各项制度和正常管理秩序；按规定备齐技术文件。建立并按时填写各项原始记录、台帐、技术履历、表报等。

When the traction substation is put into operation, it is necessary to establish various systems and normal management order; Prepare technical documents as required. Establish and fill in all original records, accounts, technical resumes, forms, etc. on time.  
When the traction substation is put into operation, various systems and normal management order must be established; technical documents must be prepared as required. Establish and fill in various original records, accounts, technical resumes, reports, etc. on time.

1. 牵引变电所应有下列技术文件：

Traction substation shall have the following technical documents:  
Traction substation shall have the following technical documents:

1. 一次接线图、室内外设备平面布置图、室外配电装置断面图、保护装置原理图、二次接线的展开图、安装图和电缆手册等。

Primary wiring diagram, layout of indoor and outdoor equipment, sectional diagram of outdoor power distribution equipment, schematic diagram of protection device, unfolding diagram of secondary wiring, installation diagram and cable manual, etc.  
Primary wiring diagram, indoor and outdoor equipment layout plan, outdoor power distribution device cross-section diagram, protective device schematic diagram, secondary wiring development diagram, installation diagram, cable manual, etc.

1. 设备说明书及维护手册。

Equipment manual and maintenance manual.  
Equipment instructions and maintenance manuals.

1. 电气设备、安全用具和绝缘工具的试验结果，保护装置的整定值。

Test results of electrical equipment, safety appliances and insulation tools, and setting values of protection devices.  
Test results of electrical equipment, safety appliances and insulating tools, and setting values of protective devices.

1. 无人值守的牵引变电所应建立下列原始记录：

The unattended traction substation shall establish the following original records:  
The following original records shall be established for unattended traction substations:

* 1. 作业命令记录（见附件 1）：由巡视、检修人员填写。

Operation order record (see Annex 1): Fill in by patrol and maintenance personnel.  
Operation order record (see Attachment 1): to be filled in by patrol and maintenance personnel.

* 1. 无人所设备巡视记录(见附件 2)：由巡视人员填写。

Patrol record of unmanned equipment (see Annex 2): Fill in by patrol personnel.  
Equipment inspection record of unmanned premises (see Annex 2): to be filled in by the inspection personnel.

* 1. 避雷器动作记录(见附件 3)：由巡视人员填写。

Lightning arrester action record (see Annex 3): Fill in by patrol personnel.  
Lightning arrester action record (see Attachment 3): to be filled in by the patrol personnel.

* 1. 保护装置整定记录(见附件 4)：由检修人员填写。

Setting record of protection device (see Annex 4): Fill in by maintenance personnel.  
Protection device setting record (see Attachment 4): to be filled in by maintenance personnel.

* 1. 蓄电池开路电压测量记录(见附件 5)：由检修人员填写，每季度不少于一次。

Battery open circuit voltage measurement record (see Annex 5): Fill in by maintenance personnel, not less than once every quarter.  
Battery open-circuit voltage measurement record (see Attachment 5): It shall be filled out by maintenance personnel at least once a quarter.

* 1. 设备检修记录（见附件 6）：由检修人员填写。

Equipment maintenance record (see Annex 6): Fill in by maintenance personnel.  
Equipment maintenance record (see Attachment 6): to be filled in by maintenance personnel.

* 1. 设备缺陷记录（见附件 7）：由巡视、检修人员填写。

Equipment defect record (see Annex 7): Fill in by patrol and maintenance personnel.  
Equipment defect record (see Attachment 7): to be filled in by patrol and maintenance personnel.

1. 牵引变电所控制室内要有一次主接线图。

There should be a main wiring diagram in the control room of traction substation.  
There must be a main wiring diagram in the control room of the traction substation.

1. 无人值守牵引变电所的技术文件和原始记录应放置在所内，由负责巡视或检修的班组填写。

Technical documents and original records of unattended traction substation shall be placed in the substation and filled out by the team responsible for patrol or maintenance.  
Technical documents and original records of unattended traction substations should be placed in the substation and filled in by the team responsible for inspection or maintenance.

1. 为保证牵引变电所故障时尽快地恢复正常供电，最大限度地减少对运输的影响，牵

In order to ensure that the normal power supply can be restored as soon as possible when the traction substation fails and minimize the impact on transportation, the traction substation  
In order to ensure that normal power supply can be restored as soon as possible in the event of a failure of the traction substation and minimize the impact on transportation,

引变电所应配备满足事故处理时所需要的设备、零部件、材料和工具，并保持良好状态。

The transformer substation shall be equipped with equipment, parts, materials and tools required for accident treatment and keep them in good condition.  
The diversion substation shall be equipped with equipment, parts, materials and tools required for accident handling and maintained in good condition.

# 第三章 变电所倒闸、巡视管理规定

# Chapter III Provisions on the Administration of Switching and Patrol of Substations Chapter 3 Provisions on the Management of Switching and Inspection of Substation

1. 牵引变电所倒闸作业，一般由工电供调度员通过远动操作完成。

The switching operation of traction substation is generally completed by the dispatcher of power supply through telecontrol operation.  
The switching operation of traction substation is generally completed by the industrial and electrical power supply dispatcher through remote operation.

1. 当以备用断路器代替主用断路器时，应检查、核对备用断路器的投入运行条件后方能进行倒闸。

When the standby circuit breaker replaces the main circuit breaker, it should be checked and checked the operation conditions of the standby circuit breaker before switching.  
When replacing the main circuit breaker with a standby circuit breaker, the operating conditions of the standby circuit breaker should be checked and checked before switching can be carried out.

1. 无人值守的牵引变电所、分区所现场巡视每月应不少于 2 次。现场夜间巡视每季度

On-site inspections of unattended traction substations and sub-districts shall be conducted at least twice a month. On-site night patrol every quarter  
On-site inspections of unattended traction substations and subdivisions shall be conducted no less than twice a month. On-site night inspections quarterly

不少于 1 次。视频远程巡视可作为巡视的辅助手段，但不得计入巡视次数。

Not less than once. Video remote patrol can be used as an auxiliary means of patrol, but it shall not be included in the number of patrols.  
No less than once. Video remote inspections can be used as an auxiliary means of inspections, but shall not be counted into the number of inspections.

日常巡视应按牵引变电所巡视路线图进行。每次断路器跳闸后对有关设备要进行巡视；在遇有下列情况，要适当增加巡视次数：

Daily patrol shall be carried out according to the patrol road map of traction substation. Patrol the relevant equipment after each trip of the circuit breaker; In case of the following circumstances, the number of inspections should be appropriately increased:  
Daily inspections should be carried out in accordance with the traction substation inspection roadmap. Relevant equipment shall be inspected after each trip of the circuit breaker; in the following circumstances, the number of inspections shall be increased appropriately:

1. 设备过负荷，或负荷有显著增加时。

When the equipment is overloaded, or the load increases significantly.  
When the equipment is overloaded, or the load increases significantly.

1. 设备经过大修、改造或长期停用后重新投入系统运行；新安装的设备加入系统运

The equipment is put into system operation again after overhaul, transformation or long-term shutdown; Newly installed equipment is added to the system transportation  
Equipment is put into system operation after major repair, transformation or long-term shutdown; newly installed equipment is added to the system for transportation

行。

OK.  
Okay.

1. 遇有雾、大风、雷雨等恶劣天气、事故跳闸和设备运行中有异常和非正常运行时。 19．各种巡视中，一般项目和要求如下：

In case of bad weather such as fog, strong wind and thunderstorm, accident trip and abnormal and abnormal operation of equipment during operation. 19. The general items and requirements during the various inspections are as follows:  
In case of severe weather such as fog, strong wind, thunderstorm, accidental tripping, and abnormal and abnormal operation during equipment operation. 19. Among various inspections, the general items and requirements are as follows:

1. 绝缘体瓷体应清洁、无破损和裂纹、无放电痕迹及现象，瓷釉剥落面积不得超过 300mm2；复合绝缘子无变形、龟裂等现象。

Insulator porcelain body should be clean, without damage and crack, without discharge traces and phenomena, and the enamel peeling area should not exceed 300mm 2 ; Composite insulators have no deformation, cracking and other phenomena.  
The insulator porcelain body shall be clean and free from damage, cracks, discharge traces and phenomena. The enamel peeling area shall not exceed 300 mm2; the composite insulator shall have no deformation, cracking and other phenomena.

1. 电气连接部分（引线、二次接线）应连接牢固，接触良好，无过热、断股和散股、过紧或过松。

Electrical connection parts (leads and secondary wiring) should be firmly connected and in good contact without overheating, broken strands and scattered strands, too tight or too loose.  
The electrical connection parts (leads, secondary wiring) should be firmly connected and in good contact, without overheating, broken strands and loose strands, too tight or too loose.

1. 设备音响正常，无异味。

The sound of the equipment is normal and there is no peculiar smell.  
The equipment sound is normal and there is no peculiar smell.

1. 充油设备的油标、油阀、油位、油温、油色应正常，充油、充气设备应无渗漏、喷油现象。充气设备气压和气体状态应正常。

The oil mark, oil valve, oil level, oil temperature and oil color of oil-filled equipment should be normal, and there should be no leakage and oil injection in oil-filled and air-filled equipment. The air pressure and gas state of inflation equipment should be normal.  
The oil label, oil valve, oil level, oil temperature and oil color of oil-filled equipment shall be normal, and the oil-filled and inflated equipment shall have no leakage or oil spray. The air pressure and gas status of the inflation equipment should be normal.

1. 设备安装牢固，无倾斜，外壳应无严重锈蚀，接地良好，基础、支架应无严重破损和剥落。设备室和围栅应完好并锁住。户外机构箱、端子箱锁具无锈蚀。

The equipment shall be firmly installed without inclination, the shell shall be free from serious corrosion, the grounding shall be good, and the foundation and support shall be free from serious damage and peeling. Equipment room and fence shall be intact and locked. Locks of outdoor mechanism box and terminal box are free of rust.  
The equipment is installed firmly without inclination, the shell should be free from serious corrosion, the grounding should be good, and the foundation and support should be free from serious damage or peeling. The equipment room and enclosure should be intact and locked. The locks of outdoor mechanism boxes and terminal boxes are free of rust.

1. 通风、空调、安全环境监控、消防、照明等设备应正常。

Ventilation, air conditioning, safety and environment monitoring, fire fighting, lighting and other equipment should be normal.  
Ventilation, air conditioning, safety and environmental monitoring, fire protection, lighting and other equipment should be normal.

1. 主控制室、高压室、所用变室、电缆夹层、低压盘等防止小动物措施完备；房屋无渗漏破损。

The main control room, high-voltage room, used transformer room, cable interlayer, low-voltage disk and other measures to prevent small animals are complete; The house is free from leakage and damage.  
Measures to prevent small animals are complete for the main control room, high-pressure room, used transformer room, cable interlayer, low-voltage panel, etc.; there is no leakage and damage in the house.

1. 设备标识和各种安全警示牌等完好，清晰，固定牢。

Equipment identification and various safety warning signs are intact, clear and fixed.  
Equipment logos and various safety warning signs are in good condition, clear and firmly fixed.

* 1. 巡视变压器时，除一般项目和要求外，还要注意以下几点：

When inspecting transformers, in addition to general items and requirements, we should also pay attention to the following points:  
When inspecting transformers, in addition to general items and requirements, the following points should also be noted:

1. 压力释放阀密封良好，无渗油。

The pressure relief valve is well sealed and has no oil leakage.  
The pressure relief valve is well sealed and there is no oil leakage.

1. 呼吸器内干燥剂颜色正常。

The color of desiccant in respirator is normal.  
The color of desiccant in the respirator is normal.

1. 瓦斯继电器内应无气体。

There should be no gas in the gas relay.  
There should be no gas in the gas relay.

1. 冷却装置、风扇电机应齐全，运行应正常无渗漏。

Cooling device and fan motor should be complete, and the operation should be normal without leakage.  
The cooling device and fan motor should be complete and operate normally without leakage.

1. 分接开关位置指示正确。

Tap changer position indication is correct.  
The tap changer position indication is correct.

* 1. 巡视 AIS 开关柜及组合电器时，除一般项目和要求外，还要注意以下几点：

When inspecting AIS switchgear and combined electrical appliances, besides general items and requirements, we should also pay attention to the following points:  
When inspecting AIS switchgear and combined electrical appliances, in addition to general items and requirements, the following points should also be paid attention to:

1. 开关柜屏上指示灯、带电显示器指示应正常；操作方式选择开关、机械操作把手投切位置应正确；控制电源及电压回路电源分合闸指示正确。

The indicator light and live display on the switch cabinet screen should be normal; Operation mode selection switch, mechanical operation handle switching position should be correct; The opening and closing instructions of control power supply and voltage loop power supply are correct.  
The indication lights and live displays on the switch cabinet screen should be normal; the switching position of the operation mode selection switch and the mechanical operation handle should be correct; the opening and closing indication of the control power supply and voltage loop power supply should be correct.

1. 分合闸指示器应与实际运行方式相符；分合闸计数器指示应正确。

The opening and closing indicator should be consistent with the actual operation mode; The indication of opening and closing counter should be correct.  
The opening and closing indicator should be consistent with the actual operation mode; the opening and closing counter should be correct.

1. 储能状态显示正常。

The energy storage status shows normal.  
The energy storage status shows normal.

1. 屏面表计工作应正常；无异音、异味现象。

The screen meter should work normally; There is no abnormal sound or peculiar smell.  
The screen meter should work normally; there should be no sound or peculiar smell.

1. 柜内应无放电声、异味和不均匀的机械噪声。

There should be no discharge sound, peculiar smell and uneven mechanical noise in the cabinet.  
There should be no discharge sound, peculiar smell and uneven mechanical noise in the cabinet.

1. 柜体应无过热、变形、下沉、各封闭板螺丝应齐全无松脱、锈蚀、接地应牢固。

The cabinet body should be free from overheating, deformation and sinking, and the screws of each sealing plate should be complete without loosening and corrosion, and the grounding should be firm.  
The cabinet body should be free from overheating, deformation, or sinking. The screws on each closing plate should be complete without loosening, corrosion, and the grounding should be firm.

1. 巡视 AIS 柜加热电源和加热器应运行正常。

Patrol the heating power supply and heater of AIS cabinet should operate normally.  
Inspection AIS cabinet heating power supply and heater should operate normally.

* 1. 巡视气体断路器时，除一般项目和要求外，还要注意以下几点：

When inspecting gas circuit breakers, in addition to general items and requirements, we should also pay attention to the following points:  
When inspecting gas circuit breakers, in addition to general items and requirements, the following points should also be noted:

1. 气压表（或气体密度表）、弹簧储能应指示正确。

Barometer (or gas density meter) and spring energy storage should be indicated correctly.  
The barometer (or gas density meter) and spring energy storage should indicate correctly.

1. 分合闸指示器应与实际状态相符。

The opening and closing indicator shall be consistent with the actual state.  
The opening and closing indicator should be consistent with the actual state.

1. 分合闸计数器指示应正确。

The indication of opening and closing counter should be correct.  
The opening and closing counter indication should be correct.

* 1. 巡视真空断路器时，除一般项目和要求外，还要注意以下几点：

When inspecting vacuum circuit breakers, in addition to general items and requirements, we should also pay attention to the following points:  
When inspecting vacuum circuit breakers, in addition to general items and requirements, the following points should also be noted:

1. 动静触指应接触良好，无发热现象。

Dynamic and static contact fingers should be in good contact without heating.  
Dynamic and static contacts should have good contact with fingers without heating.

1. 玻璃真空灭弧室内无辉光，铜部件应保持光泽。

There is no glow in the glass vacuum interrupter, and copper parts should keep luster.  
There is no glow in the glass vacuum interrupter, and copper parts should maintain luster.

1. 闭锁杆位置正确，止轮器良好。

Locking lever position is correct, and wheel stopper is in good condition.  
The locking lever is in correct position and the wheel stopper is in good condition.

1. 分合闸位置指示器应与实际情况相符。

The opening and closing position indicator shall be consistent with the actual situation.  
The opening and closing position indicator shall be consistent with the actual situation.

1. 储能状态显示正常。

The energy storage status shows normal.  
The energy storage status shows normal.

* 1. 巡视隔离开关时，除一般项目和要求外，还要注意以下几点：

When patrolling isolating switches, in addition to general items and requirements, we should also pay attention to the following points:  
When inspecting the isolating switch, in addition to general items and requirements, the following points should also be paid attention to:

1. 闸刀位置应正确，分闸角度或距离应符合规定。

The position of the knife should be correct, and the opening angle or distance should conform to the regulations.  
The blade position should be correct, and the opening angle or distance should comply with regulations.

1. 触头应接触良好，无严重烧伤。

Contacts should be in good contact without serious burns.  
The contacts should be in good contact without serious burns.

1. 电动操作机构分合闸指示器应与实际状态相符。机构箱密封良好，部件完好无锈

The opening and closing indicator of the electric operating mechanism shall be consistent with the actual state. The mechanism box is well sealed, and the components are intact and rust-free  
The opening and closing indicator of the electric operating mechanism shall be consistent with the actual state. The mechanism box is well sealed and the parts are in good condition and free of rust

蚀。

Erosion.  
erosion.

1. 闭锁电磁锁无异常，手动操作机构应加锁。

There is no abnormality in locking electromagnetic lock, and the manual operating mechanism should be locked.  
There is no abnormality in the locking electromagnetic lock, and the manual operating mechanism should be locked.

1. 消弧装置状态良好。

Arc suppression device is in good condition.  
The arc extinguishing device is in good condition.

* 1. 巡视接地保护放电装置时，除一般项目和要求外，还要注意以下几点：

When patrolling the grounding protection discharge device, in addition to general items and requirements, the following points should also be paid attention to:  
When inspecting the grounding protective discharge device, in addition to general items and requirements, the following points should also be noted:

1. 放电电容器应无渗漏油、膨胀、变形。

Discharge capacitor should be free from oil leakage, expansion and deformation.  
The discharge capacitor shall be free from oil leakage, expansion or deformation.

1. 放电间隙应光滑，无烧损现象。

The discharge gap should be smooth and free from burning loss.  
The discharge gap should be smooth and free from burning.

1. 动作次数计数器应指示正确。

The action number counter should indicate correctly.  
The action count counter should indicate correctly.

* 1. 巡视电容补偿装置时，除一般项目和要求外，还要注意以下几点：

When patrolling capacitor compensation devices, in addition to general items and requirements, we should also pay attention to the following points:  
When inspecting the capacitor compensation device, in addition to general items and requirements, the following points should also be noted:

1. 电容器外壳应无膨胀、变形、接缝应无开裂、无渗漏油。

Capacitor shell should be free from expansion and deformation, and joints should be free from cracking and oil leakage.  
The capacitor shell shall be free from expansion or deformation, and the joints shall be free from cracking or oil leakage.

1. 熔断器、放电回路及附属装置应完好。

Fuses, discharge circuits and accessory devices shall be in good condition.  
Fuses, discharge circuits and auxiliary devices should be intact.

1. 电抗器无异声异味，空心电抗器线圈本体及附近铁磁件无过热现象；油浸式电抗器油位正常符合要求，无渗油现象。

The reactor has no abnormal sound and odor, and the coil body of the air-core reactor and the nearby ferromagnetic parts have no overheating phenomenon; The oil level of oil-immersed reactor meets the requirements normally, and there is no oil leakage.  
The reactor has no sound or peculiar smell, and there is no overheating of the air-core reactor coil body and nearby ferromagnetic parts; the oil level of the oil-immersed reactor normally meets the requirements, and there is no oil leakage.

1. 室内温度应符合规定，通风良好。

Indoor temperature should comply with regulations and be well ventilated.  
The indoor temperature should comply with regulations and the ventilation should be good.

* 1. 巡视高压母线时，除一般项目和要求外，还要注意以下几点：

When patrolling high-voltage bus, in addition to general items and requirements, we should also pay attention to the following points:  
When inspecting high-voltage buses, in addition to general items and requirements, the following points should also be noted:

1. 多股线应无松股、断股。

There should be no loose or broken strands in multi-strand lines.  
Multi-stranded wires should have no loose or broken shares.

1. 硬母线应无断裂、无脱漆。

Hard bus bar should be free from fracture and paint stripping.  
The hard bus bar shall be free from breakage or paint peeling.

1. 连接母线的设备线夹应完好，无松脱、断裂。

Equipment clamps connecting bus bars should be in good condition without loosening or breaking.  
The equipment clamps connecting the bus bars shall be intact without loosening or breaking.

* 1. 巡视电缆、电缆沟及电缆夹层时，除一般项目和要求外，还要注意以下几点：

When inspecting cables, cable trenches and cable interlayers, in addition to general items and requirements, the following points should also be paid attention to:  
When inspecting cables, cable trenches and cable interlayers, in addition to general items and requirements, the following points should also be noted:

1. 电缆沟盖板应齐全、无严重破损，沟内无积水、无杂物。

Cable trench cover plate should be complete, without serious damage, no accumulated water and sundries in the trench.  
The cover plate of the cable trench shall be complete without serious damage, and there shall be no water or debris in the trench.

1. 电缆外皮应无断裂、无锈蚀、无明显鼓包现象，其裸露部分无损伤。电缆头及接线盒密封良好，无接头发热、放电现象。

Cable sheath shall be free from fracture, corrosion and obvious bulging, and its bare part shall be free from damage. Cable head and junction box are well sealed, and there is no joint heating and discharge phenomenon.  
The cable sheath shall be free from breakage, corrosion, or obvious bulging, and its exposed parts shall be free from damage. The cable head and junction box are well sealed, and there is no joint heating or discharge.

1. 电缆测温传感装置应状态良好。

Cable temperature sensing device should be in good condition.  
The cable temperature sensing device should be in good condition.

1. 电缆夹层照明、通风设施良好。

Cable interlayer lighting and ventilation facilities are good.  
The cable interlayer has good lighting and ventilation facilities.

1. 电缆沟、电缆夹层孔洞封堵良好，无明显积水、杂物以及水浸探头状态良好。 29．巡视端子箱、集中接地箱时，除一般项目和要求外，还要注意以下几点：

Cable trench and cable interlayer holes are well plugged, without obvious water accumulation and sundries, and the flooding probe is in good condition. 29. When patrolling terminal boxes and centralized grounding boxes, in addition to general items and requirements, we should also pay attention to the following points:  
The holes in the cable trench and cable interlayer are well sealed, there is no obvious water or debris, and the probe is in good condition. 29. When inspecting terminal boxes and centralized grounding boxes, in addition to general items and requirements, the following points should also be noted:

1. 箱体应清洁、牢固，不倾斜，密封良好，箱体内外无严重锈蚀。

The box body should be clean, firm, not inclined, well sealed, and there is no serious corrosion inside and outside the box body.  
The box should be clean, firm, not tilted, well sealed, and free from serious corrosion inside and outside the box.

1. 箱内端子排应完好、清洁、连接整齐、牢固、接触良好。闸刀接触良好、无烧伤，熔断器不松动。空气开关状态良好。

The terminal blocks in the box should be intact, clean, connected neatly, firmly and in good contact. The knife is in good contact, without burn, and the fuse is not loose. The air switch is in good condition.  
The terminal strips in the box should be intact, clean, connected neatly, firmly, and in good contact. The blade has good contact without burns, and the fuse is not loose. The air switch is in good condition.

1. 巡视避雷器时，除一般项目和要求外，还要注意以下几点：

When patrolling lightning arresters, in addition to general items and requirements, we should also pay attention to the following points:  
When inspecting lightning arresters, in addition to general items and requirements, the following points should also be noted:

1. 各节连接应正直，整体无严重倾斜，均压环安装应水平。

The connection of each section should be upright, without serious inclination as a whole, and the installation of equalizing ring should be horizontal.  
The connection of each section should be straight and the whole should be free from serious tilt. The installation of the pressure equalizing ring should be horizontal.

1. 放电记录器应完好。

The discharge recorder shall be in good condition.  
The discharge recorder should be intact.

1. 带有监测装置的放电记录器泄漏电流显示应正常。

The leakage current display of discharge recorder with monitoring device should be normal.  
The leakage current display of the discharge recorder with a monitoring device shall be normal.

1. 巡视避雷针时，除一般项目和要求外，还要注意：避雷针应无倾斜、无弯曲，针头无熔化。避雷针上照明灯具状态良好，电缆保护管应良好无破损。

When patrolling the lightning rod, in addition to general items and requirements, it should also be noted that the lightning rod should have no inclination, no bending and no melting of the needle. The lighting fixtures on the lightning rod are in good condition, and the cable protection pipe should be in good condition without damage.  
When inspecting the lightning rod, in addition to general items and requirements, it should also be noted that the lightning rod should have no tilt or bend, and the needle should not melt. The lighting lamps on the lightning rod are in good condition, and the cable protection pipes should be in good condition without damage.

1. 交直流电源装置巡视项目和要求如下：

Patrol items and requirements of AC and DC power supply devices are as follows:  
The inspection items and requirements for AC and DC power supply equipment are as follows:

1. 装置及风扇工作正常，无异音、异味和过热。

The device and fan work normally without abnormal sound, peculiar smell and overheating.  
The device and fan are working normally, with no sound, odor or overheating.

1. 两路交直流电源及各交直流馈线空开供电方式正确、充电模块工作正常。自动调压装置、交流接触器工作状态正常。

Two AC and DC power supply and each AC and DC feeder empty-open power supply mode is correct, and the charging module works normally. Automatic voltage regulating device and AC contactor work normally.  
The air-open power supply method of the two AC and DC power supplies and each AC and DC feeder lines is correct, and the charging module is working normally. The automatic voltage regulating device and AC contactor are in normal working condition.

1. 直流输出电压值和电流值，正、负母线对地的绝缘（电压）值等显示应正常；装置信号、指示显示及声响报警等显示应正常；分、合位置指示正确。

DC output voltage value and current value, positive and negative bus insulation (voltage) value to ground should be displayed normally; Device signal, indication display and sound alarm display should be normal; The opening and closing positions are indicated correctly.  
The DC output voltage value and current value, the insulation (voltage) value of positive and negative buses to ground, etc. shall be normal; the device signal, indication display and audible alarm display shall be normal; the opening and closing position indication shall be correct.

1. UPS 电源工作正常。

UPS power supply works normally.  
The UPS power supply is working normally.

1. 接触器及继电器等元器件无冒烟异味现象；回路接线端子无松脱，无氧化或锈蚀。

Contactors, relays and other components have no smoke and peculiar smell; No loosening, oxidation or corrosion of circuit terminals.  
Contactors, relays and other components shall have no smoke and odor; loop terminals shall be free from looseness, oxidation or corrosion.

1. 监控装置与充电装置通讯状况良好。 33．蓄电池组巡视项目和要求如下：

The communication between the monitoring device and the charging device is in good condition. 33. The battery patrol items and requirements are as follows:  
The communication between the monitoring device and the charging device is in good condition. 33. The battery pack inspection items and requirements are as follows:

1. 蓄电池完好，无外伤、变形和渗液现象表面清洁。

The battery is in good condition, without trauma, deformation and leakage. The surface is clean.  
The battery is in good condition, and the surface is clean without trauma, deformation or leakage.

1. 电池极柱间连接片及连接线安装牢固，接触良好，无腐蚀现象。

The connecting pieces and connecting wires between the poles of the battery are firmly installed, with good contact and no corrosion.  
The connecting strips and connecting wires between battery poles are firmly installed, in good contact, and there is no corrosion.

1. 蓄电池均浮充电压和电流、放电电流正常。 34．控制室巡视项目和要求如下：

The charging voltage and current of the battery are floating, and the discharging current is normal. 34. The control room patrol items and requirements are as follows:  
The floating charge voltage, current and discharge current of the battery are normal. 34. Control room inspection items and requirements are as follows:

1. 各种盘（台）上的设备清洁，锈蚀面积不超过规定,安装牢固。

The equipment on all kinds of trays (tables) shall be clean, the corroded area shall not exceed the regulations, and the installation shall be firm.  
The equipment on various plates (tables) is clean, the corroded area does not exceed the regulations, and the installation is firm.

1. 监控盘与实际运行方式相符。

The monitoring disk is consistent with the actual operation mode.  
The monitoring panel is consistent with the actual operation mode.

1. 转换开关、继电保护和自动装置压板以及切换开关的位置应正确，并与记录相符。

Change-over switches, relay protection and automatic device pressure plates and change-over switches shall be positioned correctly and in accordance with the records.  
The positions of transfer switches, relay protection and automatic device pressure plates and transfer switches shall be correct and consistent with the records.

1. 开关、熔断器、端子安装牢固，接触良好，无过热和烧伤痕迹。

Switches, fuses and terminals are firmly installed and in good contact without overheating and burn marks.  
Switches, fuses and terminals are firmly installed, in good contact, and there are no signs of overheating or burn.

1. 综自测控屏设备工作及后台主界面信息显示正常。

The integrated self-control screen equipment works and the background main interface information displays normally.  
The equipment operation of the comprehensive automatic measurement and control screen and the information display on the main interface in the background are normal.

1. 二次回路熔断器（或空气开关）位置应正确，端子排的连片、跨接线应正常。

Secondary circuit fuse (or air switch) position should be correct, terminal block contiguous, jumper wire should be normal.  
The position of the secondary circuit fuse (or air switch) should be correct, and the connection and jumper wires of the terminal block should be normal.

1. 事故照明切换正常。

Emergency lighting switching is normal.  
The emergency lighting switches normally.

1. 电缆光纤光栅在线测温系统、接触网开关监控装置、试验信号装置等各种显示装置指示正常。

Various display devices, such as cable fiber grating on-line temperature measurement system, catenary switch monitoring device, test signal device, etc., indicate normal.  
Various display devices such as cable fiber grating online temperature measurement system, catenary switch monitoring device, and test signal device indicate normal.

# 第四章 变电所设备运行规定

# Chapter IV Operation Regulations of Substation Equipment Chapter 4 Provisions on Operation of Substation Equipment

1. 长期停用和检修后的变压器，在投入运行前除按正常巡视项目检查外，还要检查下列各项：

After long-term shutdown and overhaul of transformers, before putting into operation, in addition to checking according to normal patrol items, the following items should also be checked:  
Transformers that have been suspended and overhauled for a long time must not only be inspected according to normal inspection items before being put into operation, but also the following items must be inspected:

1. 分接开关位置应正确。

Tap changer position should be correct.  
The tap changer position should be correct.

1. 各散热器、油枕、压力释放装置等处阀门应打开，散热器、油箱上部残存的空气应排除。

Valves of radiators, oil pillows and pressure relief devices should be opened, and residual air on the upper part of radiators and oil tanks should be removed.  
Valves at each radiator, oil conservator, pressure relief device, etc. should be opened, and residual air on the upper part of the radiator and fuel tank should be expelled.

1. 按规定试验合格。

Pass the test according to regulations.  
Pass the test as specified.

1. 保护装置应正常。

Protective devices should be normal.  
The protective device should be normal.

1. 检修时所做的安全设施应拆除，变压器顶部应无遗留工具和杂物等。

Safety facilities made during maintenance should be removed, and there should be no left tools and sundries on the top of transformer.  
The safety facilities made during maintenance should be removed, and the top of the transformer should be free of left tools and sundries.

1. 在正常情况下允许的牵引变压器过负荷值，在事故情况下允许的变压器过负荷值可参照下表执行。

The allowable overload value of traction transformer under normal conditions and the allowable overload value of transformer under accident conditions can be implemented with reference to the following table.  
The allowable overload value of traction transformer under normal circumstances and the allowable overload value of transformer under accident conditions can refer to the following table.

当变压器过负荷运行时，对有关设备要加强检查：

When the transformer is overloaded, the relevant equipment should be inspected:  
When the transformer is operating under overload, the inspection of relevant equipment should be strengthened:

1. 监视综自后台机或前台面板电流测量回路显示数值，记录过负荷的数值和持续时

Monitor the value displayed by the background machine or the current measurement loop of the foreground panel, and record the value and duration of overload  
Monitor the displayed value of the current measurement loop on the comprehensive automatic background machine or front panel, and record the value and duration of the overload

间。

Between.  
between.

1. 注意保护装置的运行情况。

Pay attention to the operation of the protection device.  
Pay attention to the operation of the protective device.

1. 监视变压器音响、油温和油位的运行状况。

Monitor the operation status of transformer sound, oil temperature and oil level.  
Monitor the operating conditions of transformer sound, oil temperature and oil level.

1. 检查运行的变压器、断路器、隔离开关、母线及引线等有无过热现象。

Check the running transformer, circuit breaker, isolating switch, bus and lead for overheating.  
Check the operating transformers, circuit breakers, isolating switches, buses and leads for overheating.

1. 当变更变压器分接开关的位置后，必须检查回路的完整性和各相电阻的均一性，并将变更前后分接开关的位置及有关情况记入有关记录中。

When changing the position of the tap-changer of the transformer, it is necessary to check the integrity of the loop and the uniformity of the resistance of each phase, and record the position of the tap-changer before and after the change and related conditions in the relevant records.  
After changing the position of the transformer tap changer, the integrity of the loop and the uniformity of the resistance of each phase must be checked, and the position of the tap changer before and after the change and relevant conditions must be recorded in the relevant records.

1. 变压器在换油、滤油后，一般情况下，变压器油静置时间应不少于下列规定，待绝缘油中的气泡消除后方可运行。

Transformer in the oil change, oil filter, in general, the transformer oil standing time should not be less than the following provisions, to be insulating oil bubble elimination after the operation.  
After the transformer is changed and filtered, under normal circumstances, the standing time of the transformer oil should not be less than the following regulations, and it can be run only after the bubbles in the insulating oil are eliminated.

110kV 及以下 24 小时；220kV48 小时；500(330)kV72 小时（按照变压器电压等级）。

110kV and below for 24 hours; 220kV48 hours; 500 (330) kV 72 hours (according to transformer voltage class).  
110kV and below for 24 hours;220kV for 48 hours;500(330)kV for 72 hours (according to transformer voltage class).

1. 运行中的油浸自冷、风冷式变压器，其上层油温不应超过 85℃；风冷式变压器当其上层油温超过 55℃时应起动风扇。

For oil-immersed self-cooling and air-cooled transformers in operation, the upper oil temperature should not exceed 85 ℃; When the upper oil temperature of air-cooled transformer exceeds 55 ℃, the fan should be started.  
For oil-immersed self-cooled and air-cooled transformers in operation, the upper oil temperature should not exceed 85℃; for air-cooled transformers, the fan should be started when the upper oil temperature exceeds 55℃.

当变压器油温超过规定值时，要检查原因，采取措施降低油温，一般应进行下列工作：

When the transformer oil temperature exceeds the specified value, check the reasons and take measures to reduce the oil temperature. Generally, the following work should be carried out:  
When the transformer oil temperature exceeds the specified value, the cause must be checked and measures taken to reduce the oil temperature. Generally, the following work should be carried out:

1. 检查变压器负荷和温度，并与正常情况下的油温核对。

Check transformer load and temperature, and check with normal oil temperature.  
Check the transformer load and temperature and check with the oil temperature under normal conditions.

1. 核对油温表。

Check the oil temperature gauge.  
Check the oil temperature gauge.

1. 检查变压器冷却装置及通风情况。

Check the cooling device and ventilation of transformer.  
Check the transformer cooling device and ventilation conditions.

1. 当变压器有下列情况之一者须立即停止运行：

When the transformer has one of the following conditions, it must stop running immediately:  
The transformer must stop running immediately when one of the following conditions occurs:

1. 变压器音响很大且不均匀或有爆裂声。

Transformer sound is loud and uneven or has crackling sound.  
The transformer sound is loud and uneven or has a popping sound.

1. 油枕或防爆管喷油。

Oil pillow or explosion-proof pipe injects oil.  
Oil spray from oil conservators or explosion-proof pipes.

1. 冷却及油温测量系统正常但油温较平时在相同条件下运行时高出 10℃以上或不断上升时。

When the cooling and oil temperature measuring system is normal but the oil temperature is higher than 10 ℃ or rising when it is operated under the same conditions.  
When the cooling and oil temperature measurement system is normal, but the oil temperature is more than 10 ° C higher than usual when operating under the same conditions or continues to rise.

1. 套管严重破损和放电。

Serious damage and discharge of casing.  
The casing was severely damaged and discharged.

1. 由于漏油致使油位不断下降或低于下限。

The oil level drops continuously or falls below the lower limit due to oil leakage.  
Due to oil leaks, the oil level continues to drop or fall below the lower limit.

1. 油色不正常（隔膜式油枕除外）或油内有碳质等杂物。

The oil color is abnormal (except diaphragm oil pillow) or there are sundries such as carbon in the oil.  
The oil color is abnormal (except for diaphragm oil conservators) or there are carbon and other debris in the oil.

1. 变压器着火。

The transformer caught fire.  
The transformer caught fire.

1. 重瓦斯保护动作。

Heavy gas protection action.  
Heavy gas protection action.

1. 因变压器内部故障引起差动保护动作。

Differential protection action caused by internal fault of transformer.  
Differential protection action due to internal fault of the transformer.

1. 对断路器要建立专门记录（见附件 8），逐台统计其自动跳闸次数，当自动跳闸次数达到规定数值时应进行检修。

Special records shall be established for circuit breakers (see Annex 8), and the automatic tripping times shall be counted one by one. When the automatic tripping times reach the specified value, maintenance shall be carried out.  
Special records shall be established for circuit breakers (see Attachment 8), and the number of automatic trips shall be counted one by one. When the number of automatic trips reaches the specified value, maintenance shall be carried out.

发现断路器拒动时应立即停止运行。

When the circuit breaker refuses to operate, it should stop running immediately.  
Stop running immediately when it is found that the circuit breaker refuses to operate.

断路器跳闸时，发生严重喷油、喷瓦斯或发现油内含碳量很高或气体颜色极不正常、气压低于下限值、触头严重烧伤、不对位时应立即停止使用。

When the circuit breaker trips, serious oil injection and gas injection occur, or it is found that the carbon content in the oil is very high or the gas color is extremely abnormal, the air pressure is lower than the lower limit, the contacts are seriously burned, and the use should be stopped immediately when it is not aligned.  
When the circuit breaker trips, severe oil injection or gas injection occurs, or when the oil contains a high carbon content or the gas color is extremely abnormal, the air pressure is lower than the lower limit, the contacts are seriously burned, and the alignment should be stopped immediately.

断路器每次自动跳闸后，依据工电供调度命令进行处置，尽快恢复送电。 42．直流操作母线电压不应超过额定值的±５％。

After each automatic trip of the circuit breaker, it shall be disposed according to the dispatching command of power supply and power transmission shall be resumed as soon as possible. 42. DC operating bus voltage shall not exceed 5% of rated value.  
After each automatic trip of the circuit breaker, it will be handled according to the power supply dispatch order, and power transmission will be restored as soon as possible. 42. The DC operating bus voltage shall not exceed ± 5% of the rated value.

直流母线调压开关在手动位时的操作应按照产品使用说明书进行。

The operation of DC bus voltage regulating switch in manual position should be carried out according to the product instruction manual.  
The operation of the DC bus voltage regulating switch when it is in the manual position shall be carried out in accordance with the product instructions.

1. 运行中的蓄电池，应经常处于浮充电状态，并定期进行核对性充放电。蓄电池的充放电电流不得超过其允许的最大电流。

The battery in operation should always be in a floating charging state, and check the charging and discharging regularly. The charging and discharging current of the battery shall not exceed its maximum allowable current.  
Batteries in operation should always be in a floating charging state, and check charging and discharging should be carried out regularly. The charging and discharging current of the battery shall not exceed its allowable maximum current.

1. 运行的继电保护装置必须设置密码，定值修改密码由检修人员管理。在紧急情况下，由当班的工电供调度员远程更改或下令由运行检修人员更改定值，事后工电供调度员和运行检修人员应记录上述过程。

Password must be set for relay protection devices in operation, and the password for setting value modification shall be managed by maintenance personnel. In case of emergency, the power supply dispatcher on duty shall remotely change or order the operation maintenance personnel to change the setting value, and the power supply dispatcher and operation maintenance personnel shall record the above process afterwards.  
Passwords must be set for running relay protection devices, and fixed value modification passwords must be managed by maintenance personnel. In case of emergency, the power supply dispatcher on duty shall remotely change or order the operation and maintenance personnel to change the fixed value. Afterwards, the power supply dispatcher and operation and maintenance personnel shall record the above process.

1. 凡设有继电保护装置的电气设备，必要时经过工电供调度员的批准，允许在部分继电保护暂时撤出的情况下运行。

All electrical equipment equipped with relay protection devices are allowed to operate under the condition that part of relay protection is temporarily withdrawn after being approved by the dispatcher of power supply when necessary.  
All electrical equipment equipped with relay protection devices is allowed to operate under the condition that part of the relay protection is temporarily withdrawn, with the approval of the industrial and power supply dispatcher if necessary.

主变压器的重瓦斯和差动保护不得同时撤除。

Heavy gas and differential protection of main transformer shall not be removed at the same time.  
Heavy gas and differential protection of the main transformer shall not be removed at the same time.

1. 互感器在投入运行前要检查一、二次接地端子及外壳接地应良好，对电流互感器还

Before the transformer is put into operation, it is necessary to check that the primary and secondary grounding terminals and the shell grounding should be good. For the current transformer,  
Before the transformer is put into operation, check that the primary and secondary grounding terminals and the housing grounding must be in good condition.

应保证二次无开路，电压互感器应保证二次无短路，并检查其高低压熔断器、空气开关是否完好。

Should ensure no secondary open circuit, voltage transformer should ensure no secondary short circuit, and check its high and low voltage fuses, air switch is in good condition.  
Ensure that there is no secondary open circuit, and the voltage transformer should ensure that there is no secondary short circuit, and check whether its high and low voltage fuses and air switches are in good condition.

互感器投入运行后要检查有关表计，指示应正确。监控后台显示相关数据正确。

After the transformer is put into operation, check the relevant meters, and the instructions should be correct. The monitoring background shows that the relevant data is correct.  
After the transformer is put into operation, the relevant meters must be checked and the instructions must be correct. The relevant data displayed in the monitoring background is correct.

1. 切换电压互感器或断开其二次侧熔断器或空气开关时，应采取措施防止有关保护装置误动作。

When switching voltage transformer or disconnecting its secondary fuse or air switch, measures should be taken to prevent misoperation of relevant protection devices.  
When switching a voltage transformer or disconnecting its secondary side fuse or air switch, measures should be taken to prevent misoperation of relevant protective devices.

1. 当互感器有下列情况之一者须立即停止运行：

When the transformer has one of the following conditions, it must stop running immediately:  
The transformer must stop operating immediately when one of the following conditions occurs:

1. 高压侧熔断器连续烧断两次。

The fuse on the high voltage side burns out twice continuously.  
The high-voltage side fuse blows twice in succession.

1. 音响很大且不均匀或有爆裂声。

The sound is loud and uneven or has a crackling sound.  
The sound is loud and uneven or has a popping sound.

1. 有异味或冒烟。

Have peculiar smell or smoke.  
Smell or smoke.

1. 喷油或着火。

Fuel injection or fire.  
Oil spray or fire.

1. 由于漏油使油位不断下降或低于下限。

The oil level drops continuously or falls below the lower limit due to oil leakage.  
Due to oil leaks, the oil level continues to drop or fall below the lower limit.

1. 严重的火花放电现象。

Severe spark discharge phenomenon.  
Severe spark discharge.

1. 保护和自动装置的接线及整定必须符合规定，改变时必须由变电维修组或设计单位提供定值整定计算书，经变电维修组主管领导供电队队长批准并报基础设施维护公司核备方准实施；属地方电业部门管辖者应有电业部门主管单位的书面通知单。

The wiring and setting of protection and automatic devices must conform to the regulations. When changing, the substation maintenance group or the design unit must provide the setting calculation book, which shall be approved by the leader of the power supply team in charge of the substation maintenance group and reported to the infrastructure maintenance company for approval; Those under the jurisdiction of the local electric power department shall have a written notice from the competent unit of the electric power department.  
The wiring and setting of protection and automatic devices must comply with regulations. When changing, the transformer maintenance team or the design unit must provide a setting value setting calculation, which must be approved by the leader of the power supply team leader in charge of the transformer maintenance team and reported to the infrastructure maintenance company for verification and preparation. For implementation; those under the jurisdiction of the local electric power department shall have a written notice from the competent unit of the electric power department.

1. 继电保护、自动装置及操作、信号、测量回路所用的导线必须符合下列规定：

Conductors used in relay protection, automatic devices and operation, signal and measurement circuits must meet the following requirements:  
The wires used for relay protection, automatic devices and operation, signal and measurement circuits must meet the following requirements:

1. 用绝缘单芯铜线。当采用接线鼻子时，也可使用绝缘多股铜。

Use insulated single-core copper wire. When connecting noses are used, insulated multi-strands of copper can also be used.  
Use insulated single-core copper wire. When connecting noses are used, insulated multi-strand copper can also be used.

1. 电流互感器二次电流回路的导线截面，应按电流互感器的额定二次负荷计算，5A的计量回路不宜小于 4mm2,1A 的计量回路不宜小于 2.5mm2 ， 其他测量回路不宜小于 2.5mm2。

The conductor section of the secondary current loop of the current transformer shall be calculated according to the rated secondary load of the current transformer. The metering loop of 5A shall not be less than 4mm 2 , the metering loop of 1A shall not be less than 2.5 mm 2 , and other metering loops shall not be less than 2.5 mm 2 .  
The wire cross-section of the secondary current loop of the current transformer should be calculated based on the rated secondary load of the current transformer. The 5A measuring loop should not be less than 4mm2, the 1A measuring loop should not be less than 2.5mm2, and other measuring loops should not be less than 2.5mm2.

1. 电压互感器二次电压回路的导线截面选择应符合二次回路允许的电压降，一般计量回路不宜小于 4mm2,其他测量回路不宜小于 2.5mm2。

The selection of conductor section of secondary voltage circuit of voltage transformer should conform to the allowable voltage drop of secondary circuit, and the general metering circuit should not be less than 4mm 2 , and other metering circuits should not be less than 2.5 mm 2 .  
The wire cross-section selection of the secondary voltage loop of the voltage transformer should comply with the allowable voltage drop of the secondary loop. The general measurement loop should not be less than 4mm2, and other measurement loops should not be less than 2.5mm2.

1. 所有屏、台、柜内的电气仪表电流回路导线截面积不应小于 2.5mm2,电压回路不应小于 1.5mm2。

The cross-sectional area of current loop wires of electrical instruments in all screens, tables and cabinets shall not be less than 2.5 mm 2 , and the voltage loop shall not be less than 1.5 mm 2 .  
The cross-sectional area of the current loop wires of all electrical instruments in screens, desks and cabinets should not be less than 2.5mm2, and the voltage loop should not be less than 1.5mm2.

1. 导线的绝缘应满足 500V 工作电压的要求。

The insulation of conductors should meet the requirements of 500V working voltage.  
The insulation of wires shall meet the requirements of 500V working voltage.

1. 导线中间不得有接头；遇有油浸蚀的处所，要用耐油绝缘导线。

There shall be no joint in the middle of the conductor; In case of oil erosion, oil-resistant insulated wires should be used.  
No joints shall be allowed between wires; oil-resistant insulated wires shall be used in places eroded by oil.

1. 接地的设备均应逐台用单独的接地线接到接地母线上，禁止设备串联接地。接地线与接地体的连接宜用焊接。接地线与电力设备的连接可用螺栓连接或焊接。用螺栓连接时应设防松螺帽或防松垫片。地面上的接地线、接地端子均要涂黑漆；接地端子的螺栓应镀锌。

Grounded equipment shall be connected to the grounding bus with separate grounding wires one by one, and series grounding of equipment is prohibited. The connection between grounding wire and grounding body should be welded. The connection between grounding wire and power equipment can be bolted or welded. When connecting with bolts, lock nuts or lock gaskets should be fortified. Grounding wires and grounding terminals on the ground should be painted with black paint; Bolts of grounding terminals shall be galvanized.  
Earthed equipment shall be connected to the grounding bus one by one with a separate grounding wire, and it is prohibited for equipment to be grounded in series. Welding should be used for the connection between the ground wire and the ground body. The connection between the ground wire and the power equipment can be bolted or welded. When connecting with bolts, loose nuts or anti-loose washers should be provided. The grounding wire and grounding terminal on the ground must be painted with black paint; the bolts of the grounding terminal should be galvanized.

# 第五章 修程修制

# Chapter V Repair System Chapter 5 Repair procedures and systems

1. 电气设备的检修分小修、状态维修和大修 3 种。

The maintenance of electrical equipment is divided into three types: minor repair, condition-based maintenance and overhaul.  
The maintenance of electrical equipment is divided into three types: minor repairs, condition-based maintenance and major repairs.

1. 小修：维持性修理。对设备进行检查、清扫、调整,保持设备正常的技术状态。

Minor repairs: maintenance repairs. Check, clean and adjust the equipment to keep the normal technical state of the equipment.  
Minor repairs: Maintenance repairs. Inspect, clean and adjust the equipment to maintain normal technical status of the equipment.

1. 状态维修：根据检测、试验结果对存在问题的设备安排的有计划性维修。

Condition-based maintenance: the planned maintenance of equipment with problems according to the inspection and test results.  
Condition-based maintenance: Planned maintenance arranged for problematic equipment based on testing and test results.

1. 大修：达到使用寿命后的整体更换。 53．检修方式

Overhaul: Integral replacement after reaching service life. 53. Maintenance method  
Overhaul: Overall replacement after reaching service life. 53. maintenance mode

1. 小修：清扫维护，更换易损件。

Minor repairs: Clean and maintain, and replace wearing parts.  
Minor repairs: Cleaning and maintenance, replacing wearing parts.

1. 状态维修：局部更换。

Condition-based maintenance: partial replacement.  
Condition maintenance: Partial replacement.

1. 大修：整体更换

Overhaul: Integral replacement  
Overhaul: Overall replacement

较复杂的检修、试验可委托专业机构进行。

Complicated maintenance and test can be entrusted to professional institutions.  
More complex maintenance and tests can be entrusted to professional organizations.

1. 主要设备的小修、大修周期如下表（或按设备生产厂商建议的时间周期）:

The minor repair and overhaul periods of major equipment are as follows (or according to the time period recommended by the equipment manufacturer):  
The minor repair and overhaul cycle of major equipment is as follows (or according to the time cycle recommended by the equipment manufacturer):

|  |  |  |  |
| --- | --- | --- | --- |
| 序号 serial number  Serial number | 设备 device  equipment | 小修 minor repair  Minor repairs | 大修（推荐值） Overhaul (recommended value)  Overhaul (recommended value) |
| 1 | 变压器（含自耦变压器）  Transformer (including autotransformer) Transformer (including autotransformer) | 1年  1 year 1 year | 15-20 年  15-20 years 15-20 years |
| 2 | 干式变压器  Dry type transformer dry-type transformer | 1年  1 year 1 year | 15-20 年  15-20 years 15-20 years |
| 3 | 单装互感器  Single transformer Single installed transformer | 1年  1 year 1 year | 15-20 年  15-20 years 15-20 years |
| 4 | 隔离开关（单独装设、含操作机构  Isolating switch (separately installed, including operating mechanism Isolating switch (separately installed, including operating mechanism | 1年  1 year 1 year | 10-15 年  10-15 years 10-15 years |
| 5 | 交直流电源装置  AC/DC power supply device AC and DC power supply device | 1年  1 year 1 year | 8-10 年  8-10 years 8-10 years |
| 6 | 户外高压母线  Outdoor high voltage bus Outdoor high-voltage bus | 1年  1 year 1 year | 10-15 年  10-15 years 10-15 years |
| 7 | 高压电缆  High voltage cable high-voltage cable | 1年  1 year 1 year | 15-20 年  15-20 years 15-20 years |
| 8 | 避雷针  Lightning rod lightning rod | 每年雷雨季节前  Before the thunderstorm season every year, Every year before the thunderstorm season | 15-20 年  15-20 years 15-20 years |
| 9 | 避雷器  Lightning arrester arrester | 每年雷雨季节前  Before the thunderstorm season every year, Every year before the thunderstorm season | 10-15 年  10-15 years 10-15 years |
| 10 | 接地装置  Grounding device grounding device | 每年雷雨季节前  Before the thunderstorm season every year, Every year before the thunderstorm season | 10-15 年  10-15 years 10-15 years |
| 11 | 单装气体断路器  Single gas circuit breaker Single installed gas circuit breaker | 1年  1 year 1 year | 15-20 年  15-20 years 15-20 years |
| 12 | 单装真空断路器  Single vacuum circuit breaker Single vacuum circuit breaker | 1年  1 year 1 year | 15-20 年  15-20 years 15-20 years |
| 13 | 综合自动化设备  Integrated automation equipment Comprehensive automation equipment | 1年  1 year 1 year | 6-8 年  6-8 years 6-8 years |
| 14 | 负荷开关柜  Load switchgear load switch cabinet | 1年  1 year 1 year | 10-15 年  10-15 years 10-15 years |

|  |  |  |  |
| --- | --- | --- | --- |
| 15 | 电缆光纤光栅在线测温装置  Fiber Bragg grating cable on-line temperature measuring device Cable fiber grating online temperature measuring device | 1年  1 year 1 year | 6-8 年  6-8 years 6-8 years |
| 16 | 接触网开关监控盘  Catenary switch monitoring panel Contact line switch monitoring panel | 1年  1 year 1 year | 6-8 年  6-8 years 6-8 years |
| 17 | 安全环境监测设备  Safety environment monitoring equipment Safety environment monitoring equipment | 1年  1 year 1 year | 6-8 年  6-8 years 6-8 years |
| 18 | 远动装置  Telecontrol device telecontrol device | 1年  1 year 1 year | 6-8 年  6-8 years 6-8 years |
| 19 | 集合式电容器（电容器组）  Collective capacitor (capacitor bank) Collective capacitor (capacitor bank) | 1年  1 year 1 year | 5-10 年  5-10 years 5-10 years |
| 20 | 空心电抗器  Air core reactor air-core reactor | 1年  1 year 1 year | 10-15 年  10-15 years 10-15 years |
| 21 | 端子箱（集中接地箱）  Terminal box (centralized grounding box) Terminal box (centralized grounding box) | 1年  1 year 1 year | 8-10 年  8-10 years 8-10 years |

小修实际周期允许较以上规定伸缩 15%。

The actual period of minor repairs is allowed to expand and contract by 15% compared with the above regulations.  
The actual cycle of minor repairs is allowed to be 15% longer than the above regulations.

1. 牵引变电所运行检修应配备必要的备品备件、仪器仪表及工器具，并与设备发展相适应。

The operation and maintenance of traction substation should be equipped with necessary spare parts, instruments and instruments, and adapt to the development of equipment.  
The operation and maintenance of traction substations shall be equipped with necessary spare parts, instruments and tools, and shall be compatible with the development of equipment.

1. 设备达到使用寿命，经产权单位组织有关专家评审认定可以延期使用的，可继续投入使用。

If the equipment reaches its service life and can be postponed after being reviewed by relevant experts organized by the property right unit, it can continue to be put into use.  
If the equipment has reached its service life and has been reviewed by relevant experts organized by the property rights unit and determined that its use can be extended, it can continue to be put into use.

1. 设备鉴定是全面质量管理工作的重要组成部分，是掌握设备质量，做好年度检修、大修设备计划的重要依据。设备维护管理单位应于每年（天气干燥季节，如秋季）组织一次设备鉴定，评定设备的优良率、合格率、不合格率。

Equipment appraisal is an important part of total quality management, and it is an important basis for mastering equipment quality and making annual maintenance and overhaul plan. Equipment maintenance and management units shall organize equipment appraisal once a year (dry weather season, such as autumn) to evaluate the excellent rate, qualified rate and unqualified rate of equipment.  
Equipment appraisal is an important part of total quality management and an important basis for grasping equipment quality and making annual maintenance and overhaul equipment plans. The equipment maintenance and management unit shall organize an equipment appraisal every year (dry weather season, such as autumn) to evaluate the excellent rate, pass rate and failure rate of the equipment.

优良——主要项目达到优良标准，次要项目全部达到合格以上标准者；

Excellent-the major projects have reached the excellent standard, and all the minor projects have reached the above-qualified standard;  
Excellent-The main items meet the excellent standard, and all secondary items meet the standard above pass;

合格——主要项目全部达到合格标准，次要项目多数达到合格以上标准者；不合格——主要项目中有一项未达到合格标准或次要项目多数不合格者。 设备鉴定的方式：巡视、检修试验的结果分析、重点设备的抽测。

Qualified-all major projects have reached the qualification standard, and most minor projects have reached the qualification standard or above; Unqualified-one of the major items fails to meet the eligibility criteria or most of the minor items fail. Equipment appraisal methods: patrol, analysis of maintenance test results, sampling and testing of key equipment.  
Qualified-all major items meet the qualification standards, and most minor items meet the qualification standards or above; unqualified-one of the major items fails to meet the qualification standards or most minor items fail. Equipment identification methods: inspection, analysis of the results of maintenance tests, and sampling testing of key equipment.

对已封存的设备、已列入年度大修计划的设备可不作鉴定和统计；本年度新建或大修后的设备质量状态可按竣工验收评定结果统计。

The equipment that has been sealed up and listed in the annual overhaul plan may not be identified and counted; The quality status of newly built or overhauled equipment in this year can be counted according to the evaluation results of completion acceptance.  
Identification and statistics may not be made for sealed equipment or equipment included in the annual overhaul plan; the quality status of equipment newly built or overhauled this year may be calculated based on the completion acceptance evaluation results.

1. 检修计划依据设备鉴定、检修试验结果编制。变电维修组于前一年 12 月底前完成并上报到维修基地，同时报基础设施维护公司备案。

Maintenance plan shall be prepared according to equipment appraisal and maintenance test results. The substation maintenance team shall complete and report to the maintenance base before the end of December of the previous year, and report to the infrastructure maintenance company for the record.  
The maintenance plan is prepared based on equipment identification and maintenance test results. The substation maintenance team completed it before the end of December of the previous year and reported it to the maintenance base, and also reported it to the infrastructure maintenance company for filing.

1. 设备大修应填写设备大修申请书（格式见附件 9）,报联营公司核备。

Equipment overhaul should fill in the application form for equipment overhaul (see Annex 9 for the format) and report it to the associated company for approval.  
For equipment overhaul, an equipment overhaul application form should be filled in (see Attachment 9 for format) and submitted to the associated company for approval.

1. 设备大修要根据批准的计划由承修单位或设计部门提出设计施工文件（包括检修内容、质量标准、费用和工时等），报请联营公司批准后方准开工。

According to the approved plan, the overhaul unit or design department shall submit design and construction documents (including overhaul contents, quality standards, costs and working hours, etc.), and submit them to the associated company for approval before commencement.  
Equipment overhaul must be submitted by the maintenance unit or the design department according to the approved plan to design and construction documents (including maintenance content, quality standards, costs and working hours, etc.) and submitted to the joint venture company for approval before starting.

1. 需接触网停电的牵引变电所设备作业一般应在“天窗”点内进行。夜间作业应具备足够的固定、移动照明设备。

The equipment operation of traction substation requiring power failure of catenary should generally be carried out in the "skylight" point. Adequate fixed and mobile lighting equipment should be provided for night work.  
Equipment operations in traction substations that require a power outage of the catenary should generally be carried out within the "skylight" point. Adequate fixed and mobile lighting equipment should be available for night operations.

不需要接触网停电的牵引变电所备用设备以及退出后不影响机车车辆（含动车组）运行的分区所可昼间进行作业。

Standby equipment of traction substation without power failure of catenary and sub-districts that do not affect the operation of locomotives and rolling stock (including EMUs) after exit can operate in daytime.  
Spare equipment in traction substations that do not require a power outage of the catenary and subdivisions that will not affect the operation of rolling stock (including EMU) after withdrawal can be operated during the day.

在检修试验过程中，当运行设备发生故障无法投入备用设备时，检修作业须能在短时间内恢复至正常运行状态，用该设备代替故障设备投入运行，确认该牵引变电所两边供电臂上分区所的远动通道处于正常运行状态，以防紧急情况下随时可以实施越区供电。

In the process of maintenance test, when the running equipment fails and the standby equipment cannot be put into operation, the maintenance operation must be able to return to the normal operation state in a short time, and the equipment should be put into operation instead of the faulty equipment, so as to confirm that the telecontrol channels of the sub-districts on the power supply arms on both sides of the traction substation are in normal operation state, so as to prevent cross-regional power supply from being implemented at any time in case of emergency.  
During the maintenance test, when the operating equipment fails and cannot be put into standby equipment, the maintenance operation must be able to return to normal operation in a short time, and the equipment must be used instead of the failed equipment and put into operation. Confirm that the remote control channel of the sub-division station is in normal operation to prevent cross-zone power supply from being implemented at any time in an emergency.

1. 设备每次检修后，变电维修组均应填写设备检修记录（格式见附件 6）,设备大修及进行较大的技术改造后，还应填写设备检修（改造）竣工验收报告，格式按新建工程竣工验收报告格式编写并附试验记录，报请基础部验收，经验收合格方准投入运行。

After each equipment overhaul, the substation maintenance team shall fill in the equipment overhaul record (see Annex 6 for the format). After the equipment overhaul and major technical transformation, it shall also fill in the equipment overhaul (transformation) completion acceptance report. The format shall be prepared according to the new project completion acceptance report format with test records attached, and shall be submitted to the foundation department for acceptance. Only after passing the acceptance can it be put into operation.  
After each equipment maintenance, the substation maintenance team shall fill in the equipment maintenance record (see Attachment 6 for the format). After the equipment is overhauled and major technical transformation, the equipment maintenance (transformation) completion acceptance report shall also be filled in, and the format shall be in accordance with the completion acceptance report of the new project. The format of the report shall be compiled and attached with the test records, and submitted to the Basic Department for acceptance. It can be put into operation only after passing the acceptance.

1. 设备小修、状态维修、大修验收办法由基础部自行制定。

The acceptance methods for minor repair, condition-based maintenance and overhaul of equipment shall be formulated by the foundation department itself.  
Equipment minor repair, condition maintenance, and overhaul acceptance methods shall be formulated by the Basic Department itself.

# 第六章 检修范围和标准

# Chapter VI Scope and Standards of Maintenance Chapter 6 Maintenance Scope and Standards

1. 所有电气设备的外壳均应清洁无油垢，工作接地及保护接地良好。

The enclosures of all electrical equipment shall be clean and free of grease, and the working grounding and protective grounding shall be good.  
The enclosures of all electrical equipment should be clean and free of oil scale, and the working and protective grounding should be good.

1. 所有充油（气）设备的油位（气压）、油（气）色均要符合规定，油管路畅通，油位计（气压表、密度表）清洁透明，无渗、漏油（气）。

The oil level (air pressure) and oil (gas) color of all oil-filled (gas) equipment shall conform to the regulations, the oil pipeline shall be unblocked, and the oil level gauge (barometer and density gauge) shall be clean and transparent without leakage or oil (gas).  
The oil level (air pressure) and oil (air) color of all oil (air) filled equipment must comply with regulations, the oil pipeline must be smooth, and the oil level gauge (barometer, density gauge) must be clean and transparent, without leakage or oil leakage (air).

1. 金属构架、杆塔和支撑装置的锈蚀面积，不得超过总面积的 5%。钢筋混凝土基础、杆塔、构架应完好，安装牢固，并不得有破损、下沉。

The corrosion area of metal frame, tower and supporting device shall not exceed 5% of the total area. Reinforced concrete foundation, tower and frame shall be intact and firmly installed, and shall not be damaged or sunk.  
The corroded area of metal frames, towers and supporting devices shall not exceed 5% of the total area. The reinforced concrete foundation, tower and frame shall be intact and firmly installed, and shall be free of damage or subsidence.

1. 紧固件要固定牢靠，不得松动，并有防松、防锈措施。

Fasteners should be fixed firmly, not loose, and have anti-loosening and anti-rust measures.  
Fasteners must be fixed firmly and must not be loosened, and anti-loosening and anti-rust measures must be taken.

1. 绝缘件应无脏污、裂纹、破损和放电痕迹，瓷釉剥落面积不得超过 300mm2。复合绝缘子无变形、龟裂等现象。

Insulation parts shall be free from dirt, cracks, damage and discharge traces, and the enamel peeling area shall not exceed 300mm 2 . Composite insulators have no deformation, cracking and other phenomena.  
Insulating parts shall have no dirt, cracks, damage and discharge traces, and the enamel peeling area shall not exceed 300 mm2. Composite insulators have no deformation, cracking and other phenomena.

1. 各种引线不得松股、断股，连接要牢固，接触良好，张力、弛度适当，相间和对地距离均要符合规定。

All kinds of leads shall not be loose or broken, the connection shall be firm, the contact shall be good, the tension and relaxation shall be appropriate, and the interphase and ground distance shall conform to the regulations.  
All kinds of leads shall not be loose or broken. The connection shall be firm, the contact shall be good, the tension and sag shall be appropriate, and the distance between phases and ground must comply with regulations.

1. 电气设备带电部分距接地部分及相间的最小距离要符合下表。

The minimum distance from the live part of electrical equipment to the grounding part and between phases shall conform to the following table.  
The minimum distance between the live part of electrical equipment and the grounded part and the phases shall comply with the following table.

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 项目 project  Project | 室内  indoor indoor indoor | | 室外  Outdoor outdoor outdoor outdoor outdoor outdoor | | | | |
| 10kV | 35kV | 1-10kV | 35kV | 63kV | 110kV | 220kV |
| 带电部分至接地部分  Live part to ground part Live part to grounded part | 125mm | 300mm | 200mm | 400mm | 650mm | 1000mm | 1800mm |
| 不同相的带电部分之间  Between charged parts of different phases between the charged parts of different phases | 125mm | 300mm | 200mm | 400mm | 650mm | 1100mm | 2000mm |

1. 状态维修后的设备质量应满足设备正常运行要求。大修更换后的设备，整体性能应达到新建项目的标准。

The quality of equipment after condition-based maintenance should meet the requirements of normal operation of equipment. After overhaul and replacement, the overall performance of the equipment shall meet the standards of the newly built project.  
The quality of the equipment after condition-based maintenance shall meet the requirements for normal operation of the equipment. The overall performance of the equipment after overhaul and replacement should meet the standards of new projects.

1. 变压器小修范围和标准：

Scope and standard of transformer minor repair:  
Scope and standards for minor repairs of transformers:

1. 检查清扫外壳，必要时局部涂漆。

Check and clean the shell and paint it locally if necessary.  
Inspect and clean the shell and paint it locally if necessary.

1. 检查紧固法兰，受力均匀适当，检查油位并补油。

Check the fastening flange, the force is uniform and appropriate, check the oil level and replenish the oil.  
Check the fastening flange to ensure that the force is even and appropriate, check the oil level and replenish oil.

1. 检修呼吸器，更换失效的干燥剂及油封内的油。

Repair respirator, replace failed desiccant and oil in oil seal.  
Repair the respirator and replace the failed desiccant and oil in the oil seal.

1. 瓷套清洁无油垢、裂纹和破损。电容末屏螺栓紧固。检查套管将军帽和注油孔密封胶垫应作用良好，必要时更换胶垫。

The porcelain sleeve is clean and free of grease, cracks and damages. Bolt fastening of capacitor terminal screen. Check that the casing cap and oil injection hole sealing rubber pad should work well, and replace the rubber pad if necessary.  
The porcelain sleeve is clean and free from oil stains, cracks and damage. Tighten the capacitor end screen bolts. Check that the casing cap and oil filling hole sealing rubber pad should work well, and replace the rubber pad if necessary.

1. 检修冷却装置，风扇电机完好，工作正常。

Overhaul the cooling device, and the fan motor is in good condition and working normally.  
The cooling device was repaired and found that the fan motor was in good condition and working normally.

1. 检修瓦斯保护，各接点正常、动作正确，连接电缆无锈蚀，绝缘良好。

Overhaul gas protection, all contacts are normal, the action is correct, the connecting cable is corrosion-free, and the insulation is good.  
Maintenance gas protection, all contacts are normal and operate correctly, the connecting cables are free of rust, and the insulation is good.

1. 检修温度计，各部零件和连线完好，指示正确。

Overhaul the thermometer, all parts and connections are in good condition, and the instructions are correct.  
Maintain the thermometer, find that all parts and connections are in good condition, and the instructions are correct.

1. 检修基础、支撑部件、套管和引线。

Overhaul foundations, support components, bushings and leads.  
Repair foundations, support parts, casings and leads.

1. 检修碰壳保护的电流互感器，各部零件应完好，安装牢靠。

Overhaul the current transformer protected by shell collision, and all parts should be in good condition and installed firmly.  
When repairing current transformers protected by shell contact, all parts should be intact and installed firmly.

1. 检修分接开关位置指示正常。

Service tap changer position indication is normal.  
The maintenance tap changer position indication is normal.

1. 检查中间端子箱密封良好，端子紧固、无松动。各种线缆安装整齐无破损。

Check that the intermediate terminal box is well sealed, and the terminals are tightened without loosening. All kinds of cables are installed neatly without damage.  
Check that the middle terminal box is well sealed and that the terminals are tight and not loose. All kinds of cables are installed neatly and without damage.

1. 检查箱体接地、铁芯接地良好。 73．干式变压器小修范围和标准：

Check that the box body is grounded and the iron core is grounded well. 73. Scope and standard of minor repairs of dry-type transformers:  
Check that the box and iron core are well grounded. 73. Scope and standards for minor repairs of dry-type transformers:

1. 清扫变压器及变压器室，无尘土、杂物，保证空气流通，防止绝缘击穿。

Clean the transformer and transformer room without dust and sundries, ensure air circulation and prevent insulation breakdown.  
Clean the transformer and transformer room free of dust and debris to ensure air circulation and prevent insulation breakdown.

1. 检查紧固件、连接件是否松动，导电零件有无生锈、腐蚀的痕迹。铁芯、绕组、引线、套管分接板及外箱等无损伤及局部变形，特别是各处铜焊处有无开裂现象。

Check whether fasteners and connectors are loose, and whether conductive parts have rust and corrosion marks. There is no damage and local deformation of iron core, winding, lead wire, bushing tap plate and outer box, especially whether there is cracking at brazing places.  
Check whether the fasteners and connections are loose, and whether the conductive parts have traces of rust or corrosion. The iron core, windings, leads, bushing tapping plates and outer boxes are free from damage or local deformation, especially for cracks at the brazing locations.

1. 观察绝缘表面有无爬电痕迹和碳化现象，必要时釆取相应的措施进行处理。

Observe whether there are creepage marks and carbonization on the insulation surface, and take corresponding measures to deal with it if necessary.  
Observe whether there are any creepage traces and carbonization on the insulating surface, and take corresponding measures to deal with it if necessary.

1. 检查低压抽头引线之间绝缘状态，高压引线绝缘子及支持夹具是否受潮，是否有放电痕迹。

Check the insulation state between low voltage tap leads, whether the insulators of high voltage leads and supporting fixtures are damp and whether there are discharge traces.  
Check the insulation status between the low-voltage tap leads, and whether the high-voltage lead insulators and supporting fixtures are damp and whether there are any discharge traces.

74．单装互感器小修范围和标准：

74. Minor repair scope and standard of single transformer:  
74. Scope and standards of minor repairs for single transformers:

1. 清扫检查外部（包括套管和引线），必要时局部涂漆。

Clean and inspect the exterior (including sleeve and lead), and paint locally if necessary.  
Clean and inspect the exterior (including casing and lead wires), and partially paint if necessary.

1. 检修金属膨胀器，应作用良好。

Overhaul the metal expander, which should work well.  
Repair the metal expander and it should work well.

1. 检修基础、支撑部件。

Overhaul foundation and supporting parts.  
Repair foundations and supporting parts.

1. 检修熔断器。壳筒、熔丝应完整无损，接触良好。空气开关状态正常。

Overhaul the fuse. Shell and fuse should be intact and in good contact. The air switch is in normal condition.  
Repair the fuses. The shell, barrel and fuse should be intact and in good contact. The air switch is in normal condition.

1. 检查油位指示器应正常，必要时补油。 75．SF6 高压断路器小修范围及标准：

Check that the oil level indicator should be normal and replenish oil if necessary. 75. Scope and standard of minor repair of SF6 high voltage circuit breaker:  
Check that the oil level indicator should be normal, and replenish oil if necessary. 75. Minor repair scope and standards for SF6 high-voltage circuit breaker:

1. 检查记录操作计数器的读数应显示正常。

Check that the reading of the recording operation counter should be displayed normally.  
Check and record the reading of the operation counter should be normal.

1. 检查、清扫断路器外壳、套管和引线，用干布将瓷套擦干净。

Check and clean the circuit breaker shell, sleeve and lead, and wipe the porcelain sleeve with a dry cloth.  
Inspect and clean the circuit breaker shell, bushing and leads, and wipe the porcelain sleeve clean with a dry cloth.

1. 检查持续加热系统及通风情况。通风口应当干净，没有灰尘，障碍物。必要时，可用溶剂进行清洗。

Check the continuous heating system and ventilation. Vents should be clean and free of dust and obstacles. If necessary, it can be cleaned with solvent.  
Check the continuous heating system and ventilation. The vents should be clean and free from dust or obstacles. If necessary, use solvent for cleaning.

1. 检查 SF6 气体的压力。指针式 SF6 气体密度计的指针位置处于正常范围内。

Check the pressure of SF6 gas. The pointer position of the pointer SF6 gas densimeter is within the normal range.  
Check the pressure of SF6 gas. The pointer position of the pointer SF6 gas densitometer is within the normal range.

1. 检查、紧固各部件螺栓是否紧固良好。

Check and tighten the bolts of each part well.  
Check and tighten the bolts of each component to see if they are well tightened.

1. 检查低压端子排上的接线应紧固，继电器的运行正常。

Check that the wiring on the low-voltage terminal block should be tightened and the relay is running normally.  
Check that the wiring on the low-voltage terminal block is tight and the relay is operating normally.

1. 检查联锁、防跳及非全相合闸等辅助控制装置的动作性应正常。

Check that the action of auxiliary control devices such as interlocking, anti-tripping and non-full-phase closing should be normal.  
Check that the action of auxiliary control devices such as interlocking, anti-tripping and non-full-phase closing should be normal.

1. 进行当地、远方分合闸操作，确认断路器及控制回路等正常动作。 76．AIS 开关柜及组合电器小修范围及标准：

Carry out local and remote opening and closing operations, and confirm the normal actions of circuit breakers and control circuits. 76. Scope and standard of minor repair of AIS switchgear and combined electrical appliances:  
Conduct local and remote opening and closing operations to confirm that the circuit breaker and control loop operate normally. 76. Scope and standards for minor repairs of AIS switchgear and combined electrical appliances:

1. 外观检查，应清洁无锈蚀。

Visual inspection, should be clean without rust.  
Appearance inspection should be clean and free from rust.

1. 检查辅助回路的接线端子无松动。

Check that the terminal of the auxiliary circuit is not loose.  
Check that the connecting terminals of the auxiliary circuit are not loose.

1. 检查开关柜表计及指示灯显示应正确。

Check that the meter of switchgear and the indicator light display should be correct.  
Check that the meter and indicator lights of the switch cabinet are displayed correctly.

1. 必要时打开电缆室检查高压电缆及护层保护器状态应良好。 77．真空断路器小修范围及标准：

If necessary, open the cable room to check that the high-voltage cable and sheath protector should be in good condition. 77. Scope and standard of minor repair of vacuum circuit breaker:  
Open the cable room if necessary and check that the high-voltage cable and sheath protector are in good condition. 77. Scope and standards for minor repairs of vacuum circuit breakers:

1. 检查、清扫开关外壳。要求无灰尘、无污垢，无变形、破损。

Check and clean the switch housing. No dust, dirt, deformation and damage are required.  
Inspect and clean the switch housing. It is required to be free of dust, dirt, deformation or damage.

1. 检查主导电回路。软连接应无裂痕破损，连接紧固，接触良好，隔离触指应完整无损，无烧伤痕迹，压力足够。

Check the main electrical circuit. The soft connection should be free from cracks and damages, the connection should be tight and the contact should be good, and the isolated contact finger should be intact and without burn marks, and the pressure should be sufficient.  
Check the main conductive loop. The soft connection should be free from cracks and damage, the connection should be tight and in good contact, and the isolation fingers should be intact and without burn marks, and the pressure should be sufficient.

1. 检查静触指支持瓷瓶和真空灭弧室绝缘拉杆，应无裂纹破损、脏污及表面闪络等现象。

Check the static contact finger support porcelain bottle and insulation tie rod of vacuum interrupter, and there should be no cracks, dirt and surface flashover.  
Check that the static contact finger supports the porcelain bottle and the insulation rod of the vacuum interrupter chamber and there should be no cracks, damage, dirt or surface flashover.

1. 检查操作机构。各部分零件齐全，无破损、变形，动作灵活可靠，分合闸指示牌指示正确，辅助开关完好无损，动作灵活，准确可靠，接触良好，对各运动部件加注润滑油。

Check the operating mechanism. All parts are complete, without damage or deformation, flexible and reliable action, correct indication of opening and closing signs, intact auxiliary switches, flexible, accurate and reliable action, good contact, and lubricating oil is added to all moving parts.  
Inspect the operating mechanism. All parts are complete without damage or deformation, and the action is flexible and reliable. The opening and closing sign indicates correctly. The auxiliary switch is intact. The action is flexible, accurate and reliable, and the contact is good. Lubricating oil is added to each moving part.

1. 手动分合闸操作及电动分合闸操作各 3 次，开关各部分应灵活可靠，无卡滞现象。 78．隔离开关小修范围和标准：

Manual opening and closing operation and electric opening and closing operation 3 times each, each part of the switch should be flexible and reliable, without jamming phenomenon. 78. Scope and standard of minor repairs of isolating switches:  
Manual opening and closing operations and electric opening and closing operations shall be performed 3 times each. Each part of the switch shall be flexible and reliable without jamming. 78. Scope and standards for minor repairs of isolating switches:

1. 清扫、检查绝缘子，检查引线和接地装置。要求各部分无灰尘，无污垢，支持绝缘子无裂纹、破损及爬电痕迹，引线无断股，连接牢固，接地良好。

Clean and inspect insulators, lead wires and grounding devices. It is required that all parts should be free of dust and dirt, support insulators should be free of cracks, damages and creepage traces, lead wires should be free of broken strands, and the connection should be firm and grounded well.  
Clean and inspect insulators, and inspect leads and grounding devices. All parts are required to be free of dust and dirt. The supporting insulator has no cracks, damage and creepage traces. The leads have no broken strands. The connection is firm and the grounding is good.

1. 触头间接触密贴性检查按照产品说明书要求进行。

Contact tightness inspection between contacts shall be carried out according to the requirements of product specifications.  
The contact tightness inspection between contacts shall be carried out in accordance with the requirements of the product manual.

1. 分闸时分闸角度和接地闸刀与带电部分的距离符合规定。

When switching, the switching angle and the distance between grounding knife and live part meet the requirements.  
When opening, the opening angle and the distance between the grounding blade and the live part shall comply with the regulations.

1. 清扫检查操作机构。各零部件完好、连接牢固；转动灵活，连锁、限位器作用良好可靠，各转动部分注油。

Clean and check the operating mechanism. All parts are in good condition and firmly connected; Flexible rotation, interlocking, good and reliable function of limiter, and oil injection of each rotating part.  
Clean and inspect the operating mechanism. All parts are in good condition and firmly connected; they rotate flexibly, the chain and limiter function well and reliably, and each rotating part is filled with oil.

对于电动隔离开关，应对电动操作机构的分合闸电机进行检查，限位开关位置正确，动作灵活可靠；紧固端子排及其他电气回路的接线。

For the electric isolating switch, the opening and closing motor of the electric operating mechanism should be checked, and the position of the limit switch is correct and the action is flexible and reliable; Fasten the wiring of terminal blocks and other electrical circuits.  
For electric isolating switches, the opening and closing motors of the electric operating mechanism should be checked to ensure that the limit switch is positioned correctly and the action is flexible and reliable; the wiring of terminal blocks and other electrical circuits should be tightened.

1. 检查构架及支撑装置并进行局部除锈涂漆。

Check the frame and support device and carry out local derusting and painting.  
Inspect the frame and supporting devices and carry out local rust removal and painting.

1. 手动、电动、远程分合闸操作各 3 次，开关各部分应灵活可靠，无卡滞现象。 79．负荷开关柜小修项目及标准：

Manual, electric and remote opening and closing operations shall be performed for 3 times respectively, and each part of the switch shall be flexible and reliable without jamming. 79. Minor repair items and standards of load switchgear:  
Manual, electric and remote opening and closing operations shall be performed three times each. Each part of the switch shall be flexible and reliable without jamming. 79. Minor repair items and standards for load switchgear:

1. 检查、清扫绝缘件、引线和接地装置。要求各部无灰尘、污垢，支持绝缘子无破损、裂纹及爬电痕迹，引线无断股、松股，连接牢固，接地良好。

Check and clean insulation, leads and grounding devices. All parts are required to be free of dust and dirt, support insulators are free of damage, cracks and creepage marks, leads are free of broken strands and loose strands, and the connection is firm and grounded well.  
Inspect and clean insulation parts, leads and grounding devices. All parts are required to be free of dust and dirt, support insulators have no damage, cracks and creepage traces, leads have no broken strands or loose strands, are connected firmly, and are well grounded.

1. 检查柜内各紧固件。应连接良好，无松动及脱落现象，必要时进行紧固。

Check the fasteners in the cabinet. It should be well connected, free from loosening and falling off, and fastened if necessary.  
Check all fasteners in the cabinet. The connection should be good without loosening or falling off, and tighten it if necessary.

1. 检查调整操作机构。标准同电动隔离开关。

Check and adjust the operating mechanism. The standard is the same as the electric isolating switch.  
Check and adjust the operating mechanism. The standard is the same as the electric isolating switch.

1. 检查构架及支撑装置，并进行局部除锈涂漆。

Check the frame and support device, and carry out local derusting and painting.  
Inspect the framework and supporting devices, and carry out local rust removal and painting.

1. 对柜内避雷器、熔断器等设备按要求进行检查和维护。

Check and maintain lightning arresters, fuses and other equipment in the cabinet as required.  
Inspect and maintain lightning arresters, fuses and other equipment in the cabinet as required.

1. 手动、电动操作开关各 3 次。开关应动作灵活，闭锁可靠。 80．空心电抗器小修范围和标准：

Manual and electric switches are operated 3 times each. The switch should act flexibly and lock reliably. 80. Scope and standard of minor repairs for air-core reactors:  
Operate the switch manually and electrically 3 times each. The switch should be flexible in action and reliable in locking. 80. Scope and standards for minor repairs of air-core reactors:

1. 清扫检查电抗器和连接部分。各部分清洁完好，连接部分螺栓紧固，接触良好。

Clean and check the reactor and connecting parts. All parts are clean and intact, and the connecting parts are bolted and in good contact.  
Clean and inspect the reactor and connecting parts. All parts are clean and intact, and the connecting parts are bolted tightly and in good contact.

1. 检查电抗器的安装。安装牢固，不倾斜变形，支持绝缘子无破损；接地端接触良

Check the installation of reactor. Install firmly, do not tilt and deform, and support insulators without damage; Good contact of grounding terminal  
Check reactor installation. The installation is firm, without tilting and deformation, and the supporting insulator is free from damage; the ground terminal is in good contact.

好。

Good.  
Okay.

1. 检查电抗器线圈。导线无损伤，线圈无变形，匝间绝缘垫块完好，间隙均匀。绝缘无破损、受潮，必要时进行处理。

Check the reactor coil. There is no damage to the conductor, no deformation of the coil, good insulation pad between turns and uniform gap. Insulation is not damaged or damp, and should be treated if necessary.  
Check the reactor coil. There is no damage to the conductor, no deformation of the coil, the insulation spacer between turns is intact, and the gap is even. The insulation is free from damage or moisture, and treat it if necessary.

81．集合电容器小修范围和标准：

81. Scope and standard of minor repairs for collective capacitors:  
81. Scope and standards for minor repairs of collective capacitors:

1. 清扫检查集合电容器的外部和连接部分。各部分清洁完好必要时对电容器局部涂漆；连接部分螺栓紧固。

Clean and inspect the exterior and connecting parts of the collective capacitor. All parts are clean and intact. If necessary, paint the capacitor locally; Bolt fastening of connecting part.  
Clean and inspect the external and connecting parts of the collecting capacitor. All parts are clean and intact. If necessary, partially paint the capacitor; the connecting parts are bolted tightly.

1. 检查集合电容器。外壳无膨胀、变形，焊缝无开裂、无渗漏油，必要时进行处理。 82．交直流电源装置小修范围和标准：

Check the collection capacitor. The shell is free from expansion and deformation, and the weld is free from cracking and oil leakage. If necessary, it should be treated. 82. Scope and standard of minor repairs of AC and DC power supply devices:  
Check the collecting capacitor. There is no expansion or deformation of the outer shell, and there is no crack in the weld seam or oil leakage. Treat it if necessary. 82. Scope and standards for minor repairs of AC and DC power supply units:

1. 测量并记录每个蓄电池的端电压，浮充电压、应符合说明书的规定。

Measure and record the terminal voltage and floating charge voltage of each battery, which shall conform to the specifications.  
Measure and record the terminal voltage of each battery. The floating charge voltage shall comply with the provisions of the instructions.

1. 清除直流充电装置的尘垢，特别是散热片和散热风扇上的尘垢。

Remove dirt from DC charging device, especially dirt from heat sink and heat dissipation fan.  
Remove dirt from DC charging devices, especially on heat sinks and cooling fans.

1. 检查蓄电池外观，应完好、清洁、无变形、无鼓肚现象，导线连接可靠。

Check the appearance of the battery, which should be in good condition, clean, free from deformation and bulging, and the wire connection is reliable.  
Check the appearance of the battery and make sure that it is in good condition, clean, without deformation or bulging, and that the wires are connected reliably.

1. 直流盘、柜安装牢固，无腐蚀脏污并涂漆良好。

DC panels and cabinets are firmly installed, free of corrosion and dirt and well painted.  
DC panels and cabinets are firmly installed, free from corrosion and dirt, and are well painted.

1. 检查装置的电流、电压、绝缘监察数据和信号显示,应正常。

Check that the current, voltage, insulation monitoring data and signal display of the device should be normal.  
Check that the current, voltage, insulation monitoring data and signal display of the device should be normal.

1. 通过盘上绝缘监察显示数据，确定直流系统对地的绝缘状态应良好。

Through the on-board insulation monitoring display data, it is determined that the insulation state of DC system to ground should be good.  
Through the on-board insulation monitoring display data, it is determined that the insulation status of the DC system to the ground should be good.

1. 试验两路交流电源互投应正常。 83．高压母线小修范围和标准:

The mutual switching of two AC power supplies in the test should be normal. 83. Scope and standard of minor repairs of high voltage bus:  
Test that the two AC power supplies should be switched to each other normally. 83. Scope and standards for minor repairs of high-voltage buses:

1. 检查绝缘子、杆塔和构架。绝缘子不得有裂纹、破损和放电痕迹。杆塔和构架应完好,安装牢固，无倾斜和基础下沉现象,铁件无锈蚀，接地良好，相位标志牌清晰鲜明。软母线张力适当，不得有松股,断股和机械损伤。

Check insulators, towers and frames. Insulators shall not have cracks, damage and discharge traces. Towers and frames should be intact, firmly installed, without inclination and foundation sinking, iron pieces without corrosion, well grounded, and phase signs should be clear and distinct. The tension of soft bus bar is appropriate, and there shall be no loose strands, broken strands and mechanical damage.  
Inspect insulators, towers and frames. Insulators must not have cracks, damage or discharge traces. The tower and frame should be intact and firmly installed, without tilting and foundation sinking, the iron parts should be free of rust, the grounding should be good, and the phase signs should be clear and distinctive. The tension of the soft bus bar should be appropriate, and there should be no loose strands, broken strands or mechanical damage.

1. 检查导线（包括引线）。硬母线应固定牢靠，且可伸缩，漆膜完好，相色鲜明不得有裂纹，连接紧密。

Check wires (including leads). Hard bus should be fixed firmly, and telescopic, paint film intact, bright color without cracks, tight connection.  
Inspect wires (including leads). The hard bus should be fixed firmly and stretchable, with intact paint film, clear phase color and no cracks, and tight connection.

1. 检查金具。金具应无锈蚀，固定、连接牢靠，接触良好。 84．电力电缆小修范围和标准：

Check the fittings. Hardware should be corrosion-free, fixed, firmly connected and in good contact. 84. Scope and standard of minor repairs of power cables:  
Check the fittings. The fittings should be free from rust, be firmly fixed and connected, and have good contact. 84. Scope and standards for minor repairs of power cables:

1. 检查电缆头、套管、引线、接线盒、护层保护器及接地。固定牢靠，绝缘良好；引线连接牢固，引线相间和距接地物的距离符合规定。

Check cable head, sleeve, lead, junction box, sheath protector and grounding. Fixed firmly and insulated well; The leads are firmly connected, and the distance between leads and grounding objects meets the requirements.  
Inspect cable heads, bushings, leads, junction boxes, sheath protectors and grounding. It is firmly fixed and insulated; the leads are firmly connected, and the distance between the leads and the grounded objects meets the requirements.

1. 检查电缆。排列整齐、固定牢靠且不受张力，弯曲半径符合下表规定，接地良好；电缆外露部分应有保护管，管口应密封，保护管应完整无损，且固定牢靠。

Check the cable. Arranged neatly, fixed firmly and free from tension, bending radius conforms to the following table, and grounded well; The exposed part of the cable shall have protective pipes, the nozzle shall be sealed, and the protective pipes shall be intact and fixed firmly.  
Check the cables. It is arranged neatly, fixed firmly and free from tension, the bending radius shall comply with the provisions in the table below, and the grounding shall be good; the exposed part of the cable shall be provided with protective pipes, and the nozzle shall be sealed. The protective pipes shall be intact and fixed firmly.

注：D 为电缆外径。

Note: D is the outer diameter of cable.  
Note: D is the outer diameter of the cable.

1. 清扫电缆沟及电缆夹层。沟内、夹层内应无积水、杂物；支架完好，固定牢靠不锈蚀；盖板齐全无严重破损。电缆沟、夹层内通向室内的入口处应有完好的防止小动物的措施。电缆夹层内排风设施良好。

Clean cable trench and cable interlayer. There should be no accumulated water and sundries in the ditch and interlayer; The bracket is in good condition and fixed firmly without corrosion; The cover plate is complete without serious damage. The cable trench and the entrance to the room in the interlayer should have intact measures to prevent small animals. The exhaust facilities in the cable interlayer are good.  
Clean cable trench and cable interlayer. There should be no water or debris in the ditch and interlayer; the brackets should be intact and fixed firmly without corrosion; the cover plates should be complete without serious damage. Measures to prevent small animals should be in good condition at the entrances to the room in cable trenches and mezzanine. The exhaust facilities in the cable interlayer are good.

85．避雷器小修范围和标准：

85. Scope and standard of minor repairs of lightning arresters:  
85. Scope and standards for minor repairs of lightning arrestors:

1. 清扫检查瓷套、引线和均压环。应固定牢靠，无锈蚀。

Clean and inspect the porcelain sleeve, lead wire and equalizing ring. Should be fixed firmly, no rust.  
Clean and inspect porcelain sleeves, leads and grading rings. It should be fixed firmly and free from rust.

1. 检查底座、构架、基础等。

Check the base, frame, foundation, etc.  
Inspect the base, frame, foundation, etc.

1. 动作指示器密封，作用良好。

The action indicator is sealed and works well.  
The action indicator is sealed and works well.

1. 检查接地线，对锈蚀部位进行除锈涂漆。 86．避雷针小修范围和标准：

Check the grounding wire and remove rust and paint the corroded parts. 86. Scope and standard of minor repairs of lightning rods:  
Check the ground wire and rust and paint the corroded parts. 86. Scope and standards for minor repairs of lightning rod:

1. 检查杆塔无倾斜和弯曲，固定牢靠；除锈补漆，必要时全面涂漆。

Check that the tower is not inclined and bent, and it is fixed firmly; Rust removal and paint repair, and paint completely when necessary.  
Check that the tower is not tilted or bent and is firmly fixed; remove rust and paint, and fully paint if necessary.

1. 检查避雷针，无熔化和断裂。

Check the lightning rod for no melting and fracture.  
Check the lightning rod and see no melting or breakage.

1. 检查底部装置。

Check the bottom device.  
Inspect the bottom device.

1. 接地装置小修范围和标准：

Scope and standard of minor repair of grounding device:  
Scope and standards for minor repairs of grounding devices:

1. 检查地面上和电缆沟内的接地线、接地端子等，完整无锈蚀、损伤、断裂及其他异状；与设备连接牢固，接触良好。

Check the grounding wire and grounding terminal on the ground and in the cable trench, which are complete and free from corrosion, damage, fracture and other abnormal shapes; Strong connection and good contact with equipment.  
Check that the grounding wires, grounding terminals, etc. on the ground and in the cable trench are complete without corrosion, damage, rupture and other abnormalities; they are firmly connected to the equipment and in good contact.

1. 检查 PW 线、回流线、综合地线、钢轨回流、N 线在集中接地箱中与地网汇流母排间的连接接头，连接牢固，接触截面符合规定。

Check the connection joints between PW line, return line, integrated ground line, rail return line and N line in the centralized grounding box and the bus bus of the ground grid. The connection is firm and the contact section meets the requirements.  
Check the connection joints between the PW wire, return wire, comprehensive ground wire, rail return wire, and N wire in the centralized grounding box and the ground grid bus bar. The connection is firm and the contact section meets the requirements.

1. 检查穿芯流互的二次接线无松动。

Check that there is no looseness in the secondary wiring of cross-core flow.  
Check that the secondary wiring passing through the core and current is not loose.

1. 检查设备接地连接牢固。

Check that the grounding connection of the equipment is firm.  
Check that the equipment is connected firmly.

1. 接地放电装置小修范围和标准：清扫、检查绝缘子和绝缘件，应无污垢，无破裂。

Minor repair scope and standard of grounding discharge device: clean and check insulators and insulators without dirt and rupture.  
Scope and standards for minor repairs of grounding discharge devices: Clean and inspect insulators and insulation parts to ensure that there is no dirt or rupture.

1. 低压盘（含端子箱）包括综自盘、电缆光纤光栅在线测温装置、安全环境监测设备、接触网开关监控盘、计量盘等，其小修范围和标准如下：

Low-voltage disk (including terminal box) includes comprehensive self-propelled disk, cable fiber grating online temperature measuring device, safety and environment monitoring equipment, catenary switch monitoring disk, metering disk, etc. Its minor repair scope and standards are as follows:  
The low-voltage panel (including terminal box) includes comprehensive self-control panels, cable fiber grating online temperature measuring devices, safety and environment monitoring equipment, contact network switch monitoring panels, metering panels, etc. The minor repairs scope and standards are as follows:

1. 清扫低压盘（箱、台，下同）及其相应的装置，内部及外壳清洁无尘。

Clean the low-pressure tray (box, table, the same below) and its corresponding devices, and the interior and shell are clean and dust-free.  
Clean the low pressure disc (box, table, the same below) and its corresponding devices, and keep the interior and outer shell clean and dust-free.

1. 检查盘的表面状态。安装牢固、端正，排列整齐，接地良好；标志齐全、正确、清楚；盘面无锈蚀；且盘（台）体密封良好。

Check the surface condition of the disc. The installation is firm, correct, arranged neatly and well grounded; The signs are complete, correct and clear; No corrosion on the disk surface; And the disk (table) body is well sealed.  
Check the surface condition of the disk. The installation is firm and upright, neatly arranged, and is well grounded; the signs are complete, correct and clear; the disk surface is free of rust; and the disk (platform) body is well sealed.

1. 检查盘内各项装置，安装牢固，绝缘和接触良好；端子排和配线排列整齐；标示牌、标志、信号齐全、正确、清楚。

Check the devices in the disk, which are firmly installed, insulated and in good contact; Terminal blocks and wiring are arranged neatly; Signs, signs and signals are complete, correct and clear.  
Check that all devices in the panel are firmly installed, with good insulation and contact; terminal strips and wiring are arranged neatly; signs, signs and signals are complete, correct and clear.

1. 清理机箱风扇及面板的滤网，保持机箱内通风通畅。

Clean the filter screen of the chassis fan and panel to keep the ventilation in the chassis unobstructed.  
Clean the filters on the chassis fans and panels to keep the ventilation inside the chassis smooth.

1. UPS 电源工作正常。

UPS power supply works normally.  
The UPS power supply is working normally.

1. 核对保护测控盘及综自后台各项信息显示的正确性,后台机各项功能应正常。

Check the correctness of the information display of the protection measurement and control disk and the comprehensive self-background, and the functions of the background machine should be normal.  
Check the correctness of various information displayed on the protection monitoring and control panel and the comprehensive automatic backend, and all functions of the backend machine should be normal.

1. 调整或更换不合格的继电器、插件、打印机等元器件。 90．远动系统小修范围及标准

Adjust or replace unqualified relays, plug-ins, printers and other components. 90. Scope and standard of minor repairs of telecontrol system  
Adjust or replace unqualified relays, plug-ins, printers and other components. 90. Scope and standards of minor repair of remote control system

1. 调度主站

Dispatching master station  
dispatching master station

1. 清扫调度主站各部件，紧固端子排连接螺栓，检查连接线缆。要求各部件无积尘、螺栓无松动、线缆无断裂、表皮无破损。

Clean all parts of the dispatching master station, tighten the connecting bolts of the terminal block, and check the connecting cables. All parts are required to be free of dust, bolts are free of looseness, cables are free of fracture, and skin is free of damage.  
Clean and dispatch all parts of the main station, tighten the terminal block connecting bolts, and check the connecting cables. All parts are required to have no dust accumulation, no loose bolts, no broken cables, and no damage to the skin.

1. 检查调度主站的附属外围设备，工作正常。

Check the auxiliary peripheral equipment of the dispatching master station, and it works normally.  
Check that the auxiliary peripheral equipment of the dispatch main station is working normally.

1. 对供电远动系统调度主站的 UPS 不间断电源的专用蓄电池进行核对性充放电维护，电池组容量应满足规定要求。

Carry out check charging and discharging maintenance on special battery of UPS uninterruptible power supply in dispatching master station of power supply telecontrol system, and the capacity of battery pack should meet the specified requirements.  
Carry out verification charge and discharge maintenance on the special battery of the UPS uninterruptible power supply of the dispatching main station of the power supply remote control system, and the battery pack capacity shall meet the specified requirements.

1. 被控站。

The accused station.  
Accused station.

1. 清扫被控站各部件，紧固端子排连接螺栓，检查连接线缆。要求各部件无积尘、螺栓无松动、线缆无断裂、表皮无破损。

Clean all parts of the controlled station, tighten the connecting bolts of the terminal block, and check the connecting cables. All parts are required to be free of dust, bolts are free of looseness, cables are free of fracture, and skin is free of damage.  
Clean all parts of the controlled station, tighten the connecting bolts of the terminal strips, and check the connecting cables. All parts are required to have no dust accumulation, no loose bolts, no broken cables, and no damage to the skin.

1. 检查信号收发正常，显示正确。

Check that the signal is sent and received normally and displayed correctly.  
Check that the signal receiving and receiving is normal and the display is correct.

1. 核对与调度主站的系统时钟一致。 (d)对被控站进行双通道切换试验。

Check that it is consistent with the system clock of the dispatching master station. (d) Carry out two-channel switching test on the controlled station.  
Check that it is consistent with the system clock of the dispatching master station. (d)Conduct a dual-channel switching test on the controlled station.

1. 牵引变电所内安装的计费用电度表、指示仪表、试验用仪表的检验周期按规定的工作计量器具检定周期执行。

The inspection cycle of the meter, indicating instrument and testing instrument installed in the traction substation shall be carried out according to the specified verification cycle of working measuring instruments.  
The inspection cycle of cost-based electricity meters, indicating instruments, and test instruments installed in the traction substation shall be implemented in accordance with the specified verification cycle of working measuring instruments.

1. 设备大修的标准及要求：牵引变电所各项设备的大修：达到使用寿命后的整体更换，应达到新建项目的标准。

Standards and requirements for equipment overhaul: Overhaul of various equipment in traction substation: Overall replacement after reaching service life, which should meet the standards of new projects.  
Standards and requirements for equipment overhaul: Overhaul of various equipment in traction substation: The overall replacement after reaching its service life should meet the standards of new projects.

1. 鼓励开展带电测试或在线监测。当带电测试或在线监测发现问题时应进行停电试验进一步核实。如经实用证明利用带电测试或在线监测技术能达到停电试验的效果，可以延长停电试验周期或不做停电试验。

Encourage live testing or online monitoring. When problems are found in live test or online monitoring, power outage test shall be carried out for further verification. If it is proved by practice that live test or on-line monitoring technology can achieve the effect of power outage test, the power outage test period can be prolonged or no power outage test can be done.  
Encourage live testing or online monitoring. When problems are found in live test or online monitoring, a power outage test should be carried out for further verification. If it has been proved in practice that the effect of power outage test can be achieved by using live testing or online monitoring technology, the power outage test period can be extended or no power outage test can be performed.

1. 进行变电设备红外热像仪测温时，应按标准要求进行。设备的红外热成像测温周期如下：

The temperature measurement of infrared thermal imager of substation equipment shall be carried out according to the standard requirements. The infrared thermal imaging temperature measurement period of the equipment is as follows:  
When measuring temperature by infrared thermal imaging camera of substation equipment, it should be carried out in accordance with standard requirements. The infrared thermal imaging temperature measurement cycle of the equipment is as follows:

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| --- | --- | --- | --- |
| 6 | shunt capacitor  并联电容器  Shunt capacitor | （1）交接及大修后带负荷一个月内（但应超过24h）； (1) Within one month after handover and overhaul when loaded (but should exceed 24 hours);  (1) Within one month (but more than 24h) after handover and overhaul;  （2）1 年内； (2) Within 1 year;  (2) Within 1 year;  （3）必要时。 (3) When necessary.  (3) When necessary. | Measure joints and capacitor shells and other parts.  测量接头及电容器外壳等部位。  Measure joints and capacitor shells. |
|  |  | （1）交接及大修后带负荷一个月内（但应超  (1) Within one month with load after handover and overhaul (but should exceed (1) Within one month after handover and overhaul when loaded (but should exceed |  |
|  |  | 过24h）；  After 24 hours); After 24 hours); |  |
| 7 | 避雷器  Lightning arrester arrester | （2）200kV 及以上 3 个月；  (2) 200kV and above for 3 months; (2) 3 months of 200 kV and above;  （3）其他 6 个月；  (3) Other 6 months; (3) Other 6 months; | 测量引线接头及瓷套表面等部位。  Measure the lead joint and the surface of porcelain sleeve. Measure lead joints and porcelain sleeve surface. |
|  |  | （4）必要时。  (4) When necessary. (4) When necessary. |  |

# 第七章 牵引变电所试验要求

# Chapter VII Test Requirements for Traction Substation Chapter 7 Test requirements for traction substations

1. 电气设备的绝缘试验，要尽量将连接在一起不同试验标准的设备分解开，单独进行试验。对分开有困难或已装配的成套设备必须连在一起试验时，其试验标准应采用其中的最低标准。

In the insulation test of electrical equipment, the equipment connected with different test standards should be decomposed as far as possible, and the test should be carried out separately. When it is difficult to separate or assemble complete sets of equipment and must be tested together, the minimum standard shall be adopted.  
For insulation testing of electrical equipment, try to separate equipment connected with different test standards and conduct separate tests. When complete sets of equipment that are difficult to separate or have been assembled must be tested together, the test standard shall adopt the lowest standard among them.

1. 当设备的出厂额定电压与实际使用的额定工作电压不同时，应根据下列原则确定试验电压的标准：

When the factory rated voltage of the equipment is different from the actual rated working voltage, the test voltage standard shall be determined according to the following principles:  
When the factory rated voltage of the equipment is different from the rated working voltage actually used, the test voltage standard should be determined based on the following principles:

1. 当采用额定电压较高的设备用以加强绝缘者，应按照设备的额定电压标准进行试

When equipment with higher rated voltage is used to strengthen insulation, the test shall be carried out according to the rated voltage standard of the equipment  
When equipment with higher rated voltage is used to strengthen insulation, the test shall be carried out in accordance with the rated voltage standard of the equipment.

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Test.  
Test.

1. 用额定电压较高的设备用以满足产品通用性的要求时，可以按照设备实际使用的额定工作电压或出厂额定电压的标准进行试验。

When equipment with higher rated voltage is used to meet the requirements of product universality, the test can be carried out according to the actual rated working voltage of the equipment or the standard of factory rated voltage.  
When equipment with higher rated voltage is used to meet the requirements of product versatility, the test can be carried out according to the actual rated working voltage of the equipment or the factory rated voltage standard.

1. 采用较高电压等级的设备用以满足高海拔地区要求时，应在安装地点按照实际使用的额定工作电压的标准进行试验。

When equipment with a higher voltage level is used to meet the requirements of high altitude areas, it shall be tested at the installation site according to the standard of rated working voltage actually used.  
When equipment with a higher voltage level is used to meet the requirements of high-altitude areas, the test should be carried out at the installation site according to the standard of the rated working voltage actually used.

1. 所有电气设备预防性试验周期，除特别规定者外均为 1 年 1 次（或按设备生产厂商建议的时间周期）。设备检修时的试验如能包括预防性试验的内容和要求，则在该周期内可以不再做预防性试验。

The preventive test period of all electrical equipment shall be once a year (or according to the time period recommended by the equipment manufacturer) except as otherwise specified. If the test during equipment maintenance can include the contents and requirements of preventive test, preventive test can no longer be done in this cycle.  
The preventive test cycle for all electrical equipment is once a year unless otherwise specified (or the time period recommended by the equipment manufacturer). If the test during equipment maintenance can include the content and requirements of preventive tests, preventive tests can no longer be performed during this period.

1. 在进行与温度及湿度有关的各种试验时（如测量直流电阻、绝缘电阻、介质损失角、泄漏电流等）,应同时测量被试物周围的温度及湿度。绝缘试验应在良好天气且被试物及仪器周围温度不宜低于+5℃,空气相对湿度不宜高于 80%的条件下进行。

When carrying out various tests related to temperature and humidity (such as measuring DC resistance, insulation resistance, dielectric loss angle, leakage current, etc.), the temperature and humidity around the tested object should be measured at the same time. Insulation test should be carried out in good weather, and the temperature around the tested object and instrument should not be lower than + 5 ℃, and the relative humidity of air should not be higher than 80%.  
When conducting various tests related to temperature and humidity (such as measuring DC resistance, insulation resistance, dielectric loss angle, leakage current, etc.), the temperature and humidity around the test object should be measured at the same time. The insulation test should be carried out in good weather and under conditions where the temperature around the tested object and instrument should not be lower than +5℃, and the relative humidity of the air should not be higher than 80%.

试验标准中所列的绝缘电阻系指 60 秒的绝缘电阻值(R60),吸收比为 60 秒与 15 秒绝缘电阻的比值(R60/R15)。

The insulation resistance listed in the test standard refers to the insulation resistance value of 60 seconds (R60), and the absorption ratio is the ratio of insulation resistance of 60 seconds to 15 seconds (R60/R15).  
The insulation resistance listed in the test standard refers to the insulation resistance value at 60 seconds (R60), and the absorption ratio is the ratio of the insulation resistance at 60 seconds to 15 seconds (R60/R15).

交流耐压试验加至试验标准电压后的持续时间，凡无特殊说明者，均为 1 分钟。

The duration of AC withstand voltage test after it is applied to the test standard voltage is 1 minute unless otherwise specified.  
The duration of the AC withstand voltage test after being added to the test standard voltage is 1 minute unless otherwise specified.

99．110kV 及以上设备经交接试验后超过 6 个月未投入运行，或运行中设备停运超过 6个月的，在投运前应进行绝缘项目试验，如测量绝缘电阻、tanδ、绝缘油的水分和击穿电压、绝缘气体湿度等。27.5kV 及以下设备按 1 年执行。

If the equipment of 99.110 kV and above has not been put into operation for more than 6 months after handover test, or the equipment in operation has been shut down for more than 6 months, insulation project test shall be carried out before putting into operation, such as measuring insulation resistance, tan δ, moisture and breakdown voltage of insulating oil, humidity of insulating gas, etc. Equipment of 27.5 kV and below shall be implemented for one year.  
99. If equipment of 110kV and above has not been put into operation for more than 6 months after handover test, or equipment is stopped for more than 6 months during operation, insulation item tests should be carried out before commissioning, such as measuring insulation resistance, tan δ, moisture and breakdown voltage of insulating oil, humidity of insulating gas, etc. Equipment of 27.5kV and below shall be implemented for one year.

1. AIS 开关柜及组合电器试验在交接时、大修后、必要时进行，其中电流互感器、电压互感器和避雷器分别根据电流互感器、电压互感器、避雷器单项设备试验标准。

The test of AIS switchgear and combined electrical appliances shall be carried out when handover, overhaul and necessary, in which current transformer, voltage transformer and lightning arrester shall be carried out according to the test standards of single equipment of current transformer, voltage transformer and lightning arrester respectively.  
The test of AIS switchgear and combined electrical equipment is carried out during handover, after overhaul, and when necessary. The current transformer, voltage transformer and lightning arrester are based on the test standards for individual equipment of current transformer, voltage transformer and lightning arrester respectively.

1. 额定电压为 27.5kV 的电气设备，除特别指出者外可暂比照 35kV 电力系统电气设备的试验标准进行。工程交接验收试验除进行本办法全部项目外，要求按有关规定执行。

Electrical equipment with rated voltage of 27.5 kV can be temporarily compared with the test standard of electrical equipment of 35kV power system unless otherwise specified. Except for all items in these Measures, the project handover acceptance test shall be carried out according to relevant regulations.  
For electrical equipment with a rated voltage of 27.5kV, unless otherwise specified, the test standards for electrical equipment in the 35kV power system can be temporarily followed. In addition to carrying out all items in this method, the project handover acceptance test is required to be carried out in accordance with relevant regulations.

1. 变压器的试验项目、周期和要求。

Test items, cycles and requirements of transformers.  
Test items, cycles and requirements for transformers.

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| --- | --- | --- | --- | --- |
| serial number  序号  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
|  |  |  | (1) For transformers above 1.6MVA, the difference between the resistances of various windings should not be more than 2% of the average value of the three phases. For windings without neutral points, the difference between wires should not be more than 1% of the average value of the three phases;  （1）1.6MVA 以上变压器，各绕组电阻相互间的差别不应大于三相平均值的 2%,无中性点引出的绕组，线间差别不应大于三 相平均值的 1%；  (1) For transformers above 1.6 MVA, the difference in resistance between windings shall not be greater than 2% of the three-phase average value, and the difference between windings without neutral point shall not be greater than 1% of the three-phase average value; (2) For transformers of 1.6MVA and below, the inter-phase difference is generally not more than 4% of the average value of the three phases, and the inter-line difference is generally not more than 2% of the average value of the three phases;  （2）1.6MVA 及以下的变压器，相间差别一般不大于三相平均值的 4%,线间差别一般不大于三相平均值的 2%；  (2) For transformers with 1.6 MVA or less, the difference between phases is generally not more than 4% of the average value of three phases, and the difference between lines is generally not more than 2% of the average value of three phases; (3) Compared with the previously measured values of the same parts, the change should not be more than 2%.  （3）与以前相同部位测的值比较，其变化不应大于 2%。  (3) Compared with the values measured in the same position before, the change should not be greater than 2%. | （1）如电阻相间差在出厂时超过规定，制造厂 (1) If the resistor phase difference exceeds the specified when leaving the factory, the manufacturer  (1) If the resistance phase-to-phase difference exceeds the regulations when leaving the factory, the manufacturer |
|  |  |  | 已说明了这种偏差的原因，按要求中（3）项执  The cause of this deviation has been explained, according to item (3) of the requirement The reasons for this deviation have been explained and implemented in accordance with item (3) of the requirements. |
|  |  | （1）大修后  (1) After overhaul (1) After overhaul | 行；  Row; OK; |
|  |  | （2）1-3 年  (2) 1-3 years (2) 1-3 years | （2）不同温度下的电阻值按下式换算：  (2) The resistance values at different temperatures are converted according to the following formula: (2) The resistance values at different temperatures are converted according to the following formula: |
| 1 | 绕组直流电阻  Winding DC resistance winding DC resistance | （3）无载变更接头位  (3) Change the joint position without load (3) Change the joint position without load | R2=R1(T+t2)/(T+t1)式中 R1、R2 分别为在温度  R2=R1 (T+t2)/(T+t1) where R1 and R2 are at temperature, respectively R2=R1(T+t2)/(T+t1) Where R1 and R2 are respectively at temperature |
|  |  | 置后  Put back send to back | t1、t2 时的电阻值；T 为计算常数，铜导线取  The resistance value at t1 and t2; T is the calculation constant, and the copper wire is taken Resistance value at t1 and t2;T is a calculation constant, and copper wire is taken as |
|  |  | （4）必要时  (4) When necessary (4) When necessary | 235； |
|  |  |  | （3）封闭式电缆出线或 GIS 出线的变压器，电  (3) Transformer and electricity of closed cable outgoing line or GIS outgoing line (3) Transformers for closed cable outlet or GIS outlet, electricity |
|  |  |  | 缆、GIS 侧绕组可不进行定期试验。  Cable and GIS side windings may not be tested regularly. Regular tests may not be carried out on cable and GIS side windings. |
|  |  |  |  | ⑴采用 2500V 或 5000V 兆欧表； (1) Use a 2500V or 5000V megohmmeter;  (1) 2500V or 5000V megohm meters are used; |
|  |  |  |  | ⑵测量前被试绕组应充分放电；  ⑵ The tested winding should be fully discharged before measurement; (2) The winding under test should be fully discharged before measurement; |
| 2 | 绕组绝缘电阻、吸收比或(和)极化指数 Winding insulation resistance, absorption ratio or (and) polarization index  Insulation resistance, absorption ratio or (and) polarization index of winding | 1. 投运前 before commissioning   Before putting into operation   1. 大修后 after overhaul   After overhaul  （3）1-3 年 (3) 1 - 3 years  (3) 1-3 years  （4）必要时 (4) When necessary  (4) When necessary | ⑴绝缘电阻换算至同一温度下，与前一次测试结果相比应无明显变化；  (1) When the insulation resistance is converted to the same temperature, there should be no obvious change compared with the previous test results;  ⑵吸收比(10〜30°C 范围)不低于 1.3 或极化指数不低于  ⑵ The absorption ratio (in the range of 10 ~ 30 ° C) is not less than 1.3 or the polarization index is not less than  1.5。 | ⑶测量温度以顶层油温为准，尽量使每次测量温度相近；  (3) The measured temperature shall be subject to the top oil temperature, and the measured temperature shall be similar every time as far as possible; (3) The measured temperature is based on the oil temperature of the top layer, and try to make the temperature of each measurement similar;  ⑷尽量在油温低于 50℃时测量，不同温度下的  (4) Try to measure when the oil temperature is lower than 50 ℃, and at different temperatures (4) Try to measure when the oil temperature is lower than 50 ° C, and at different temperatures  绝缘电阻值一般可按下式换算  Insulation resistance value can generally be converted according to the following formula The insulation resistance value can generally be converted as follows  *R*2  *R*1 1.（5 t1 t 2 ）/10 式中 R1、R2 分别为温  R2  R1 1.（5 t1 t 2 ）/10 Where R1 and R2 are temperatures, respectively R2  R1 1. (5t1 t2)/10 Where R1 and R2 are temperature respectively |
|  |  |  |  | 度 t1、t2 时的绝缘电阻值；  Insulation resistance value at degrees t1 and t2; Insulation resistance value at degrees t1 and t2; |
|  |  |  |  | ⑸吸收比和极化指数不进行温度换算。  5. Absorption ratio and polarization index are not converted by temperature. (5) The absorption ratio and polarization index are not subjected to temperature conversion. |

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| 绕组电压 10kV 及以上  Winding voltage 10kV and above | 10kV |
| 绕组电压 10kV 以下  Winding voltage below 10kV | Un |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 3 | tanδ of winding  绕组的 tanδ  Tan δ of winding | (1) At handover  ⑴交接时  (1) At the time of handover (2) After major repair  ⑵大修后  ⑵ After overhaul (3)1~ Once every 3 years  (3)1〜3 年一次  (3) Once every 1 ~ 3 years (4) When necessary  ⑷必要时  (4) When necessary | ⑴20℃时不大于下列数值：66〜220kV 0.8%  (1) At 20 ℃, it is not greater than the following values: 66 ~ 220kV 0.8% (1) At 20℃, it shall not exceed the following values: 66 ~ 220kV 0.8%  35kV 及以下 1.5%；  1.5% of 35kV and below; 1.5% of 35kV and below;  ⑵tanδ值与历年的数值比较不应有显著变化(一般不大于30%)；  (2) The tan δ value should not change significantly compared with the value of previous years (generally not more than 30%); (2) The tanδ value should not change significantly compared with the previous years (generally no more than 30%);  ⑶试验电压如下：  The test voltages are as follows: (3) Test voltages are as follows: | ⑴非被试绕组应接地或屏蔽； (1) Windings not being tested shall be grounded or shielded;  (1) Non-tested windings shall be grounded or shielded;  ⑵同一变压器各绕组 tanδ的要求值相同； (2) The required value of tanδ for each winding of the same transformer is the same;  ⑵ The required value of tan δ for each winding of the same transformer is the same;  ⑶测量温度以顶层油温为准，尽量使每次测量的温度相近； (3) The measured temperature is based on the oil temperature of the top layer, and try to make the temperature measured each time similar;  (3) The measured temperature shall be subject to the top oil temperature, and the measured temperature shall be as close as possible every time;  ⑷尽量在油温低于 50°C 时测量； (4) Try to measure when the oil temperature is lower than 50°C;  (4) Try to measure when the oil temperature is lower than 50 ° C;  ⑸封闭式电缆出线的变压器只测量非电缆出线侧绕组的 tanδ。 (5) Transformers with closed cable outlets only measure tanδ on the winding on the non-cable outlet side.  (5) Transformers with closed cable outgoing lines only measure tan δ of windings on the outgoing side of non-cable. |
| 4 | 电容型套管的 tanδ和电容值 tanδ and capacitance value of capacitive bushing  Tan δ and capacitance value of capacitive bushing | （1）大修后  (1) After overhaul (1) After overhaul  （2）1〜3 年一次  (2) Once every 1 ~ 3 years (2) Once every 1 to 3 years  （3）必要时  (3) When necessary (3) When necessary |  | ⑴用正接法测量； (1) Measure with positive connection method;  (1) Measure by positive connection method;  ⑵测量时记录环境温度及变压器顶层油温。 (2) Record the ambient temperature and the oil temperature on the top layer of the transformer during measurement.  ⑵ Record ambient temperature and top oil temperature of transformer during measurement. |
| 5 | AC withstand voltage test  交流耐压试验  AC withstand voltage test | ⑴大修后（66kV 及以下）  (1) After overhaul (66kV and below) (1) After overhaul (66kV and below)  ⑵更换绕组后  ⑵ After replacing the winding, (2) After replacing windings  ⑶必要时  (3) When necessary 3. When necessary | The test voltage value of oil-immersed transformer shall comply with the power industry standards  油浸变压器试验电压值按电力行业标准  The test voltage value of oil-immersed transformer is in accordance with the power industry standard | ⑴可釆用倍频感应或操作波感应法； (1) Double-frequency induction or operating wave induction method can be used;  (1) Frequency doubling induction or operation wave induction method can be used;  ⑵66kV 及以下全绝缘变压器，现场条件不具备时，可只进行外施工频耐压试验。 (2) For fully insulated transformers of 66 kV and below, when site conditions are not met, only external power frequency withstand voltage test can be carried out.  (2) For all-insulated transformers of 66kV and below, only external construction frequency withstand voltage test can be carried out when site conditions are not available. |
| 6 | 铁心（有外引接地线的）绝缘电阻  Insulation resistance of iron core (with external grounding wire) Insulation resistance of iron core (with external grounding wire) | ⑴大修后  After overhaul (1) After major repair  ⑵1-3 年一次  (2) Once every 1-3 years (2) Once every 1-3 years  ⑶必要时  (3) When necessary 3. When necessary | ⑴与以前测试结果相比无显著差别； (1) There is no significant difference compared with previous test results;  Compared with the previous test results, there is no significant difference;  ⑵运行中铁心接地电流一般不大于 0..lA。 (2) The core grounding current during operation is generally not greater than 0lA.  ⑵ The grounding current of iron core in operation is generally not more than 0. lA. | ⑴采用 2500kV 兆欧表（对运行年久的变压器可用 1000kV 兆欧表）；  (1) 2500kV Megohm meter is adopted (1000kV Megohm meter can be used for transformers that have been in operation for a long time); (1) Use 2500kV megohmmeter (1000kV megohmmeter can be used for long-term transformers);  ⑵夹件引出接地的可单独对夹件进行测量。  ⑵ If the clamp is grounded, the clamp can be measured separately. (2) If the clip is led out and grounded, the clip can be measured separately. |
| 7 | 穿心螺栓、铁辘夹件、绑扎钢带、铁心、线圈压环及屏蔽等的绝缘电阻  Insulation resistance of through-core bolts, iron reel clamps, binding steel strips, iron cores, coil pressure rings and shields, etc. Insulation resistance of through-through bolts, iron reel clamps, binding steel strips, iron cores, coil pressing rings and shields, etc. | (1) After major repair  ⑴大修后  After overhaul (2) When necessary  ⑵必要时  ⑵ When necessary | The insulation resistance of 220kV and above is generally not less than 500MΩ, and others are stipulated by themselves.  220kV 及以上者绝缘电阻一般不低于 500MΩ,其他自行规定。  The insulation resistance of 220kV and above is generally not less than 500 M Ω, and others are specified by themselves. | ⑴釆用 2500kV 兆欧表（对运行年久的变压器可用 1000kV 兆欧表）； (1) Use a 2500kV megohmmeter (1000kV megohmmeter can be used for long-term transformers);  (1) 2500kV Megohm meter is used (1000kV Megohm meter can be used for transformers that have been in operation for a long time);  ⑵连接片不能拆开者可不进行。 (2) If the connecting piece cannot be disassembled, it may not be done.  ⑵ If the connecting piece cannot be disassembled, it may not be carried out. |

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| 8 | winding leakage current  绕组泄漏电流  Winding leakage current | （1）1〜3 年一次 (1) Once every 1 to 3 years  (1) Once every 1 ~ 3 years  （2）必要时 (2) When necessary  (2) When necessary | ⑴试验电压一般如下：  (1) The test voltage is generally as follows: (1) The test voltage is generally as follows: (1) The test voltage is generally as follows: (1) The test voltage is generally as follows: (1) The test voltage is generally as follows: (1) The test voltage is generally as follows: | | | | | Read the leakage current value at 1 minute.  读取 1 分钟时的泄漏电流值。  Read the leakage current value at 1 minute. |
| 绕组额定电压 kV  Rated voltage of winding kV Rated winding voltage kV | 6-15 | 20-35 | 66-330 |  |
| 直流试验电压 kV  DC test voltage kV DC test voltage kV | 10 | 20 | 40 |
| 泄露电流 kA  Leakage current kA Leakage current kA | 33 | 50 | 50 |
| ⑵与前一次测试结果相比应无明显变化。  ⑵ There should be no obvious change compared with the previous test results. (2) There should be no significant change compared with the previous test result. (2) There should be no significant change compared with the previous test result. (2) There should be no significant change compared with the previous test result. (2) There should be no significant change compared with the previous test result. (2) There should be no significant change compared with the previous test result. | | | | |
| 9 | Voltage ratio of all taps in winding  绕组所有分接的电压比  Voltage ratio of all taps of windings | (1) After disassembly and disassembly of tap changer leads  ⑴分接开关引线拆装后  After the tap changer leads are disassembled and assembled (2) After major repair  ⑵大修后  ⑵ After overhaul 3. When necessary  ⑶必要时  (3) When necessary | ⑴各相应接头的电压比与铭牌值相比，不应有显著差别且符合规律；  (1) Compared with the nameplate value, the voltage ratio of each corresponding joint should not be significantly different and conform to the law; (1) Compared with the nameplate value, the voltage ratio of each corresponding connector should not be significantly different and comply with the law; (1) Compared with the nameplate value, the voltage ratio of each corresponding connector should not be significantly different and comply with the law; (1) Compared with the nameplate value, the voltage ratio of each corresponding connector should not be significantly different and comply with the law; (1) Compared with the nameplate value, the voltage ratio of each corresponding connector should not be significantly different and comply with the law; (1) Compared with the nameplate value, the voltage ratio of each corresponding connector should not be significantly different and comply with the law;  ⑵电压 35kV 以下，电压比小于 3 的变压器电压比允许偏差为±1%;其他所有变压器：额定分接电压比允许偏差为  ⑵ The allowable deviation of voltage ratio of transformer with voltage below 35kV and voltage ratio less than 3 is 1%; All other transformers: the allowable deviation of rated tap voltage ratio is (2) The allowable deviation of the voltage ratio of transformers with a voltage ratio less than 3 is ±1% for voltages below 35kV; for all other transformers: the allowable deviation of the rated tapping voltage ratio is (2) The allowable deviation of the voltage ratio of transformers with a voltage ratio less than 3 is ±1% for voltages below 35kV; for all other transformers: the allowable deviation of the rated tapping voltage ratio is (2) The allowable deviation of the voltage ratio of transformers with a voltage ratio less than 3 is ±1% for voltages below 35kV; for all other transformers: the allowable deviation of the rated tapping voltage ratio is (2) The allowable deviation of the voltage ratio of transformers with a voltage ratio less than 3 is ±1% for voltages below 35kV; for all other transformers: the allowable deviation of the rated tapping voltage ratio is (2) The allowable deviation of the voltage ratio of transformers with a voltage ratio less than 3 is ±1% for voltages below 35kV; for all other transformers: the allowable deviation of the rated tapping voltage ratio is  ±0.5%；其他分接的电压比应在变压器阻抗电压值(%)的 1/10 以内，但不得超过±1%。  ± 0.5%; The voltage ratio of other taps shall be within 1/10 of the transformer impedance voltage value (%), but shall not exceed 1%. ±0.5%; the voltage ratio of other taps should be within 1/10 of the transformer impedance voltage value (%), but should not exceed ±1%. ±0.5%; the voltage ratio of other taps should be within 1/10 of the transformer impedance voltage value (%), but should not exceed ±1%. ±0.5%; the voltage ratio of other taps should be within 1/10 of the transformer impedance voltage value (%), but should not exceed ±1%. ±0.5%; the voltage ratio of other taps should be within 1/10 of the transformer impedance voltage value (%), but should not exceed ±1%. ±0.5%; the voltage ratio of other taps should be within 1/10 of the transformer impedance voltage value (%), but should not exceed ±1%. | | | | |  |
| 10 | 校核单相变压器极性  Check the polarity of single-phase transformer Check polarity of single-phase transformer | 更换绕组后 after winding replacement  After changing the winding, | 必须与变压器铭牌和顶盖上的端子标志相一致。 It must be consistent with the terminal markings on the transformer nameplate and top cover.  It must be consistent with the terminal marks on the nameplate and top cover of the transformer. | | | | |  |
| 11 | 测温装置及二次回路试验 Temperature measuring device and secondary loop test  Temperature measuring device and secondary circuit test | ⑴1〜3 年一次  (1) Once every 13 years (1) Once every 1 to 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary | ⑴密封良好，指示正确，测温电阻值应和出厂值相符； (1) The seal is good, the instructions are correct, and the temperature measuring resistance value should be consistent with the factory value;  (1) The seal is good, the indication is correct, and the temperature measuring resistance value should be consistent with the factory value;  ⑵绝缘电阻一般不低于 1MΩ。 (2) The insulation resistance is generally not less than 1MΩ.  ⑵ Insulation resistance is generally not less than 1 M Ω. | | | | | 测量绝缘电阻采用 2500V 兆欧表。 Use a 2500V megohmmeter to measure insulation resistance.  2500V Megohm meter is used to measure insulation resistance. |
| 12 | 冷却装置及其二次回路检査试验 Inspection test of cooling device and its secondary circuit  Inspection test of cooling device and its secondary loop | ⑴1〜3 年一次(二次回路)  (1) Once every 1 ~ 3 years (secondary circuit) (1) Once every 1 to 3 years (secondary circuit)  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary | ⑴投运后，流向、温升和声响正常，无渗漏； (1) After being put into operation, the flow direction, temperature rise and sound are normal, and there is no leakage;  (1) After being put into operation, the flow direction, temperature rise and sound are normal and there is no leakage;  ⑵强油水冷装置的检查和试验，按制造厂规定； (2) Inspection and testing of strong oil-water cooling devices shall be in accordance with the manufacturer's regulations;  ⑵ The inspection and test of strong oil water cooling device shall be in accordance with the regulations of the manufacturer;  ⑶绝缘电阻一般不低于 1MΩ。 (3) The insulation resistance is generally not less than 1MΩ.  (3) Insulation resistance is generally not less than 1 M Ω. | | | | | Use a 2500V megohmmeter to measure insulation resistance.  测量绝缘电阻釆用 2500V 兆欧表。  The insulation resistance is measured with a 2500V megohmmeter. |
| 13 | 套管中的电流互感器绝缘试验 Insulation test of current transformer in bushing  Insulation test of current transformer in bushing | ⑴必要时 (1) When necessary  When necessary  ⑵大修后 (2) After major repair  ⑵ After overhaul | 绝缘电阻一般不低于 1MΩ The insulation resistance is generally not less than 1MΩ  Insulation resistance is generally not less than 1 M Ω | | | | | 采用 2500V 兆欧表。 Use a 2500V megohmmeter.  2500V Megohm meter is adopted. |

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| 14 | 全电压下空载合闸 No-load closing under full voltage  No-load closing under full voltage | after overhaul  大修后  After overhaul | ⑴全部更换绕组，空载合闸 5 次，每次间隔 5 分钟； (1) Replace all windings, and switch on 5 times without load, with an interval of 5 minutes each time;  (1) All windings shall be replaced and closed 5 times without load, with an interval of 5 minutes each time;  ⑵部分更换绕组，空载合闸 3 次，每次间隔 5 分钟。 (2) Partly replace the windings, and close the windings 3 times without load, with an interval of 5 minutes each time.  ⑵ Replace the winding partially, and close it three times without load, with an interval of 5 minutes each time. | ⑴在使用分接上进行； (1) Conduct it on the use of tapping;  (1) in the use of tap;  ⑵由变压器高压或中压侧加压； (3)110kV 及以上的变压器中性点接地。 (2) Pressure is applied from the high or medium voltage side of the transformer; (3) The neutral point of the transformer of 110kV and above is grounded.  ⑵ Pressurized by the high voltage or medium voltage side of the transformer; (3) The neutral point of 110kV and above transformers is grounded. |
| 15 | 气体继电器及其二次回路试验 Gas relay and its secondary circuit test  Gas relay and its secondary circuit test | ⑴1〜3 年一次二次回路  (1) Secondary circuit once every 1 ~ 3 years (1) Secondary circuit once every 1 to 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary |  |  |
| 16 | 压力释放器校验 Pressure release verification  Calibration of pressure releaser | 必要时 if necessary  When necessary | 动作值与铭牌值相差应在±10%范围内或按制造厂规定。 The difference between the action value and the nameplate value shall be within ±10% or as specified by the manufacturer.  The difference between the action value and the nameplate value should be within 10% or according to the manufacturer's regulations. |  |
| 17 | partial discharge measurement  局部放电测量  Partial discharge measurement | ⑴大修后(220kV 及以上) (1) After overhaul (220kV and above)  (1) After overhaul (220kV and above)  ⑵更换绕组后(220kV及以上、120MVA 及以上) (2) After replacing windings (220kV and above, 120MVA and above)  ⑵ After winding replacement (220kV and above, 120MVA and above)  ⑶必要时 3. When necessary  (3) When necessary | (1) When the line terminal voltage is 1.5Um/ 3, the discharge amount is generally no more than 500pC. When the line terminal voltage is 1.3Um/ 3, the discharge amount is generally no more than 300pC.  ⑴在线端电压为 1.5Um/ 3 时，放电量一般不大于 500pC在线端电压为 1.3Um/ 3 时，放电量—般不大于 300pC  When the on-line terminal voltage is 1.5 Um/3, the discharge quantity is generally not more than 500pC. When the on-line terminal voltage is 1.3 Um/3, the discharge quantity is generally not more than 300pC (2) Dry type transformers shall be implemented in accordance with relevant regulations  ⑵干式变压器按相关规定执行  ⑵ Dry-type transformer shall be implemented according to relevant regulations | (1) The test method complies with relevant regulations;  ⑴试验方法符合相关规定； (2)"After overhaul" in the cycle refers to after defect elimination overhaul.  (1) The test method complies with relevant regulations;  ⑵周期中“大修后”系指消缺性大修后。  ⑵ "After overhaul" in the cycle refers to after defect elimination overhaul. |

1. 干式变压器的试验项目、周期和要求。

Test items, cycles and requirements of dry-type transformers.  
Test items, cycles and requirements for dry-type transformers.

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| 序号. Serial number.  Serial number. | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | winding DC resistance  绕组直流电阻  Winding DC resistance | ⑴交接时  (1) At the time of handover (1) At handover  ⑵大修后 (3)6 年一次  ⑵ Once every 6 years after overhaul (3) (2) After overhaul (3) Once every 6 years  ⑷必要时  (4) When necessary (4) When necessary | ⑴相间差别一般不大于三相平均值的 4%,线间差别不应大于三相平均值的 2%； (1) The inter-phase difference is generally no more than 4% of the three-phase average value, and the inter-line difference should not be more than 2% of the three-phase average value;  (1) The difference between phases is generally not greater than 4% of the three-phase average, and the difference between lines should not be greater than 2% of the three-phase average;  ⑵与以前相同部位测得值比较，其变化不应大于 2%。 (2) Compared with the previous measured values at the same parts, the change should not be more than 2%.  ⑵ Compared with the values measured in the same part before, the change should not be greater than 2%. | 不同温度下的电阻值按下式换算： R2=R1(T+t2)/(T+t1) Resistance values at different temperatures are converted according to the following formula: R2=R1(T+t2)/(T+t1)  The resistance values at different temperatures are converted as follows: R2=R1 (T+t2)/(T+t1)  式中 R1、R2 分别为在温度 t1、t2 时的电阻值； T 为电阻温度常数，铜导线取 235。 Where R1 and R2 are the resistance values at temperatures t1 and t2 respectively; T is the resistance temperature constant, and the copper wire is 235.  Where R1 and R2 are the resistance values at temperatures t1 and t2 respectively; T is the temperature constant of resistance, and 235 is taken for copper wire. |
| 2 | Winding and core insulation resistance  绕组、铁芯绝缘电阻  Insulation resistance of winding and iron core | ⑴交接时  (1) At the time of handover (1) At handover  ⑵大修后 (3)6 年一次  ⑵ Once every 6 years after overhaul (3) (2) After overhaul (3) Once every 6 years  ⑷必要时  (4) When necessary (4) When necessary | When the insulation resistance is converted to the same temperature, there shall be no significant change compared with the previous test result, and generally no less than 70% of the previous value.  绝缘电阻换算至同一温度下，与前一次测试结果相比应无明显变化，一般不低于上次值的 70%。  When the insulation resistance is converted to the same temperature, there should be no obvious change compared with the previous test result, generally not less than 70% of the previous value. | Use a 2500V or 5000V megohmmeter.  釆用 2500V 或 5000V 兆欧表。  2500V or 5000V Megohms are used. |
| 3 | 交流耐压试验 AC withstand voltage test  AC withstand voltage test | ⑴大修后 (2)6 年一次 (1) After overhaul (2) Once every 6 years  (1) Once every six years after overhaul (2) | 全部更换绕组时，按出厂试验电压值；部分更换绕组和定期试验时，按出厂试验电压值的 0.85 倍。 When replacing all windings, the factory test voltage value shall be used; when replacing partial windings and conducting regular tests, the factory test voltage value shall be 0.85 times the factory test voltage value.  When replacing all windings, according to the factory test voltage value; For partial winding replacement and periodic test, 0.85 times of the factory test voltage value. | 10kV 变压器按 35kV\*0.8=28kV 进行。 10kV transformer is conducted as per 35kV\*0.8= 28kV.  The 10kV transformer is operated according to 35kV\*0. 8=28kV. |
| 4 | Temperature measuring device and secondary loop test  测温装置及二次回路试验  Temperature measuring device and secondary circuit test | ⑴交接时  (1) At the time of handover (1) At handover  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶六年一次  (3) Once every six years (3) Once every six years  ⑷必要时  (4) When necessary (4) When necessary | ⑴按制造厂的技术要求； (1) According to the technical requirements of the manufacturer;  (1) According to the technical requirements of the manufacturer;  ⑵指示正确，测温电阻应和出厂值相符； (2) The indication is correct, and the temperature measuring resistance should be consistent with the factory value;  ⑵ The indication is correct, and the temperature measuring resistance should be consistent with the factory value;  ⑶绝缘电阻一般不低于 1MΩ。 (3) The insulation resistance is generally not less than 1MΩ.  (3) Insulation resistance is generally not less than 1 M Ω. | ⑴釆用 2500V 兆欧表(对运行年久的变压器可用 1000V 兆欧表)； (1) Use a 2500V megohmmeter (1000V megohmmeter can be used for long-term transformers);  (1) 2500V Megohm meter is used (1000V Megohm meter can be used for transformers that have been in operation for a long time);  ⑵连接片不能拆开者可不进行。 (2) If the connecting piece cannot be disassembled, it may not be done.  ⑵ If the connecting piece cannot be disassembled, it may not be carried out. |

1. 油浸式电流互感器的试验项目、周期和要求。

Test items, periods and requirements of oil-immersed current transformers.  
Test items, cycles and requirements for oil-immersed current transformers.

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| serial number  序号  Serial number | project  项目  Project | 建议周期如下  The recommended cycle is as follows The recommended cycle is as follows  （或按设备生产厂商建议的时间  (Or at the time recommended by the equipment manufacturer (or as recommended by the equipment manufacturer  周期）  Cycle) cycle) | requirements  要求  Requirements | | | | | | | description  说明  Description |
| 1 | the insulation resistance of the winding  绕组的绝缘电阻  Insulation resistance of winding | ⑴投运前  (1) Before putting into operation (1) Before commissioning  ⑵大修后  ⑵ After overhaul (2) After major repair  (3)1〜3 年一次  (3) Once every 1 ~ 3 years (3)1~ Once every 3 years  ⑷必要时  (4) When necessary (4) When necessary | Compared with the initial value and previous data, the winding insulation resistance should not change significantly.  绕组绝缘电阻与初始值及历次数据比较，不应有显著变化。  Compared with the initial value and previous data, the winding insulation resistance should not change significantly. | | | | | | | Use a 2500V megohmmeter.  采用 2500V 兆欧表。  2500V Megohm meter is adopted. |
| 2 | tanδ和电容值  tan δ and capacitance value tanδ and capacitance tanδ and capacitance tanδ and capacitance tanδ and capacitance tanδ and capacitance tanδ and capacitance tanδ and capacitance | ⑴投运前  (1) Before putting into operation (1) Before commissioning (1) Before commissioning (1) Before commissioning (1) Before commissioning (1) Before commissioning (1) Before commissioning (1) Before commissioning  ⑵大修后  ⑵ After overhaul (2) After major repair (2) After major repair (2) After major repair (2) After major repair (2) After major repair (2) After major repair (2) After major repair  (3)1〜3 年一次  (3) Once every 1 ~ 3 years (3)1~ Once every 3 years (3)1~ Once every 3 years (3)1~ Once every 3 years (3)1~ Once every 3 years (3)1~ Once every 3 years (3)1~ Once every 3 years (3)1~ Once every 3 years  ⑷必要时  (4) When necessary (4) When necessary (4) When necessary (4) When necessary (4) When necessary (4) When necessary (4) When necessary (4) When necessary | ⑴主绝缘 tanδ (%)应不大于下面的数值，且与历年数据比较，不应有显著变化； (1) The main insulation tanδ (%) shall not be greater than the following values, and there shall be no significant change compared with the data over the years;  (1) The main insulation tan δ (%) should not be greater than the following value, and compared with the data over the years, there should be no significant change; | | | | | | |  |
| 电压等级  Voltage class voltage level voltage level | | 20-35 | 66-110 | 220 | 330-500 |  |  | |
| 大修后  After overhaul after overhaul | 油纸电容型  Oil-paper capacitive type Oil-paper capacitive type | 1.0 | 1.0 | 0.7 | 0.6 |
|  | 充油型  Oil-filled type oil immersed | 3.0 | 2.0 |  |  |
|  | 胶纸电容型  Adhesive paper capacitive type Adhesive tape capacitive type | 2.5 | 2.0 |  |  |
| 运行中  In operation in the operation of | 油纸电容型  Oil-paper capacitive type Oil-paper capacitive type  充油型  Oil-filled type oil immersed | 1.0  3.5 1.0 | 1.0  2.5 1.0 | 0.8 | 0.7 |
|  | 胶纸电容型  Adhesive paper capacitive type Adhesive tape capacitive type | 3.0 | 2.5 |  |  |
|  |  |  | (2) 电容型电流互感器主绝缘电容量与初始值或出厂值差别超出 ±5% 范围时应查明原因。 (2)When the difference between the main insulation capacitance of a capacitive current transformer and the initial value or factory value exceeds the range of ±5%, the reason should be found out.  When the difference between the main insulation capacitance of the capacitive current transformer and the initial value or the factory - set value exceeds the range of ±5%, the cause shall be investigated.  (3) 当电容型电流互感器末屏对地绝缘电阻小于 1000MΩ 时，应测量末屏对地 tanδ，其值不大于 2%。 (3)When the insulation resistance of the terminal screen to ground of the capacitive current transformer is less than 1000MΩ, the tanδ of the terminal screen to ground should be measured, and its value should not exceed 2%.  When the insulation resistance between the terminal screen and ground of the capacitive current transformer is less than 1000 MΩ, the tanδ between the terminal screen and ground shall be measured, and its value shall not be greater than 2%. | | | | | | | (1) 主绝缘 tanδ 的试验电压为 10kV，末屏对地 tanδ 的试验电压为 1kV。  The test voltage for the main insulation tanδ is 10 kV, and the test voltage for the tanδ between the terminal screen and ground is 1 kV. (1)The test voltage of tanδ of the main insulation is 10kV, and the test voltage of tanδ of the final screen to the ground is 1kV.  (2) 对于油纸电容型设备，tanδ 一般无需进行温度换算。当 tanδ 值与出厂值或上一次试验值相比有显著增长时，应综合分析 tanδ 与温度、电压之间的关系。当 tanδ 随温度明显变化，或者试验电压从 10kV 升高到 1/2Um 时，若 tanδ 的增量超过 ±0.3%，则设备不应继续运行。  For oil - paper capacitive - type equipment, generally, no temperature conversion is required for tanδ. When the tanδ value shows a significant increase compared with the factory value or the previous test value, the relationship between tanδ, temperature and voltage should be comprehensively analyzed. When tanδ changes significantly with temperature or when the test voltage increases from 10 kV to 1/2 of Um, if the increment of tanδ exceeds ±0.3%, the equipment should not continue to operate. (2)For oil-paper capacitive equipment, tanδ generally does not require temperature conversion. When the tanδ value increases significantly compared with the factory value or the previous test value, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ changes significantly with temperature, or when the test voltage increases from 10kV to 1/2Um, if the increment of tanδ exceeds ±0.3%, the equipment should not continue to operate.  (3) 固体绝缘互感器可不进行 tanδ 测量。  For solid - insulated transformers, tanδ measurement may not be necessary. (3)Solid insulation transformers may not be subject to tanδ measurement. |

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| 3 | 极性检杳 polarity check  Polarity detection | ⑴大修后 (1) After major repair  After overhaul  ⑵必要时 (2) When necessary  ⑵ When necessary | 与铭牌标志相符。 Comply with the nameplate mark.  Consistent with the nameplate mark. | | | | | | | | |  |
| 4 | AC withstand voltage test  交流耐压试验  AC withstand voltage test | (1) After major repair  ⑴大修后 (2) When necessary  After overhaul  ⑵必要时  ⑵ When necessary | ⑴一次绕组按出厂值的 80%进行，出厂值不明的按下列电压进行试验。 (1) The primary winding is tested at 80% of the factory value, and the factory value is unknown at the following voltages.  (1) The primary winding shall be tested according to 80% of the factory value, and those with unknown factory value shall be tested according to the following voltages. | | | | | | | | |  |
| 电压等级 kV  Voltage class kV Voltage class kV | 3 | 6 | 10 | 15 | 20 | 35 | 66 |  |
| 试验电压 kV  Test voltage kV Test voltage kV | 15 | 21 | 30 | 38 | 47 | 72 | 120 |
| ⑵二次绕组之间及末屏对地为 2kV；  ⑵ 2kV between secondary windings and the last screen to ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground;  ⑶全部更换绕组绝缘后，应按出厂值进行。  (3) After all winding insulation is replaced, it shall be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. (3) After all winding insulation is replaced, it should be carried out according to the factory value. | | | | | | | | |

1. 干式电流互感器的试验项目、周期和要求。

Test items, cycles and requirements of dry current transformers.  
Test items, cycles and requirements for dry-type current transformers.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按  The recommended cycle is as follows (or according to The recommended cycle is as follows (or  设备生产厂商建议的时间周期）  Time period recommended by equipment manufacturer) Time period recommended by equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | Insulation resistance of winding and final screen  绕组及末屏的绝缘电阻  Insulation resistance of winding and terminal screen | ⑴投运前  (1) Before putting into operation (1) Before commissioning  (2)35kV 及以上： 三年一次；  (2) 35kV and above: once every three years; (2)35kV and above: once every three years;  10kV：六年一次  10kV: once every six years 10kV: once every six years  ⑶大修后  (3) After overhaul (3) After major repair  ⑷必要时  (4) When necessary (4) When necessary | (1) 一次绕组对末屏及对地、各二次绕组间及其对地的绝缘电阻，与出厂值及历次数据相比，不应有显著变化，一般不应低于出厂值及初始值的 70%。  (1) When compared with the factory value and previous data, the insulation resistance of the primary winding to the terminal screen and to the ground, as well as that between the secondary windings and to the ground, should not show significant changes. Generally, it should not be less than 70% of the factory value and the initial value. (1)The insulation resistance of the primary winding to the final screen and the ground, and between the secondary windings and the ground shall not change significantly compared with the factory value and previous data, and shall generally not be lower than the factory value and the initial value. 70%.  (2) 电容型电流互感器末屏对地绝缘电阻一般不低于 1000MΩ。  (2) The insulation resistance between the terminal screen of the capacitive current transformer and the ground is generally not less than 1000 MΩ. (2)The insulation resistance of the final screen of capacitive current transformers to ground is generally not less than 1000MΩ. | (1) Use a 2500V megohmmeter;  ⑴釆用 2500V 兆欧表；  (1) 2500V Megohm meter is used; (2) When necessary, such as when a fault is suspected.  ⑵必要时，如：怀疑有故障时。  (2) When necessary, such as when there is a fault suspected. |

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| 2 | tanδ and capacitance  tanδ及电容量  Tan δ and capacitance | 35kV or above  35KV 及以上 (1) Before commissioning  35KV and above  ⑴投运前 (2) Once every three years  (1) Before putting into operation  ⑵三年一次 (3) After major repair  (2) Once every three years  ⑶大修后 (4) When necessary  (3) After overhaul  ⑷必要时  (4) When necessary | (1)When the difference between the main insulation capacitance and the initial value or factory value exceeds ±5%, the reason shall be found out.  (1) 主绝缘电容量与初始值或出厂值差别超过 ±5% 时应查明原因。  (1) When the difference between the main insulation capacitance and the initial value or the factory - set value exceeds the range of ±5%, the cause should be investigated. (2) Refer to the manufacturer's technical conditions. In the absence of the manufacturer's technical conditions, tanδ of the main insulation should not be greater than 0.5%, and there should be no significant change compared with the data over the years;  ⑵参考厂家技术条件进行，无厂家技术条件时，主绝缘 tanδ不应大于 0.5%,且与历年数据比较，不应有显著变化；  ⑵It shall be carried out with reference to the manufacturer's technical conditions. In the absence of the manufacturer's technical conditions, the main insulation tanδ should not be greater than 0.5%, and when compared with the historical data, there should be no significant changes.; (3) When the insulation resistance of the final screen of the capacitive current transformer to ground is less than 1000MΩ, the tanδ of the final screen to ground should be measured, and its value should not exceed 2%.  ⑶当电容型电流互感器末屏对地绝缘电阻小于 1000MΩ时，应测量末屏对地 tanδ ,其值不大于 2%。  (3) When the insulation resistance between the terminal screen and ground of the capacitive current transformer is less than 1000 MΩ, the tanδ between the terminal screen and ground shall be measured, and its value shall not be greater than 2%. | ⑴只对 35kV 及以上电容型互感器进行； (1) Only for capacitive transformers of 35kV and above;  (1) Only for capacitive transformers of 35kV and above;  ⑵当 tanδ值与出厂值或上一次试验值比较有明显增长时，应综合分析 tanδ、温度、电压的关系，当 tanδ随温度明显变化或试验电压由 10kV 升到 Um/2 时，tanδ增量超过土 0.3%,不应继续运行。末屏对地 tanδ试验电压为 2kV； (2) When the tanδ value increases significantly compared with the factory value or the previous test value, the relationship between tanδ, temperature and voltage should be comprehensively analyzed. When tanδ changes significantly with temperature or the test voltage increases from 10kV to Um/2, the tanδ increment exceeds 0.3%, and the operation should not be continued. The tanδ test voltage of the last screen to the ground is 2kV;  ⑵ When the tan δ value increases obviously compared with the factory value or the last test value, the relationship among tan δ, temperature and voltage should be comprehensively analyzed. When tan δ changes obviously with temperature or the test voltage rises from 10kV to Um/2, the tan δ increment exceeds 0.3% of soil, so it should not continue to operate. The terminal screen to ground tan δ test voltage is 2kV;  ⑶对具备测试条件的电容型互感器，可以用带电测试 tanδ及电容量代替。 (3) For capacitive transformers with test conditions, live test tanδ and capacitance can be used instead.  For capacitive transformers with test conditions, live test tan δ and capacitance can be used instead. |
| 3 | Live test tanδ and capacitance  带电测试 tanδ及电容量  Live test tan δ and capacitance | ⑴投产后一个月 (1) One month after production  1. One month after production  ⑵一年一次 (2) Once a year  Once a year  ⑶大修后 (3) After major repair  (3) After overhaul  ⑷必要时 (4) When necessary  (4) When necessary | ⑴可采用同相比较法：判断标准为：  (1) The in - phase comparison method can be adopted, and the judgment criteria are as follows: (1) The same phase comparison method can be used: the judgment criteria are:  ——同相设备介损测量值差值(tanδx-tanδN)与初始测量值比较，变化范围绝对值不超过±5%。  -- When compared with the initial measured value, the absolute value of the difference in dielectric loss measurement values (tanδx - tanδN) of in - phase equipment shall not exceed ±5%. --Compared with the initial measurement value, the absolute value of the difference in dielectric loss measurement value of in-phase equipment (tanδx-tanδN) shall not exceed ±5%.  —— 同相同型号设备介损测量值(tanδx-tanδN)不应超过±0.3%。  --The difference in dielectric loss measurement values (tanδx - tanδN) of the same - phase and same - type equipment shall not exceed ±0.3%. --The measured dielectric loss value (tanδx-tanδN) of the same model of equipment should not exceed ±0.3%.  ⑵釆用其他测试方法时，可根据实际制定操作细则。  (2) When other test methods are adopted, the operation rules can be formulated according to the actual situation. (2) When using other test methods, operating rules can be formulated based on actual conditions. | 只对已安装了带电测试信号取样单元的电容型电流互感器进行，当超出要求时应：  This shall only be carried out for capacitive current transformers equipped with live - test signal sampling units. When the requirements are exceeded, the following actions shall be taken: Only for capacitive current transformers with live test signal sampling units installed. When the requirements are exceeded, the following shall be performed:  (1) 查明原因  (1) Identify the cause. (1)find out the reasons  (2) 缩短试验周期  (2) Shorten the test cycle. (2)Shorten test cycles  (3) 必要时停电复试。  (3) If necessary, conduct a retest after power outage. (3)If necessary, power off for a retest. |
| 4 | AC withstand voltage test  交流耐压试验  AC withstand voltage test | ⑴35kV 及以上：必要时 (1) 35kV and above: if necessary  (1) 35kV and above: when necessary  ⑵10kV：六年一次 (2) 10kV: once every six years  (2) 10kV: once every six years | (1) 一次绕组应按出厂值的 80% 进行（相关操作）。10kV 电流互感器的耐压试验应按 35kV 进行。 (1)The primary winding should be carried out at 80% of the factory value (related operations). The withstand voltage test of 10kV current transformers shall be conducted at 35 kV.  (1) The primary winding shall be operated at 80% of the factory value. The withstand voltage test for the 10 kV current transformer shall be carried out at 35 kV.  (2) 二次绕组之间以及末屏对地（的试验电压）为 2kV，可用 2500V 兆欧表替代（进行测试）。 (2)The test voltage between the secondary windings and the final screen to the ground is 2kV, which can be replaced by a 2500V megohmmeter.  (2) The test voltage between the secondary windings and between the terminal screen and ground is 2 kV, and a 2500 V Megohmmeter can be used instead (for the test). |  |
| 5 | partial discharge measurement  局部放电测量  Partial discharge measurement | ⑴110kV 及以上： (1) 110 kV and above:  (1) 110kV and above:  ⑵必要时 (2) When necessary  ⑵ When necessary | At a voltage of 1.2Um/√3, the apparent discharge volume shall not exceed 50pC.  在电压为 1.2Um/√3 时,视在放电量不大于 50pC。  The apparent discharge quantity is not greater than 50 pC when the voltage is 1.2Um/√3. | When necessary, such as when there are doubts about insulation properties.  必要时，如：对绝缘性能有怀疑时。  When necessary, for example, when there is doubt as to the insulation properties. |

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| 6 | Change ratio inspection of each tap  各分接头的变比检査  Variable ratio inspection of each tap joint | if necessary  必要时  When necessary | ⑴与铭牌标志相符； (1) Comply with the nameplate mark;  (1) It shall be consistent with the nameplate markings;  ⑵比值差和相位差与制造厂试验值比较应无明显变化，并符合等级规定。 (2) The ratio difference and phase difference shall have no significant change compared with the manufacturer's test values and comply with the grade regulations.  ⑵ The ratio difference and phase difference should show no significant change when compared with the manufacturer's test values and shall comply with the grade regulations. | (1) The ratio difference and phase difference shall be measured for meter cost windings;  ⑴对于计量计费用绕组应测量比值差和相位差；  (1) The ratio difference and phase difference shall be measured for the metering - billing windings. (2) When necessary, such as changing the ratio tap operation.  ⑵必要时，如：改变变比分接头运行时。  ⑵ When necessary, for example, when operating with a change in the tap ratio. |
| 7 | 校核励磁特性曲线 Check excitation characteristic curve  Check excitation characteristic curve | if necessary  必要时  When necessary | 与同类型互感器特性曲线或制造厂提供的特性曲线相比较，应无明显差别。 Compared with the characteristic curve of the same type of transformer or the characteristic curve provided by the manufacturer, there should be no significant difference.  When compared with the characteristic curves of the same - type transformers or those provided by the manufacturer, there should be no significant differences. | Relay protection when required  继电保护有要求时进行  Relay protection shall be carried out when required |

1. 电磁式电压互感器的试验项目、周期和要求。

Test items, periods and requirements of electromagnetic voltage transformers.  
Test items, cycles and requirements for electromagnetic voltage transformers.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | 绝缘电阻 insulation resistance  Insulation resistance | （1）1〜3 年  (1) 1 ~ 3 years (1) 1 to 3 years   1. 大修后   After overhaul after overhaul   1. 必要时   When necessary if necessary | 绕组绝缘电阻与出厂试验值及上次试验数据比较，应无显著变化，且绝缘电阻应不低于上次试验值的 70%,最小值应符合以下要求（换算为 20°C 时）：  When compared with the factory test value and the previous test data, the insulation resistance of the windings shall show no significant change. Moreover, the insulation resistance shall not be less than 70% of the previous test value, and the minimum value shall meet the following requirements (after conversion to 20 °C): Compared with the factory test value and the last test data, the insulation resistance of the winding shall have no significant change, and the insulation resistance shall not be less than 70% of the last test value. The minimum value shall meet the following requirements (when converted to 20°C): | 一次绕组用 2500V 兆欧表，二次组用 1000V 或 2500V 兆欧表。  A 2500 V megohmmeter shall be used for the primary winding, and a 1000 V or 2500 V megohmmeter shall be used for the secondary winding. A 2500V megohmmeter is used for the primary winding, and a 1000V or 2500V megohmmeter is used for the secondary group. |

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| 2 | tan δ (20 kV and above)  tanδ(20kV及以上)  Tan δ (20kV and above) | ⑴绕组绝缘  Winding insulation (1) Winding insulation (1) Winding insulation (1) Winding insulation (1) Winding insulation (1) Winding insulation (1) Winding insulation (1) Winding insulation  （a）l〜3 年  (A) l3 years (a) l to 3 years (a) l to 3 years (a) l to 3 years (a) l to 3 years (a) l to 3 years (a) l to 3 years (a) l to 3 years   1. 大修后   After overhaul after overhaul after overhaul after overhaul after overhaul after overhaul after overhaul after overhaul   1. 必要时   When necessary if necessary if necessary if necessary if necessary if necessary if necessary if necessary  ⑵66-220kV 串级式电压互感器支架  ⑵ 66-220kV cascade voltage transformer bracket (2) 66-220kV cascade voltage transformer bracket (2) 66-220kV cascade voltage transformer bracket (2) 66-220kV cascade voltage transformer bracket (2) 66-220kV cascade voltage transformer bracket (2) 66-220kV cascade voltage transformer bracket (2) 66-220kV cascade voltage transformer bracket (2) 66-220kV cascade voltage transformer bracket   1. 投运前   Before putting into operation before commissioning before commissioning before commissioning before commissioning before commissioning before commissioning before commissioning   1. 大修后   After overhaul after overhaul after overhaul after overhaul after overhaul after overhaul after overhaul after overhaul   1. 必要时   When necessary if necessary if necessary if necessary if necessary if necessary if necessary if necessary | ⑴绕组绝缘 tanδ（%）不应大于下表数值 (1) Winding insulation tanδ ( %) shall not be greater than the values in the table below  The tanδ values (in %) of the winding insulation shall not be greater than the values in the following table. | | | | | | | | | | | | | | | (1) The terminal shielding method is recommended for the tanδ test method of cascade voltage transformers, and other test methods and requirements are specified by themselves.  （1）串级式电压互感器的 tanδ试验方法建议采用末端屏蔽法，其他试验方法与要求自行规定。 (2)The voltage transformer with graded insulation measures tanδ with an applied voltage of 3kV.  For the tanδ test of cascade - type voltage transformers, the terminal - shielding method is recommended. Other test methods and requirements shall be specified independently.  (2) 分级绝缘的电压互感器测 tanδ 时施加电压为 3kV。  When measuring the tanδ of a voltage transformer with graded insulation, the applied voltage is 3 kV. |
| 温度℃  Temperature ℃ Temperature ℃ Temperature ℃ Temperature ℃ Temperature ℃ | | | | 5 | | 10 | | 20 | | 30 | | 40 | |  |
| 35kV 及以下  35kV and below 35 kV and below 35 kV and below | 大修后  After overhaul after overhaul after overhaul after overhaul | | | 1.5 | | 2.5 | | 3.0 | | 5.0 | | 7.0 | |
| 运行中  In operation in the operation of in the operation of in the operation of | | | 2.0 | | 2.5 | | 3.5 | | 5.5 | | 8.0 | |
| 35kV 以上  Above 35kV Above 35kV Above 35kV | 大修后  After overhaul after overhaul after overhaul after overhaul | | | 1.0 | | 1.5 | | 2.0 | | 3.5 | | 4.0 | |
| 运行中  In operation in the operation of in the operation of in the operation of | | | 1.5 | | 1.0 | | 2.5 | | 4.0 | | 5.5 | |
| ⑵支架绝缘 tanδ一般不大于 6%。  ⑵ The tanδ value of the support insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. (2) The tan δ of bracket insulation is generally not greater than 6%. | | | | | | | | | | | | | | |
| 3 | AC withstand voltage test  交流耐压试验  AC withstand voltage test | (1) 3 years (20kV and below)  ⑴3 年（20kV 及以下）  (1) 3 years (20kV and below) (2) After major repair  ⑵大修后  ⑵ After overhaul 3. When necessary  ⑶必要时  (3) When necessary | ⑴一次绕组按岀厂值的 80%进行，岀厂值不明的，按下列电压进行试验：  (1) The primary winding shall be tested at 80% of the factory value. If the factory value is unknown, the test shall be carried out at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: (1) The primary winding shall be tested at 80% of the factory output value. If the factory output value is unknown, the test shall be conducted at the following voltages: | | | | | | | | | | | | | | | ⑴串级式或分级绝缘式的互感器用倍频感应耐压试验；  (1) The frequency - doubling induction withstand voltage test shall be used for cascade - type or graded - insulation transformers; (1) Double-frequency induction withstand voltage test for cascade or graded insulation type transformers; (1) Double-frequency induction withstand voltage test for cascade or graded insulation type transformers; (1) Double-frequency induction withstand voltage test for cascade or graded insulation type transformers; (1) Double-frequency induction withstand voltage test for cascade or graded insulation type transformers;  ⑵进行倍频感应耐压试验时应考虑互感器的容升电压；  ⑵ When conducting the frequency - doubling induction withstand voltage test, the capacitive voltage rise of the transformer should be considered; (2) The capacity rise voltage of the transformer should be considered when conducting the frequency doubling induction withstand voltage test; (2) The capacity rise voltage of the transformer should be considered when conducting the frequency doubling induction withstand voltage test; (2) The capacity rise voltage of the transformer should be considered when conducting the frequency doubling induction withstand voltage test; (2) The capacity rise voltage of the transformer should be considered when conducting the frequency doubling induction withstand voltage test;  ⑶倍频耐压试验前后，应检査有否绝缘损伤。  (3) Before and after the frequency - doubling withstand voltage test, it should be checked whether there is insulation damage. (3) Before and after the frequency doubling withstand voltage test, check for insulation damage. (3) Before and after the frequency doubling withstand voltage test, check for insulation damage. (3) Before and after the frequency doubling withstand voltage test, check for insulation damage. (3) Before and after the frequency doubling withstand voltage test, check for insulation damage. |
| 电压等级 kV  Voltage class kV Voltage class kV Voltage class kV | | 3 | 6 | | 10 | 15 | 20 | | 35 | | 66 | |  | |
| 试验电压 kV  Test voltage kV Test voltage kV Test voltage kV | | 15 | 21 | | 30 | 38 | 47 | | 72 | | 120 | |
| ⑵二次绕组之间及末屏对地为 2kV；  ⑵ The voltage between the secondary windings and between the terminal screen and ground is 2 kV; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground; (2) 2kV between the secondary windings and the final screen to the ground;  ⑶全部更换绕组绝缘后按出厂值进行。  (3) After all the winding insulation has been replaced, the test shall be carried out according to the factory value. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. 3. Carry out the factory value after replacing all winding insulation. | | | | | | | | | | | | | | |
| 4 | 空载电流测量 No-load current measurement  No-load current measurement | ⑴大修后； (1) After major repairs;  (1) After overhaul;  ⑵必要时 (2) When necessary  ⑵ When necessary | ⑴在额定电压下，空载电流与出厂数值比较无明显差别； (1) At rated voltage, there is no significant difference between the no-load current and the factory value;  Under the rated voltage, there is no significant difference between the no - load current and the factory - specified value;  ⑵在下列试验电压下，空载电流不应大于最大允许电流；中性点非有效接地系统 1.9Un/3；中性点接地系统 1.5Un/3。 (2) Under the following test voltages, the no-load current shall not exceed the maximum allowable current: neutral point non-effectively grounded system is 1.9Un/3; neutral point grounded system is 1.5Un/3.  ⑵ Under the following test voltages, the no - load current shall not be greater than the maximum allowable current. For the non - effectively grounded neutral system, it is 1.9Un/3; for the grounded neutral system, it is 1.5Un/3. | | | | | | | | | | | | | | |  |
| 5 | 密封检查 seal inspection  Sealing inspection | ⑴大修后  After overhaul (1) After major repair  ⑵必要时  ⑵ When necessary (2) When necessary | 应无渗漏油现象。 There should be no oil leakage.  There should be no oil leakage. | | | | | | | | | | | | | | | 试验方法按制造厂规定。 The test method shall comply with the manufacturer's regulations.  The test method shall be in accordance with the manufacturer's regulations. |
| 6 | 铁心夹紧螺 栓（可接触到的）绝缘电阻  Insulation resistance of core clamping bolt (accessible) Core clamping bolt (accessible) insulation resistance | self-imposed  自行规定  Self-regulation | 自行规定。 Make your own regulations.  Self-regulation. | | | | | | | | | | | | | | | 采用 2500V 兆欧表。 Use a 2500V megohmmeter.  A 2500 V megohmmeter shall be used. |

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| 7 | 联接组别和极性  Join groups and polarities Connection group and polarity | ⑴更换绕组后  After winding replacement (1) After replacing windings  ⑵接线变动后  ⑵ After wiring change (2) After wiring changes | 与铭牌和端子标志相符。 Comply with nameplates and terminal markings.  Consistent with nameplate and terminal mark. |  |
| 8 | 电压比 voltage ratio  Voltage ratio | ⑴更换绕组后  After winding replacement (1) After replacing windings  ⑵接线变动后  ⑵ After wiring change (2) After wiring changes | 与铭牌标志相符。 Comply with the nameplate mark.  Consistent with the nameplate mark. | 更换绕组后应测量比值差和相位差。  The ratio difference and phase difference should be measured after replacing windings. The ratio difference and phase difference should be measured after replacing the windings. |
|  |  |  |  | ⑴局部放电测量宜与交流耐压同  Partial discharge measurement should be the same as AC withstand voltage (1) Partial discharge measurement should be the same as AC withstand voltage |
|  |  |  |  | 时进行；  At the same time; Conduct when; |
| 9 | partial discharge measurement  局部放电测量  Partial discharge measurement | (1) Before commissioning  ⑴投运前  (1) Before putting into operation (2) 1 to 3 years (20 to 35kV solid insulation transformer)  ⑵1〜3 年（20〜35kV 固体绝缘互感器）  (2) 1 ~ 3 years (20 ~ 35kV solid insulated transformer) (3) After major repair  ⑶大修后  (3) After overhaul (4) When necessary  ⑷必要时  (4) When necessary | (1) When the voltage of the solid insulated ground voltage transformer is 1.1Um/√3, the discharge amount shall not exceed 100pC, and when the voltage is 1.1Um (when necessary), the discharge amount shall not exceed 500pC. For solid insulation phase-to-phase voltage transformers, when the voltage is 1.1Um, the discharge capacity shall not exceed 100pC;  （1）固体绝缘相对地电压互感器在电压为 1.1Um/√3 时，放电量不大于 100pC，在电压为 1.1Um 时(必要时)，放电量不大于 500pC。固体绝缘相对相电压互感器，在电压为 1.1Um 时，放电量不大于 100pC；  (1) The discharge capacity of solid insulated ground voltage transformer is not more than 100pC when the voltage is 1.1 Um/tick 3, and not more than 500pC when the voltage is 1.1 Um (if necessary). Solid insulated phase-to-phase voltage transformer, when the voltage is 1.1 Um, the discharge capacity is not more than 100pC;; (2) When the voltage of 110kV and above oil-immersed voltage transformers is 1.1Um/√3, the discharge capacity shall not exceed 20pC.  （2）110kV 及以上油浸式电压互感器在电压为 1.1Um/√3 时，放电量不大于 20pC。  (2) The discharge capacity of 110kV and above oil-immersed voltage transformers is not more than 20pC when the voltage is 1.1 Um/. 3. | ⑵交接时电压等级为 35kV~110kV电流互感器的局部放电测量可按 10%进行抽测，若局部放电量达不到规定要求应增加抽测比例。交接时若有出厂试验值可不进行或只进行个别抽试；  ⑵ The partial discharge measurement of current transformer with voltage grade of 35kV ~ 110kV during handover can be measured by 10%. If the partial discharge can not meet the specified requirements, the sampling measurement ratio should be increased. If there is factory test value during handover, individual sampling test may not be carried out or only carried out; (2) The partial discharge measurement of current transformers with voltage levels of 35kV~ 110kV at the time of handover can be carried out at 10%. If the partial discharge amount fails to meet the specified requirements, the sampling measurement proportion shall be increased. If there are factory test values during handover, no test can be carried out or only individual test can be carried out;  ⑶预加电压为出厂工频耐压值的 80%。测量电压在两值中任选其一进行；  (3) The pre-applied voltage is 80% of the factory power frequency withstand voltage value. The measured voltage is carried out at any one of the two values; (3) The pre-applied voltage is 80% of the factory power frequency withstand voltage value. Measure the voltage at one of two values;  ⑷必要时，如：对绝缘性能有怀疑  (4) If necessary, such as doubt on insulation performance (4) If necessary, such as: doubts about insulation properties |
|  |  |  |  | 时。  When. time. |

1. 电容式电压互感器的试验项目、周期和要求。

Test items, periods and requirements of capacitive voltage transformers.  
Test items, cycles and requirements for capacitive voltage transformers.

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| --- | --- | --- | --- | --- |
| serial number  序号  Serial number | project  项目  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | requirements  要求  Requirements | description  说明  Description |

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| --- | --- | --- | --- | --- |
| 1 | 电压比 voltage ratio  Voltage ratio | ⑴大修后  After overhaul (1) After major repair  ⑵必要时  ⑵ When necessary (2) When necessary | 与铭牌标志相符。 Comply with the nameplate mark.  Consistent with the nameplate mark. |  |
| 2 | 中间变压器的绝缘电阻 Insulation resistance of intermediate transformer  Insulation resistance of intermediate transformer | ⑴大修后  After overhaul (1) After major repair  ⑵必要时  ⑵ When necessary (2) When necessary | 自行规定。 Make your own regulations.  Self-regulation. | 采用 2500V 兆欧表。 Use a 2500V megohmmeter.  2500V Megohm meter is adopted. |
| 3 | 中间变压器的 tanδ tanδ of intermediate transformer  Tan δ of intermediate transformer | ⑴大修后  After overhaul (1) After major repair  ⑵必要时  ⑵ When necessary (2) When necessary | 与初始值相比不应有显著变比。 There should be no significant variation compared to the initial value.  There should be no significant change compared with the initial value. |  |

1. 干式电压互感器的试验项目、周期和要求。

Test items, cycles and requirements of dry voltage transformers.  
Test items, cycles and requirements for dry-type voltage transformers.

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| --- | --- | --- | --- | --- |
| serial number  序号  Serial number | project  项目  Project | 建议周期如下（或按设  The recommended cycle is as follows (or as set The recommended cycle is as follows (or as set  备生产厂商建议的时间周期）  Prepare the time period recommended by the manufacturer) Prepare the time period recommended by the manufacturer) | requirements  要求  Requirements | description  说明  Description |
| 1 | 绝缘电阻 insulation resistance  Insulation resistance | ⑴六年一次  (1) Once every six years (1) Once every six years  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary | 一般不低于出厂值及初始值的 70%。 Generally not less than 70% of the factory value and initial value.  Generally not less than 70% of the factory value and initial value. | 釆用 2500V 兆欧表。 Use a 2500V megohmmeter.  2500V Megohm meter is used. |
| 2 | AC withstand voltage test  交流耐压试验  AC withstand voltage test | ⑴六年 1 次（10kV） (1) Once every six years (10kV)  (1) Once every six years (10kV)  ⑵必要时（35 及以上 (2) If necessary (35 and above  ⑵ When necessary (35 and above | ⑴一次绕组按出厂值的 80%进行；  (1) The primary winding shall be carried out at 80% of the factory value; (1) Primary winding shall be carried out at 80% of the factory value;  ⑵二次绕组之间及末屏对地的工频耐压试验电压为 2kV,可用 2500V 兆欧表替代。  ⑵ The power frequency withstand voltage test voltage between secondary windings and the last screen to ground is 2kV, which can be replaced by 2500V Megohmmeter. (2) The power frequency withstand voltage test voltage between the secondary windings and the final screen to the ground is 2kV, which can be replaced by a 2500V megohmmeter. |  |
| 3 | 局部放电测量  Partial discharge measurement partial discharge measurement | 必要时  When necessary if necessary | 在电压为 1.2Um/√3 时视在放电量不大于 50pC。  The apparent discharge capacity is not greater than 50pC when the voltage is 1.2 Um/. 3. When the voltage is 1.2Um/√3, the apparent discharge amount shall not exceed 50pC. |  |
| 4 | 空载电流测量 No-load current measurement  No-load current measurement | 大修后 after overhaul  After overhaul | ⑴在额定电压下，空载电流与出厂数值比较无明显差别；  There is no obvious difference between no-load current and factory value under rated voltage; (1) At rated voltage, there is no significant difference between the no-load current and the factory value;  ⑵在下列试验电压下，空载电流不应大于最大允许电流中性点非有效接地系统：1.9Um/√3，中性点接地系统：1.5Um/√3。  ⑵ Under the following test voltages, the no-load current shall not be greater than the maximum allowable current for neutral point non-effectively grounded system: 1.9 Um/tick 3, neutral point grounded system: 1.5 Um/tick 3. (2) Under the following test voltages, the no-load current shall not exceed the maximum allowable current for neutral point non-effectively grounded system: 1.9Um/√3, and neutral point grounded system: 1.5Um/√3. |  |

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| --- | --- | --- | --- | --- |
| 5 | 联接组别和极性  Join groups and polarities Connection group and polarity | ⑴更换绕组后  After winding replacement (1) After replacing windings  ⑵接线变动后  ⑵ After wiring change (2) After wiring changes | 与铭牌和端子标志相符。  Consistent with nameplate and terminal mark. Comply with nameplates and terminal markings. |  |
| 6 | 电压比  Voltage ratio voltage ratio | 更换绕组后  After changing the winding, after winding replacement | 与铭牌和端子标志相符。  Consistent with nameplate and terminal mark. Comply with nameplates and terminal markings. |  |
| 7 | 绕组直流电阻 winding DC resistance  Winding DC resistance | ⑴大修后  After overhaul (1) After major repair  ⑵必要时  ⑵ When necessary (2) When necessary | 与初始值或出厂值比较，应无明显差别。 Compared with the initial value or factory value, there should be no significant difference.  Compared with the initial value or factory value, there should be no obvious difference. |  |

1. SF6 断路器的试验项目、周期和要求。

Test Items, Periods and Requirements for SF6 Circuit Breaker.  
Test items, cycles and requirements for SF6 circuit breakers.

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| --- | --- | --- | --- | --- |
| 序号 serial number  Serial number | 项日 Xiang Ri  Item day | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
|  |  |  |  | 对电压等级较高的断路器，因体积大可用局部 For circuit breakers with higher voltage levels, they can be used locally due to their large size.  For circuit breakers with higher voltage level, local parts can be used because of their large volume |
|  |  | ⑴大修后  After overhaul (1) After major repair |  | 包扎法检漏，每个密封部位包扎后历时 5 小时，  Leak detection by bandaging method, which lasts for 5 hours after bandaging each sealed part, The bandage method leaks leakage. It takes 5 hours to wrap each sealed part, |
| 1 | SF6 气体泄漏试验 SF6 gas leakage test  SF6 gas leakage test | ⑵1 年（有密度表）  (2) 1 year (with density table) (2) 1 year (with density table)  3 个月（无密度表）  3 months (no density table) 3 months (without density table) | 年漏气率不大于 1%或按制造厂要求 Annual air leakage rate shall not exceed 1% or as required by the manufacturer  The annual air leakage rate is not more than 1% or according to the requirements of the manufacturer | 测得的SF6 气体含量（体积分数）不大于30×10-6  The measured SF6 gas content (volume fraction) is not more than 30 × 10 -6 The measured SF6 gas content (volume fraction) shall not exceed 30×10-6  或采用灵敏度不低于 1×10-6（体积比）的检漏  Or use leak detection with sensitivity not less than 1 × 10 -6 (volume ratio) Or use leak detection with a sensitivity of not less than 1×10-6 (volume ratio) |
|  |  | ⑶必要时  (3) When necessary 3. When necessary |  | 仪对断路器各密封部位、管道接头等处进行检  The instrument inspects the sealing parts and pipe joints of the circuit breaker The instrument inspects all sealing parts of the circuit breaker, pipe joints, etc. |
|  |  |  |  | 测，检漏仪不应报警。  The leak detector should not give an alarm. Test, the leak detector should not alarm. |
| 2 | 辅助回路和控制回路绝缘电阻 Insulation resistance of auxiliary loop and control loop  Insulation resistance of auxiliary circuit and control circuit | ⑴1〜3 年  (1) 13 years 1 to 3 years  ⑵必要时  ⑵ When necessary (2) When necessary | 绝缘电阻不低于 2MΩ。 The insulation resistance shall not be less than 2MΩ.  Insulation resistance shall not be less than 2 M Ω. | 釆用 500V 或 1000V 兆欧表。 Use a 500V or 1000V megohmmeter.  500V or 1000V Megohms are used. |

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| --- | --- | --- | --- | --- |
| 3 | withstand voltage test  耐压试验  Withstand voltage test | (1) After major repair  (2) When necessary  ⑴大修后  After overhaul  ⑵必要时  ⑵ When necessary | The test voltage for AC withstand voltage or operating impulse withstand voltage is 80% of the factory test voltage value.  交流耐压或操作冲击耐压的试验电压为出厂试验电压值的 80%。  The test voltage of AC withstand voltage or operating impulse withstand voltage is 80% of the factory test voltage value. | ⑴试验在 SF6 气体额定压力下进行；  (1) The test is carried out under the rated pressure of SF6 gas; (1) The test is carried out at the rated pressure of SF6 gas;  ⑵对 GIS 试验时不包括其中的电磁式电压互感器及避雷器，但在投运前应对它们进行试验电压值为 Um 的 5 分钟耐压试验；  ⑵ Electromagnetic voltage transformers and lightning arresters are not included in GIS test, but 5 minutes withstand voltage test with test voltage value of Um should be carried out before they are put into operation; (2) Electromagnetic voltage transformers and lightning arresters are not included in the GIS test, but they should be subjected to a 5-minute withstand voltage test with a test voltage value of Um before being put into operation;  ⑶罐式断路器的耐压试验方式：合闸对地；分闸状态两端接地。建议在交流耐压试验的同时测量局部放电；  (3) Withstand voltage test mode of tank circuit breaker: closing to ground; Two ends are grounded in the opening state. It is suggested to measure partial discharge at the same time of AC withstand voltage test. (3) Withstand voltage test method of tank circuit breakers: when closed, it is connected to the ground; both ends are connected to the ground in the open state. It is recommended to measure partial discharge at the same time as the AC withstand voltage test;  ⑷对瓷柱式定开距型断路器只作断口间耐压。  (4) Only withstand voltage between fractures for porcelain column type fixed opening distance circuit breaker. (4) For porcelain pillar type fixed opening distance circuit breakers, only withstand voltage between breaks is applied. |
| 4 | 辅助回路和控制回路交  Auxiliary loop and control loop intersect Auxiliary loop and control loop alternating  流耐压试验  Flow withstand voltage test flow withstand test | 大修后  After overhaul after overhaul | 试验电压为 2kV。  The test voltage is 2kV. The test voltage is 2kV. | 耐压试验后的绝缘电阻值不应降低。  The insulation resistance value after withstand voltage test should not be reduced. The insulation resistance value after withstand voltage test shall not be reduced. |
| 5 | 断口间并联电容器的绝缘电阻、电容量和 tanδ Insulation resistance, capacitance and tanδ of parallel capacitors between breaks  Insulation Resistance, Capacitance and tan δ of Shunt Capacitors between Fractures | ⑴1〜3 年  (1) 13 years 1 to 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary | ⑴瓷柱式断路器各断口同时测量，测得的电容值和 tan δ与原始值比较，应无明显变化； (1) Measure each break of the porcelain column circuit breaker simultaneously. Compared with the original value, the measured capacitance value and tan δ should have no significant change;  All fractures of porcelain column circuit breaker are measured at the same time, and the measured capacitance value and tan δ should have no obvious change compared with the original value;  ⑵罐式断路器按制造厂规定。 (2) Tank circuit breakers shall comply with the manufacturer's regulations.  ⑵ Tank circuit breaker according to the manufacturer's regulations. | 大修时，对瓷柱式断路器应测量电容器和断口并联后整体的电容值和 tanδ作为该设备的原始数据。 During overhaul, the overall capacitance value and tanδ of the capacitor and the fracture after being connected in parallel should be measured for porcelain pillar circuit breakers as the raw data of the equipment.  During overhaul, the capacitance value and tan δ of the whole capacitor after parallel connection of capacitor and fracture surface should be measured as the original data of the equipment for porcelain column circuit breaker. |
| 6 | 合闸电阻值和合闸电阻的投入时间  Closing resistance value and switching time of closing resistance Closing resistor value and switching resistor input time | ⑴1-3 年（罐式断路器除外）  1-3 years (except tank circuit breakers) 1-3 years (excluding tank circuit breakers)  ⑵大修后  ⑵ After overhaul (2) After major repair | ⑴除制造厂另有规定外，阻值变化允许范围不得大于±5%；  (1) Unless otherwise stipulated by the manufacturer, the allowable range of resistance change shall not be greater than 5%; (1) Unless otherwise specified by the manufacturer, the allowable range of resistance change shall not exceed ±5%;  ⑵合闸电阻的有效接入时间按制造厂规定校核。  ⑵ The effective access time of closing resistance shall be checked according to the regulations of the manufacturer. (2) The effective connection time of the closing resistor is checked according to the manufacturer's regulations. |  |
| 7 | Time parameter of circuit breaker  断路器的时间参量  Time parameter of circuit breaker | (1) After major repair  ⑴大修后 (2) After major repair of the institution  After overhaul  ⑵机构大修后  ⑵ After the overhaul of the mechanism, | 除制造厂另有规定外，断路器的分、合闸同期性应满足下列要求：  Unless otherwise specified by the manufacturer, the synchronization of opening and closing of circuit breakers shall meet the following requirements: Unless otherwise specified by the manufacturer, the synchronization of opening and closing of circuit breakers shall meet the following requirements:  相间合闸不同期不大于 5ms；相间分闸不同期不大于 3ms；  Phase-to-phase closing is not more than 5ms;; The different periods of phase-to-phase switching are not more than 3ms;; The different periods of inter-phase closing shall not exceed 5ms; the different periods of inter-phase opening shall not exceed 3ms;  同相各断口间合闸不同期不大于 3ms；同相各断口间分闸不同期不大于 2ms。  Different closing periods between fractures in the same phase are not more than 3ms;; No more than 2ms for different opening periods between fractures in the same phase. The different periods of closing between each break in the same phase shall not be more than 3ms; the different periods of opening between each break in the same phase shall not be more than 2ms. |  |

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| 8 | 断路器的速度特性  Speed characteristics of circuit breaker Speed characteristics of circuit breakers | 大修后  After overhaul after overhaul | 测量方法和测量结果应符合制造厂规定。  The measurement method and results shall conform to the manufacturer's regulations. The measurement method and measurement results shall comply with the manufacturer's regulations. | 制造厂无要求时不测。  When the manufacturer has no requirements, it will happen. If the manufacturer has no requirements, it will be unexpected. |
| 9 | Operating voltage of opening and closing electromagnet  分、合闸电磁铁的动作电压  Operating voltage of opening and closing electromagnet | (1)1〜3 年 (1)1~ 3 years  (1) 1 ~ 3 years  ⑵大修后 (2) After major repair  ⑵ After overhaul  ⑶机构大修后 (3) After the organization's overhaul  (3) After the overhaul of the institution, | ⑴操动机构合闸：  (1) Closing of operating mechanism: (1) Closing of operating mechanism:  —操作电压为额定电压的 85%〜110%操作机构分闸  -The operating voltage is 85% ~ 110% of the rated voltage. The operating mechanism is opened - Operating voltage is 85%~ 110% of rated voltage. Operating mechanism is switched off  —操作电压大于额定值 65%；  -The operating voltage is greater than 65% of the rated value; - Operating voltage is greater than 65% of rated value;  ⑵进口设备按制造厂规定。  ⑵ Imported equipment shall be in accordance with the regulations of the manufacturer. (2) Imported equipment shall comply with the manufacturer's regulations. |  |
| 10 | 导电回路电阻 conductive loop resistance  Conductive loop resistance | ⑴1〜3 年  (1) 13 years 1 to 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair | 敞开式断路器的测量值之不大于制造厂规定值的 120%  The measured value of open circuit breaker shall not exceed 120% of the value specified by the manufacturer The measured value of the open circuit breaker shall not exceed 120% of the value specified by the manufacturer | 用直流压降法测量，电流不小于 100A。 Measured by the DC voltage drop method, the current shall not be less than 100A.  Measured by DC voltage drop method, the current is not less than 100A. |
| 11 | 分、合闸线圈直流电阻 DC resistance of opening and closing coil  DC resistance of opening and closing coils | ⑴大修后  After overhaul (1) After major repair  ⑵机构大修后  ⑵ After the overhaul of the mechanism, (2) After major repair of the institution | 测试结果应符合产品技术条件的规定。 The test results shall comply with the provisions of product technical conditions.  The test results shall conform to the provisions of product technical conditions. |  |
| 12 | SF6 气体密度监视器 (包括整定值)检验 Inspection of SF6 gas density monitor (including setting value)  Inspection of SF6 gas density monitor (including setting value) | (1)1〜3 年  (1) 1 ~ 3 years (1)1~ 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary | The test results shall comply with the provisions of product technical conditions.  测试结果应符合产品技术条件的规定。  The test results shall conform to the provisions of product technical conditions. |  |
| 13 | 压力表效验(或调整)，机构操作压力整定值校验，机械安全阀校验  Validation (or adjustment) of pressure gauge, calibration of mechanism operating pressure setting value, calibration of mechanical safety valve Pressure gauge validation (or adjustment), mechanism operating pressure setting value verification, mechanical safety valve verification | (1)1〜3 年  (1) 1 ~ 3 years (1)1~ 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair | 测试结果应符合产品技术条件的规定。 The test results shall comply with the provisions of product technical conditions.  The test results shall conform to the provisions of product technical conditions. |  |
| 14 | 操作机构在分闸、合闸重合闸下的操作 压力 (气压、液压)下降值  Operating pressure (air pressure, hydraulic pressure) drop value of operating mechanism under opening, closing and reclosing Falling value of operating pressure (air pressure, hydraulic pressure) of the operating mechanism under opening, closing and reclosing | ⑴大修后 (1) After major repair  After overhaul  ⑵机构大修后 (2) After major repair of the institution  ⑵ After the overhaul of the mechanism, | The test results shall comply with the provisions of product technical conditions.  测试结果应符合产品技术条件的规定。  The test results shall conform to the provisions of product technical conditions. |  |
| 15 | 运行中的局部放电 Partial discharge in operation  Partial discharge in operation | 必要时 if necessary  When necessary | 应无明显局部放电信号。 There should be no obvious partial discharge signal.  There should be no obvious partial discharge signal. | 只对运行中的 GIS 进行测量。 Measurements are made only on running GIS.  Measure only GIS in operation. |

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1. 真空断路器的试验项目、周期和要求。

Test items, cycles and requirements of vacuum circuit breakers.  
Test items, cycles and requirements for vacuum circuit breakers.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备  The recommended cycle is as follows (or by equipment Recommended cycles are as follows (or by equipment  生产厂商建议的时间周期）  Time period recommended by manufacturer) Manufacturer's recommended time period) | 要求 requirements  Requirements | | | | | 说明 description  Description |
| 1 | insulation resistance  绝缘电阻  Insulation resistance | (1) 1 to 3 years  （1）1〜3 年  (1) 1 ~ 3 years (2) After overhaul  （2）大修后  (2) After overhaul | ⑴整体绝缘电阻参照制造厂规定或自行规定；  (1) The overall insulation resistance refers to the manufacturer's regulations or self-regulations;  ⑵断口和用有机物制成的提升杆的绝缘电阻不应低于下表中的数值  ⑵ The insulation resistance of fracture surface and lifting rod made of organic matter shall not be lower than the values in the following table  （MΩ）： | | | | |  |
| 试验类别 test categories  Type of test | 额定电压 kv  Rated voltage kv Rated voltage kv Rated voltage kv Rated voltage kv | | |  |
| <24 | 24〜40.5 | 55〜72.5 |
| 大修后  After overhaul after overhaul | 1000 | 3000 | 6000 |
| 运行中  In operation in the operation of | 300 | 1000 | 3000 |
|  | | | | |
| 2 | AC withstand voltage test (circuit breaker main circuit to ground, phase to phase and fracture)  交流耐压试验（断路器主回对地、相间及断口）  AC withstand voltage test (main circuit breaker to ground, interphase and fracture) | （1）1〜3 年（12kV 以下  (1) 13 ~ 3 years (below 12kV) (1) 1 to 3 years (below 12kV   1. 大修后   After overhaul after overhaul   1. 必要时（40.5kV、 72.5kV）   When necessary (40.5 kV, 72.5 kV) If necessary (40.5kV, 72.5kV) | The circuit breaker is operated separately in the opening and closing states.  断路器在分、合闸状态下分别进行。  The circuit breaker is carried out separately in the opening and closing states. | | | | | ⑴更换或干燥后的绝缘提升杆必须进行耐压试验，耐压设备不能满足时可分段进行；  (1) The insulation lifting rod after replacement or drying must be tested for withstand voltage, and if the withstand voltage equipment cannot meet the requirements, it can be carried out in sections; (1) The replaced or dried insulating lifting rods must be subjected to withstand voltage test. If the withstand voltage equipment cannot meet the requirements, it can be carried out in sections;  ⑵相间、相对地及断口的  ⑵ Alternating, opposite and fractured (2) Interphase, opposite ground and fracture  耐 压值相同。  The withstand voltage value is the same. The pressure resistance value is the same. |
| 3 | 辅助回路和控制回路交流耐压试验  AC withstand voltage test of auxiliary circuit and control circuit AC withstand voltage test for auxiliary circuit and control circuit | ⑴1〜3 年  (1) 13 years 1 to 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair | 试验电压为 2kV。 The test voltage is 2kV.  The test voltage is 2kV. | | | | |  |
| 4 | 导电回路电阻 conductive loop resistance  Conductive loop resistance | ⑴1〜3 年  (1) 13 years 1 to 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair | ⑴大修后测试结果应符合产品技术条件的规定；  (1) The test results after overhaul shall conform to the provisions of product technical conditions; (1) The test results after overhaul shall comply with the provisions of product technical conditions; (1) The test results after overhaul shall comply with the provisions of product technical conditions; (1) The test results after overhaul shall comply with the provisions of product technical conditions; (1) The test results after overhaul shall comply with the provisions of product technical conditions; (1) The test results after overhaul shall comply with the provisions of product technical conditions;  ⑵运行中自行规定，建议不大于 1.2 倍出厂值。  ⑵ Self-regulation during operation, and it is recommended that it should not exceed 1.2 times the factory value. (2) Make self-regulation during operation, and it is recommended that no more than 1.2 times the factory value. (2) Make self-regulation during operation, and it is recommended that no more than 1.2 times the factory value. (2) Make self-regulation during operation, and it is recommended that no more than 1.2 times the factory value. (2) Make self-regulation during operation, and it is recommended that no more than 1.2 times the factory value. (2) Make self-regulation during operation, and it is recommended that no more than 1.2 times the factory value. | | | | | 用直流压降法测量，电流  Measure current by DC voltage drop method Measured by DC voltage drop method, current  不 小于 l00A。  Not less than l00A. Not less than 100A. |

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| 5 | 断路器的机械特性  Mechanical characteristics of circuit breakers the mechanical characteristics of the circuit breaker | 大修后  After overhaul after overhaul | 测试结果应符合产品技术条件的规定。  The test results shall conform to the provisions of product technical conditions. The test results shall comply with the provisions of product technical conditions. | 在额定操作电压下进行。  Proceed at rated operating voltage. Carry out at rated operating voltage. |
| 6 | 操作机构合闸接触器和分、合闸电磁铁的最低动作电压  Minimum operating voltage of closing contactor and opening and closing electromagnet of operating mechanism Minimum operating voltage of operating mechanism closing contactor and opening and closing electromagnet | after overhaul  大修后  After overhaul | ⑴操动机构合闸：  (1) Closing of operating mechanism: (1) Closing of operating mechanism:  —操作电压为额定电压的 85%〜110%操作机构分闸：  -Operating voltage is 85% ~ 110% of rated voltage. Operating mechanism opening: - The operating voltage is 85%~ 110% of the rated voltage. The operating mechanism opens:  —操作电压大于额定值 65%；  -The operating voltage is greater than 65% of the rated value; - Operating voltage is greater than 65% of rated value;  ⑵进口设备按制造厂规定。  ⑵ Imported equipment shall be in accordance with the regulations of the manufacturer. (2) Imported equipment shall comply with the manufacturer's regulations. |  |
| 7 | 合闸接触器和分、合闸电磁铁线圈的绝缘电阻和直流电阻  Insulation resistance and DC resistance of closing contactor and opening and closing electromagnet coil Insulation resistance and DC resistance of closing contactor and opening and closing electromagnet coil | (1)1〜3 年 (1)1~ 3 years  (1) 1 ~ 3 years  ⑵大修后 (2) After major repair  ⑵ After overhaul | ⑴绝缘电阻不应小于 2MΩ； (1) The insulation resistance should not be less than 2MΩ;  (1) Insulation resistance should not be less than 2 M Ω;  ⑵直流电阻测试结果应符合产品技术条件的规定。 (2) The DC resistance test results shall comply with the provisions of product technical conditions.  ⑵ DC resistance test results shall conform to the provisions of product technical conditions. | Adopt 1000V megohmmeter  采用 1000V 兆欧表  Adopt 1000V Megohm meter |

1. 隔离开关的试验项目、周期要求。

Test items and cycle requirements of isolating switches.  
Test items and cycle requirements for isolating switches.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商  The recommended cycle is as follows (or by equipment manufacturer Recommended cycles are as follows (or by equipment manufacturer  建议的时间周期）  Recommended time period) Recommended time period) | 要求 requirements  Requirements | | | | 说明 description  Description |
| 1 | Organic materials support insulation resistance of insulated terminals and lifting rods  有机材料支持绝缘端子及提升杆的绝缘电阻  Insulation resistance of organic materials supporting insulated terminals and lifting rods | (1)1~ 3 years  (1)1〜3 年 (2) After major repair  (1) 1 ~ 3 years  ⑵大修后  ⑵ After overhaul | ⑴用兆欧表测量胶合元件分层电阻  Measure delamination resistance of gluing element with megohmmeter  ⑵有机材料传动提升杆的绝缘电阻值不得低于下表数值  ⑵ The insulation resistance value of organic material transmission lifting rod shall not be lower than the following table value  (MΩ)： | | | | Use a 2500V megohmmeter.  采用 2500V 兆欧表。  2500V Megohm meter is adopted. |
| 试验类别 test categories  Type of test | 额定电压 kv  Rated voltage kv Rated voltage kv Rated voltage kv | |  |
| <24 | 24〜40.5 |
| 大修后  After overhaul after overhaul | 1200 | 3000 |
| 运行中  In operation in the operation of | 300 | 1000 |
|  | | | |
| 2 | 二次回路的绝缘电阻 Insulation resistance of secondary circuit  Insulation resistance of secondary circuit | (1)1〜3 年  (1) 1 ~ 3 years (1)1~ 3 years  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary | 绝缘电阻不应小于 2MΩ Insulation resistance should not be less than 2MΩ  Insulation resistance should not be less than 2 M Ω | | | | 釆用 1000V 兆欧表。 Use a 1000V megohmmeter.  1000V Megohm meter is used. |

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| --- | --- | --- | --- | --- |
| 3 | AC withstand voltage test  交流耐压试验  AC withstand voltage test | after overhaul  大修后  After overhaul | 用单个或多个元件支柱绝缘子组成的隔离开关进行整体耐压有困难时，可对各胶合元件分别做耐压试验。 When it is difficult to carry out overall withstand voltage of an isolating switch composed of single or multiple element pillar insulators, each glued element can be subjected to withstand voltage test separately.  When it is difficult to withstand voltage with isolating switch composed of single or multiple component post insulators, withstand voltage test can be done for each glued component separately. | 在交流耐压试验前、后应测量绝缘电阻；耐压后的阻值不得降低。 The insulation resistance should be measured before and after the AC withstand voltage test; the resistance value after withstand voltage shall not decrease.  Insulation resistance should be measured before and after AC withstand voltage test; The resistance value after withstand voltage shall not be reduced. |
| 4 | 二次回路交流耐压试验 Secondary circuit AC withstand voltage test  Secondary circuit AC withstand voltage test | 大修后 after overhaul  After overhaul | 试验电压为 2kV。 The test voltage is 2kV.  The test voltage is 2kV. |  |
| 5 | 电动操作机构线圈的最低动作电压  Minimum operating voltage of electric operating mechanism coil Minimum operating voltage of electric operating mechanism coil | 大修后 after overhaul  After overhaul | 最低动作电压一般在操作电源额定电压 30%~80%范围内。 The lowest operating voltage is generally within the range of 30% to 80% of the rated voltage of the operating power supply.  The lowest operating voltage is generally in the range of 30% ~ 80% of the rated voltage of operating power supply. |  |
| 6 | 导电回路电阻测量  Resistance measurement of conductive loop Conductive loop resistance measurement | 大修后  After overhaul after overhaul | 不大于制造厂规定值的 1.5 倍  Not more than 1.5 times the value specified by the manufacturer Not more than 1.5 times the value specified by the manufacturer | 用直流压降法测量，电流值不小于 100A  Measured by DC voltage drop method, the current value is not less than 100A Measured by DC voltage drop method, the current value is not less than 100A |
| 7 | Action of the operating mechanism  操作机构的动作情况  Action of operating mechanism | after overhaul  大修后  After overhaul | 1. 电动操作机构在额定的操作电压下分、合闸 5 次，动作正常； The electric operating mechanism opens and closes 5 times under the rated operating voltage, and the action is normal;   The electric operating mechanism is opened and closed for 5 times under the rated operating voltage, and the action is normal;   1. 手动操作机构操作时灵活，无卡涩；(3)闭锁装置应可靠。 The manual operating mechanism is flexible and free from jams;(3) The locking device should be reliable.   The manual operation mechanism is flexible and has no jamming; (3) Locking device should be reliable. |  |

1. 阀控式铅酸蓄电池直流屏(柜)的试验项目、周期和要求。

Test items, cycle and requirements of DC panel (cabinet) of valve-regulated lead-acid battery.  
Test items, cycles and requirements for DC panels (cabinets) of valve-regulated lead acid batteries.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | 蓄电池组容量测试 Battery pack capacity test  Battery capacity test | (1)1年  (1) 1 year (1)1 years  ⑵必要时  ⑵ When necessary (2) When necessary | 符合设备说明书的要求。 Comply with the requirements of the equipment manual.  Meet the requirements of the equipment manual. |  |
| 2 | 蓄电池放电终止电压测试 Battery discharge termination voltage test  Battery discharge termination voltage test | (1)1年  (1) 1 year (1)1 years  ⑵必要时  ⑵ When necessary (2) When necessary | 符合设备说明书的要求。 Comply with the requirements of the equipment manual.  Meet the requirements of the equipment manual. |  |

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| --- | --- | --- | --- | --- |
| 3. | Various functional inspections  各种功能检査  Check various functions | 1 year  1年  1 year | All functions should be normal.  各项功能均应正常。  All functions should be normal. | 检査项目包括：  The inspection items include: Inspection items include:   1. 监控系统   Monitoring system monitoring system   1. 充电装置系统   Charging device system Charging device system   1. 绝缘监察系统   Insulation monitoring system insulation monitoring system   1. 电池巡检系统   Battery inspection system Battery inspection system   1. 预告系统   Forecast system Prewarning system |

1. 牵引变电所的支柱绝缘子和悬式绝缘子的试验项目、周期和要求。

Test items, periods and requirements of post insulators and suspension insulators in traction substations.  
Test items, cycles and requirements for pillar insulators and suspension insulators in traction substations.

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| --- | --- | --- | --- | --- |
| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备  The recommended cycle is as follows (or by equipment Recommended cycles are as follows (or by equipment  生产厂商建议的时间周期）  Time period recommended by manufacturer) Manufacturer's recommended time period) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | 零值绝缘子检测  Zero insulator detection zero-value insulator detection  （66kV 及以上）  (66kV and above) (66kV and above) | 必要时  When necessary if necessary | 在运行电压下检测。  Detect at operating voltage. Tested at operating voltage. | ⑴可根据绝缘子的劣化率调整检测周期；  (1) The inspection period can be adjusted according to the deterioration rate of insulators; (1) The detection period can be adjusted according to the deterioration rate of insulators;  ⑵对多元件针式绝缘子应检测每一元件。  ⑵ For multi-component pin insulators, each component shall be tested. (2) For multi-element pin insulators, each element should be tested. |
| 2 | 绝缘电阻  Insulation resistance insulation resistance | 必要时  When necessary if necessary | ⑴针式支柱绝缘子的每一元件和每片悬式绝缘子的绝缘电阻不应低于 300MΩ；  (1) The insulation resistance of each element of pin post insulator and each suspension insulator shall not be less than 300 M Ω; (1) The insulation resistance of each element and each suspension insulator of pin post insulators shall not be less than 300MΩ;  ⑵棒式支柱绝缘子不进行此项试验。  ⑵ Rod post insulators will not be tested. (2) This test shall not be carried out for rod-type pillar insulators. | ⑴釆用 2500V 及以上兆欧表；  (1) Use Megohms of 2500V and above; (1) Use a megohmmeter of 2500V and above;  ⑵棒式支柱绝缘子不进行此项试验。  ⑵ Rod post insulators will not be tested. (2) This test shall not be carried out for rod-type pillar insulators. |
| 3 | 交流耐压试验  AC withstand voltage test AC withstand voltage test | 必要时  When necessary if necessary | ⑴35kV 针式支柱绝缘子交流耐压试验电压值如下： 两个胶合元件者，每元件 35kv；三个胶合元件者，每元件 34kV；  (1) The AC withstand voltage test voltage value of 35kv pin post insulator is as follows: for two glued elements, each element is 35kv; 34kV for three glued elements; (1) The AC withstand voltage test voltage values of 35kV pin post insulators are as follows: for two glued components, 35kV per element; for three glued components, 34kV per element;  ⑵机械破坏符合为 60~300kN 的盘形悬式绝缘子交流耐压试验电压值均取 60kV。  ⑵ The AC withstand voltage test values of disk suspension insulators with mechanical failure coincidence of 60 ~ 300kN are all 60kV. (2) The AC withstand voltage test voltage value of disc suspension insulators with mechanical damage compliance of 60~300kN shall be 60kV. | ⑴35kV 支柱绝缘子可根据具体情况按左栏要求⑴或⑵进行；  (1) 35kV pillar insulators can be carried out according to the requirements (1) or (2) in the left column according to specific conditions; (1) 35kV pillar insulators can be carried out according to the requirements of the left column (1) or (2) according to specific circumstances;  ⑵棒式绝缘于不进行此项试验。  ⑵ Rod insulation is not subject to this test. (2) This test shall not be carried out for rod insulation. |

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| 4 | 绝缘子表面污秽物的等值盐密  Equivalent salt density of contamination on insulator surface Equivalent salt density of pollutants on insulator surface | 必要时  When necessary if necessary |  | 应分别在户外能代表当地污秽程度的至少一串悬式绝缘子和一根棒式支柱上取样，测量在当地积污最重的时期进行。  Samples should be taken outdoors on at least one string of suspension insulators and one rod strut representing the local pollution level, and the measurement should be carried out during the period when the local pollution is most serious. Samples should be taken outdoors on at least one string of suspended insulators and one rod-type pillar that can represent the local pollution level, and measurements should be made during the period when the local pollution is heaviest. |

1. 纸绝缘电力电缆线路的试验项目、周期和要求。

Test items, cycles and requirements for paper insulated power cable lines.  
Test items, cycles and requirements for paper-insulated power cable lines.

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| --- | --- | --- | --- | --- |
| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | insulation resistance  绝缘电阻  Insulation resistance | Conduct before DC withstand voltage test  在直流耐压试验之前进行  Before DC withstand voltage test | Make your own regulations.  自行规定。  Self-regulation. | 额定电压 0.6/1kV 电缆用 1000V 兆欧表； 0.6/1kV 以上电缆用 2500V 兆欧表 1000V megohmmeter for cables with rated voltage of 0.6/1kV; 2500V megohmmeter for cables with rated voltage of 0.6/1kV and above  1000V Megohmmeter for cables with rated voltage of 0.6/1kV; 2500V Megohmmeter for cables above 0.6/1kV  （6/6kV 及以上电缆也可用 5000V 兆欧表）。 (A 5000V megohmmeter can also be used for cables of 6/6kV and above).  (5000V megohmmeter can also be used for 6/6 kV and above cables). |
| 2 | DC withstand voltage  直流耐压  DC withstand voltage | ⑴1〜3 年 1 to 3 years  (1) 13 years  ⑵新做终端或接头后进行 (2) Carry out after making new terminals or connections  ⑵ Proceed after making new terminals or joints | ⑴耐压 5 分钟时的泄漏电流值不应大于耐压 1 分钟时泄漏电流值； (1) The leakage current value when withstand voltage for 5 minutes shall not be greater than the leakage current value when withstand voltage for 1 minute;  (1) The leakage current value when withstanding voltage for 5 minutes should not be greater than the leakage current value when withstanding voltage for 1 minute;  ⑵三相之间的泄漏电流不平衡系数不应大于 2。 (2) The leakage current imbalance coefficient between the three phases should not be greater than 2.  ⑵ The leakage current imbalance coefficient between three phases should not be greater than 2. | 6/6kV 及以下电缆的泄漏电流小于10µA, Leakage current of cables 6/6kV and below is less than 10µA,  The leakage current of 6/6 kV and below cables is less than 10 μ A,  8.7/10kV 电缆的泄漏电流小于 20µA 时，对不平衡系数不作规定。 When the leakage current of 8.7/10kV cables is less than 20µA, the imbalance factor is not specified.  When the leakage current of 8.7/10kV cable is less than 20 μ A, the unbalance coefficient is not specified. |

1. 橡塑绝缘电力电缆的试验项目、周期和要求。

Test items, cycles and requirements of rubber-plastic insulated power cables.  
Test items, cycles and requirements for rubber-plastic insulated power cables.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 1 | cable insulation resistance  电缆绝缘电阻  Cable insulation resistance | ⑴投运前 (1) Before commissioning  (1) Before putting into operation  ⑵新做终端头或接头后 (2) After making a new terminal head or connector  ⑵ After the terminal head or joint is newly made,  ⑶必要时 3. When necessary  (3) When necessary | 测量电缆导体对地或对金属屏蔽层间的绝缘电阻应满足下列规定： Measuring the insulation resistance between cable conductors to ground or metal shielding layer shall meet the following requirements:  Measuring the insulation resistance between cable conductor to ground or metal shielding layer shall meet the following requirements:  ⑴耐压试验前后，应无明显变化。 (1) There should be no significant change before and after the withstand voltage test.  (1) Before and after the withstand voltage test, there should be no obvious change.  ⑵电缆外护套、内衬层的绝缘电阻不应低于 0.5MΩ/km (2) The insulation resistance of the outer sheath and inner lining of the cable shall not be less than 0.5MΩ/km  ⑵ The insulation resistance of outer sheath and inner liner of cable shall not be lower than 0.5 M Ω/km | ⑴电缆交联聚乙烯绝缘层的测量采用额定电压 5000V 兆欧表， (1) The measurement of the XLPE insulation layer of the cable uses a megohm meter with rated voltage of 5000V,  (1) The measurement of XLPE insulation layer of cable adopts rated voltage 5000V Megohmmeter,  ⑵电缆外护套、内衬层的测量釆用额定电压 500V 兆欧表。 (2) Use a megohmmeter with rated voltage of 500V for measurement of the outer sheath and inner lining of the cable.  ⑵ The measurement of outer sheath and inner liner of cable shall be made with rated voltage 500V Megohm meter. |
| 2 | Metal shield resistance to conductor resistance ratio  金属屏蔽层电阻和导体电阻比  Ratio of metal shielding resistance to conductor resistance | 1. 投运前； Before commissioning;   Before putting into operation;   1. 重做终端或接头后； After redoing the terminal or connector;   After redoing the terminal or joint;   1. 内衬层破损进水后电缆发生短路接地故障后 After the inner lining is damaged, the cable has a short circuit and a ground fault.   After the cable is short-circuited and grounded after the inner liner is damaged and water enters   1. 必要时 if necessary   When necessary | ⑴对照交接时及历年试验数据，如比值变化超过 15%应引起注意，并适当缩短试验周期 1. Compare the test data at handover and over the years, if the ratio changes by more than 15%, attention should be paid to it and the test period should be appropriately shortened.  In comparison with the test data during handover and over the years, attention should be paid if the ratio changes by more than 15%, and the test period should be shortened appropriately  ⑵发现铜屏蔽层开断，要立即寻找开断点，加以修复按制造厂规定执行 (2) If the copper shielding layer is found to be broken, immediately find the breaking point and repair it in accordance with the manufacturer's regulations.  ⑵ If the copper shielding layer is found to be broken, find the breaking point immediately and repair it according to the regulations of the manufacturer | 试验方法  Test method test method  ⑴用单臂、双臂电桥测量；  (1) Measure with single-arm and double-arm bridges; (1) Use a single arm and dual arm bridge to measure;  ⑵记录测量时的温度；  ⑵ Record the temperature during measurement; (2) Record the temperature during measurement;  ⑶当铜屏蔽层电阻与芯线导体电阻比值与上次试验数据相比增加时，表明铜屏蔽层的直流电阻增大。  When the ratio of copper shielding resistance to core conductor resistance increases compared with the previous test data, it indicates that the DC resistance of copper shielding layer increases. (3) When the ratio of the copper shield resistance to the core conductor resistance increases compared with the previous test data, it indicates that the DC resistance of the copper shield increases. |

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| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 3 | AC withstand voltage test of cable main insulation  电缆主绝缘交流耐压试验  AC withstand voltage test of cable main insulation | (1) Before commissioning  (2)After making a new terminal or connector  3. When necessary  ⑴投运前  (1) Before putting into operation  (2)新做终端或接头后  (2) After the new terminal or joint is made,  ⑶必要时  (3) When necessary | ⑴交接时:优先釆用 20〜300Hz 交流 耐压试验。橡塑电缆 20〜300Hz 交流 耐压试验电压和时间见下  (1) During handover: 20 ~ 300Hz AC withstand voltage test shall be preferentially adopted. The voltage and time of 20 ~ 300Hz AC withstand voltage test of rubber-plastic cable are shown below (1) During handover: Priority shall be given to the 20 - 300Hz AC withstand voltage test. Rubber and plastic cable 20 ~ 300Hz AC withstand voltage test voltage and time are shown below (1) During handover: Priority shall be given to the 20 - 300Hz AC withstand voltage test. Rubber and plastic cable 20 ~ 300Hz AC withstand voltage test voltage and time are shown below (1) During handover: Priority shall be given to the 20 - 300Hz AC withstand voltage test. Rubber and plastic cable 20 ~ 300Hz AC withstand voltage test voltage and time are shown below (1) During handover: Priority shall be given to the 20 - 300Hz AC withstand voltage test. Rubber and plastic cable 20 ~ 300Hz AC withstand voltage test voltage and time are shown below (1) During handover: Priority shall be given to the 20 - 300Hz AC withstand voltage test. Rubber and plastic cable 20 ~ 300Hz AC withstand voltage test voltage and time are shown below  表：  Table: Table: Table: Table: Table: Table: | | | | | (1）110kV 及以上一端为空气绝缘终端，另一端为 GIS 的电缆或两端均为空气绝缘终端的电缆应进行定期试验。  (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be tested regularly. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests. (1) Cables of 110kV and above with air insulated terminals at one end and GIS at the other end or cables with air insulated terminals at both ends shall be subjected to regular tests.  ⑵两端均为密闭式终端的电缆可不进行定期试验。  ⑵ Cables with closed terminals at both ends may not undergo periodic tests. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing. (2) Cables with closed terminals at both ends may not be subject to regular testing.  ⑶不具备上述试验条件或有特殊规定时，可采用施加正常系统相对地电压 24 小时方法代替交流耐压。  (3) When the above test conditions are not met or there are special regulations, the method of applying normal system relative ground voltage for 24 hours can be used instead of AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. (3) When the above test conditions are not met or there are special regulations, the method of applying the normal system relative to the ground voltage for 24 hours can be used to replace the AC withstand voltage. |
| 额定电压  Rated voltage  U0/U(kV) | 试验电压  Test voltage test voltage test voltage | | 时间  Time  (min) |  |
| 18/30 及以下  18/30 and below 18/30 and below | 2.5U0（或2U0）  2.5 U0 (or 2U0) 2.5U0 (or 2U0) 2.5U0 (or 2U0) | | 5（或60）  5 (or 60) 5 (or 60) |
| 21/35～  64/110 21/35~ | 2U0 | | 60 |
| 127/220 | U0（或1.4U0）  U0 (or 1.4 U0) U0 (or 1.4U0) U0 (or 1.4U0) | | 60 |
| ⑵预防性试验  ⑵ Preventive test (2) Preventive testing (2) Preventive testing (2) Preventive testing (2) Preventive testing (2) Preventive testing | | | | |
| 电压等级 kV  Voltage class kV Voltage class kV Voltage class kV | | 试验电压  Test voltage test voltage | 耐压时间  Withstand voltage time withstand voltage time |  |
| 18/30 及以下  18/30 and below 18/30 and below 18/30 and below | | 1.6Uo | 5 |
| 21/35～64/110 | | 1.36Uo | 5 |
| 127/220 | | 1.36Uo | 5 |
| 注：橡塑绝缘电力电缆是指塑料绝缘电缆和橡皮绝缘电缆的总称。塑料绝缘电缆包括聚氯乙烯绝缘、聚乙烯绝缘和交联聚乙烯绝缘电力电缆;橡皮绝缘电缆包括乙丙橡皮绝缘电力电缆。铁路一般用交联聚乙烯绝缘电力电缆。  Note: Rubber-plastic insulated power cable refers to the general name of plastic insulated cable and rubber insulated cable. Plastic insulated cables include PVC insulated, polyethylene insulated and cross-linked polyethylene insulated power cables; Rubber insulated cables include ethylene-propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used in railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. Note: Rubber and plastic insulated power cables refer to the general term of plastic insulated cables and rubber insulated cables. Plastic insulated cables include polyvinyl chloride insulated, polyethylene insulated and crosslinked polyethylene insulated power cables; rubber insulated cables include ethylene propylene rubber insulated power cables. Cross-linked polyethylene insulated power cables are generally used for railways. | | | | | | | | |

1. 套管的试验项目、周期和要求。

Test items, cycle and requirements of casing.  
Test items, cycles and requirements for casing.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 1 | 主绝缘及电容型套管末屏对地绝缘电阻  Insulation resistance of main insulation and capacitive bushing end screen to ground Ground insulation resistance of main insulation and capacitive bushing end screen | ⑴大修后 (2)3 年一次  (1) Once every three years after overhaul (2) (1) After overhaul (2) Once every 3 years  ⑶必要时  (3) When necessary 3. When necessary | ⑴主绝缘的绝缘电阻值不应低于 10000MΩ  The insulation resistance value of the main insulation shall not be less than 10000M Ω (1) The insulation resistance value of the main insulation shall not be less than 10000MΩ (1) The insulation resistance value of the main insulation shall not be less than 10000MΩ (1) The insulation resistance value of the main insulation shall not be less than 10000MΩ (1) The insulation resistance value of the main insulation shall not be less than 10000MΩ (1) The insulation resistance value of the main insulation shall not be less than 10000MΩ  ⑵末屏对地的绝缘电阻不应低于 1000MΩ  ⑵ The insulation resistance of the terminal screen to ground shall not be less than 1000M Ω (2) The insulation resistance of the last screen to the ground shall not be less than 1000MΩ (2) The insulation resistance of the last screen to the ground shall not be less than 1000MΩ (2) The insulation resistance of the last screen to the ground shall not be less than 1000MΩ (2) The insulation resistance of the last screen to the ground shall not be less than 1000MΩ (2) The insulation resistance of the last screen to the ground shall not be less than 1000MΩ | | | | | 釆用 2500V 兆欧表 Adopt a 2500V megohmmeter  2500V Megohm meter is used |
|  |  |  | ⑴20℃时的 tanδ (%)值应不大于下表中数值：  (1) The tan δ (%) value at 20 ℃ shall not be greater than the value in the following table: (1) The tanδ (%) value at 20℃ should not be greater than the values in the following table: (1) The tanδ (%) value at 20℃ should not be greater than the values in the following table: (1) The tanδ (%) value at 20℃ should not be greater than the values in the following table: (1) The tanδ (%) value at 20℃ should not be greater than the values in the following table: (1) The tanδ (%) value at 20℃ should not be greater than the values in the following table: | | | | | ⑴油纸电容型套管的 tanδ一般不进行温度换算，当 tanδ与出厂值或上一次测试值比较有明显增长或接近左表数值时，应综合分析 tanδ与温度、电压的关系。当 tanδ随温度增加明显增大或试验电压由  Generally no temperature conversion is carried out for tan δ of oil-paper capacitive bushing. When tan δ is obviously increased or close to the value in the left table compared with the factory value or the last test value, the relationship between tan δ and temperature and voltage should be comprehensively analyzed. When tan δ increases obviously with the increase of temperature or the test voltage is changed from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from (1) The tanδ of oil-paper capacitive bushing is generally not subject to temperature conversion. When the tanδ increases significantly compared with the factory value or the previous test value or is close to the value in the left table, the relationship between tanδ and temperature and voltage should be comprehensively analyzed. When tanδ increases significantly with the increase of temperature or the test voltage changes from  10kV 升到 Um/ 3 时，tanδ增量超 When 10kV rises to Um/ 3, tanδ increment exceeds  When 10kV rises to Um/3, tan δ increment exceeds  过土 0.3%,不应继续运行； (2)20kV 以下纯瓷套管及与变压器油连通的油压式套管不测 tanδ； If the soil passes 0.3%, it should not continue to operate; (2) pure porcelain bushings below 20kV and oil pressure bushings connected to transformer oil are not allowed to tanδ;  If the soil is 0.3%, it should not continue to run; (2) Pure porcelain bushing below 20kV and oil pressure bushing connected with transformer oil are not tested for tan δ;  ⑶测量变压器套管 tanδ时，与被试套管相连的所有绕组端子连在一起加压，其余绕组端子均接地，末屏接电桥，正接线测量。 (3) When measuring tanδ of the transformer bushing, all winding terminals connected to the bushing under test are connected together and pressurized, the rest of the winding terminals are grounded, the end screen is connected to the bridge, and the positive connection is made for measurement.  (3) When measuring tan δ of transformer bushing, all winding terminals connected with the bushing under test are connected together and pressurized, other winding terminals are grounded, the terminal screen is connected with a bridge, and positive connection is used for measurement. |
|  |  |  | 电压等级 kV  Voltage class kV Voltage class kV | 20〜35 | 66〜110 | 220〜500 |  |
|  |  |  | 充油型  Oil-filled type oil immersed | 3.0 | 1.5 | — |
|  |  |  | 油纸电容型  Oil-paper capacitive type Oil-paper capacitive type | 1.0 | 1.0 | 0.8 |
|  |  |  | 充胶型  Glue filling type filled type | 3.0 | 2.0 |  |
|  |  |  | 胶纸电容型  Adhesive paper capacitive type Adhesive tape capacitive type | 2.0 | 1.5 | 1.0 |
| 2 | 主绝缘及电容型套管对地末屏 tanδ与电 tanδ and electricity of main insulating and capacitive bushings to ground screen  Main insulation and capacitive bushing to ground terminal screen tan δ and electricity  容量 capacity  capacity | ⑴大修后(包括主设备大修后)  (1) After overhaul (including overhaul of main equipment) (1) After overhaul (including major equipment overhaul) (1) After overhaul (including major equipment overhaul) (1) After overhaul (including major equipment overhaul) (1) After overhaul (including major equipment overhaul)  ⑵3 年一次  (2) Once every three years (2) Once every three years (2) Once every three years (2) Once every three years (2) Once every three years  ⑶必要时  (3) When necessary 3. When necessary 3. When necessary 3. When necessary 3. When necessary | 胶纸型  Adhesive-paper type gummed paper type | 2.5 | 2.0 | — |
| 充油型  Oil-filled type oil immersed | 3.5 | 1.5 | — |
| 油纸电容型  Oil-paper capacitive type Oil-paper capacitive type | 1.0 | 1.0 | 0.8 |
| 充胶型  Glue filling type filled type | 3.5 | 2.0 | —— |
|  |  |  | 胶纸电容型  Adhesive paper capacitive type Adhesive tape capacitive type | 3.0 | 1.5 | 1.0 |
|  |  |  | 胶纸型  Adhesive-paper type gummed paper type | 3.5 | 2.0 | —— |
| ⑵当电容型套管末屏对地绝缘电阻小于 1000MΩ时，应测  ⑵ When the insulation resistance of the end screen of capacitive bushing to ground is less than 1000M Ω, it should be measured (2) When the insulation resistance of the terminal screen of the capacitive bushing to ground is less than 1000MΩ, it should be measured. (2) When the insulation resistance of the terminal screen of the capacitive bushing to ground is less than 1000MΩ, it should be measured. (2) When the insulation resistance of the terminal screen of the capacitive bushing to ground is less than 1000MΩ, it should be measured. (2) When the insulation resistance of the terminal screen of the capacitive bushing to ground is less than 1000MΩ, it should be measured. (2) When the insulation resistance of the terminal screen of the capacitive bushing to ground is less than 1000MΩ, it should be measured. | | | | |
|  |  |  | 量末屏对地 tanδ，其值不大于 2%；  Measure the terminal screen to the ground tan δ, and its value is not more than 2%; Measure the tanδ of the end screen to the ground, and its value shall not exceed 2%; Measure the tanδ of the end screen to the ground, and its value shall not exceed 2%; Measure the tanδ of the end screen to the ground, and its value shall not exceed 2%; Measure the tanδ of the end screen to the ground, and its value shall not exceed 2%; Measure the tanδ of the end screen to the ground, and its value shall not exceed 2%; | | | | |
|  |  |  | ⑶电容型套管的电容值与出厂值或上一次试验值的差别超  The difference between the capacitance value of capacitive bushing and the factory value or the last test value is over (3) The difference between the capacitance value of the capacitive bushing and the factory value or the previous test value exceeds (3) The difference between the capacitance value of the capacitive bushing and the factory value or the previous test value exceeds (3) The difference between the capacitance value of the capacitive bushing and the factory value or the previous test value exceeds (3) The difference between the capacitance value of the capacitive bushing and the factory value or the previous test value exceeds (3) The difference between the capacitance value of the capacitive bushing and the factory value or the previous test value exceeds | | | | |
|  |  |  | 出±5%时，应査明原因。  When it is 5%, the reason should be found out. When the value exceeds ±5%, the reason should be found out. When the value exceeds ±5%, the reason should be found out. When the value exceeds ±5%, the reason should be found out. When the value exceeds ±5%, the reason should be found out. When the value exceeds ±5%, the reason should be found out. | | | | |
| 3 | 交流耐压试验 AC withstand voltage test  AC withstand voltage test | ⑴交接时  (1) At the time of handover (1) At handover  ⑵大修后  ⑵ After overhaul (2) After major repair  ⑶必要时  (3) When necessary 3. When necessary | 试验电压值为岀厂值的 85% The test voltage value is 85% of the factory value  The test voltage value is 85% of the factory value | | | | | 35kV 及以下纯瓷穿墙套管可随母线绝缘子一起耐压。 Pure ceramic through-wall bushings of 35kV and below can withstand voltage together with bus insulators.  Pure porcelain through-wall bushings of 35kV and below can withstand voltage together with bus insulators. |

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 4 | Partial discharge measurement of capacitive bushings of 66 kV and above  66kV 及以上电容型套管的局部放电测量  Partial discharge measurement of 66kV and above capacitive bushing | (1) At handover  ⑴交接时  (1) At the time of handover (2) After major repair  ⑵大修后  ⑵ After overhaul 3. When necessary  ⑶必要时  (3) When necessary | ⑴变压器及电抗器套管的试验电压为 1.5Um/√3；  (1) The test voltage of transformer and reactor bushing is 1.5 Um/tick 3; (1) The test voltage of transformer and reactor bushing is 1.5Um/√3; (1) The test voltage of transformer and reactor bushing is 1.5Um/√3; (1) The test voltage of transformer and reactor bushing is 1.5Um/√3; (1) The test voltage of transformer and reactor bushing is 1.5Um/√3;  ⑵其它套管的试验电压为 1.05Um/√3；  ⑵ The test voltage of other bushings is 1.05 Um/tick 3; (2) The test voltage of other bushings is 1.05Um/√3; (2) The test voltage of other bushings is 1.05Um/√3; (2) The test voltage of other bushings is 1.05Um/√3; (2) The test voltage of other bushings is 1.05Um/√3;  ⑶在试验电压下局部放电值(pC)不大于：  (3) Partial discharge value (pC) at test voltage is not greater than: (3) The partial discharge value (pC) at the test voltage shall not be greater than: (3) The partial discharge value (pC) at the test voltage shall not be greater than: (3) The partial discharge value (pC) at the test voltage shall not be greater than: (3) The partial discharge value (pC) at the test voltage shall not be greater than: | | | | The test of this project should be carried out before the casing installed vertically is stored horizontally for more than 1 year and is put into operation.  垂直安装的套管水平存放 1 年以上投运前宜进行本项目试验。  The test of this project should be carried out before the casing installed vertically is stored horizontally for more than one year and put into operation. |
|  | 油纸电容型  Oil-paper capacitive type Oil-paper capacitive type | 胶纸电容型  Adhesive paper capacitive type Adhesive tape capacitive type |  |
| 新装或大修后  Newly installed or overhauled After new installation or major repair | 10 | 250(100) |
| 运行中  In operation in the operation of | 20 | 600 |
|  | | | |
| 注：1.充油套管指以油作为主绝缘的套管；  Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation; Note: 1. Oil-filled casing refers to casing with oil as main insulation;   1. 油纸电容型套管指以油纸电容芯为主绝缘的套管；   Oil-paper capacitive sleeve refers to the sleeve with oil-paper capacitive core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation; Oil-paper capacitor bushing refers to a bushing with oil-paper capacitor core as the main insulation;   1. 充胶套管指以胶为主绝缘的套管；   Glue-filled sleeve refers to the sleeve with glue as the main insulation; Glue filled sleeve refers to a sleeve mainly insulated by glue; Glue filled sleeve refers to a sleeve mainly insulated by glue; Glue filled sleeve refers to a sleeve mainly insulated by glue; Glue filled sleeve refers to a sleeve mainly insulated by glue; Glue filled sleeve refers to a sleeve mainly insulated by glue; Glue filled sleeve refers to a sleeve mainly insulated by glue; Glue filled sleeve refers to a sleeve mainly insulated by glue; Glue filled sleeve refers to a sleeve mainly insulated by glue;   1. 胶纸电容型套管指以胶纸电容芯为主绝缘的套管；   Gummed paper capacitive sleeve refers to the sleeve with gummed paper capacitive core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation; Adhesive tape capacitive bushing refers to a bushing with adhesive tape capacitor core as the main insulation;   1. 胶纸型套管指以胶纸为主绝缘与外绝缘的套管(如一般室内无瓷套胶纸套管)。   Gummed paper type casing refers to the casing with gummed paper as the main insulation and external insulation (such as general indoor gummed paper casing without porcelain sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). Adhesive tape type sleeve refers to a sleeve that is mainly insulated by adhesive tape and externally insulated (such as general indoor non-porcelain covered adhesive tape sleeve). | | | | | | | |

1. 集合电容器的试验项目、周期和要求。

Test items, cycle and requirements of collective capacitors.  
Test items, cycles and requirements for collecting capacitors.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商  The recommended cycle is as follows (or by equipment manufacturer Recommended cycles are as follows (or by equipment manufacturer  建议的时间周期）  Recommended time period) Recommended time period) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | 极对壳绝缘电阻 Pole-to-shell insulation resistance  Pole-to-shell insulation resistance | ⑴投运后 1 年内  (1) Within 1 year after putting into operation (1) Within 1 year after commissioning  ⑵6 年一次  (2) Once every six years (2) Once every 6 years  ⑶必要时  (3) When necessary 3. When necessary | 不低于 2000MΩ。 Not less than 2000MΩ.  Not less than 2000M Ω. | ⑴串联电容器用 1000V 兆欧表，其他用 2500V 兆欧表；  (1) 1000V Megohmmeter is used for series capacitors and 2500V Megohmmeter is used for others; (1) Use a 1000V megohmmeter for series capacitors, and use a 2500V megohmmeter for others;  ⑵单套管电容器不测。  ⑵ Single bushing capacitor accident. (2) The single bushing capacitor is unexpected. |
| 2 | capacitance value  电容值  Capacitance value | ⑴投运后 1 年内 (1) Within 1 year after commissioning  (1) Within 1 year after putting into operation  ⑵6 年一次 (2) Once every 6 years  (2) Once every six years  ⑶必要时 3. When necessary  (3) When necessary | ⑴电压值偏差不超出额定值的-5% (1) The deviation of voltage value shall not exceed-5% of the rated value  Voltage deviation not exceeding-5% of rated value  〜+10%范围； ~+10% range;  ~ +10% range;  ⑵电容值不应小于出厂值的 95%。 (2) The capacitance value should not be less than 95% of the factory value.  ⑵ The capacitance value shall not be less than 95% of the factory value. | Measure by bridge method or current-voltage method.  用电桥法或电流电压法測量。  Measure by bridge method or current and voltage method. |

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| --- | --- | --- | --- | --- |
| 3 | Parallel resistance measurement  并联电阻值测量  Parallel resistance measurement | ⑴投运后 1 年内 (1) Within 1 year after commissioning  (1) Within 1 year after putting into operation  ⑵6 年一次 (2) Once every 6 years  (2) Once every six years  ⑶必要时 3. When necessary  (3) When necessary | 电阻值与出厂值的偏差应在±10%范围内。 The deviation between the resistance value and the factory value should be within ±10%.  The deviation between resistance value and factory value should be within 10%. | Measure by self-discharge method.  用自放电法测量。  Measured by self-discharge method. |

1. 金属氧化物避雷器的试验项目、周期和要求。

Test items, cycles and requirements of metal oxide arresters.  
Test items, cycles and requirements for metal oxide lightning arresters.

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| --- | --- | --- | --- | --- |
| 序号  Serial number serial number | 项目  Project project | 建议周期如下（或按设备生产厂商建  The recommended cycle is as follows (or according to the equipment manufacturer) The recommended cycle is as follows (or according to the equipment manufacturer  议的时间周期）  Time period of discussion) Time period of discussion) | 要求  Requirements requirements | 说明  Description description |
| 1 | 绝缘电阻 insulation resistance  Insulation resistance | ⑴牵引变电所避雷器：雷雨季前一次 (1) Lightning arrester of traction substation: one before the rainy season  (1) Lightning arrester of traction substation: once before thunderstorm season  ⑵必要时 (2) When necessary  ⑵ When necessary | ⑴35kV 以上，不低于 2500MΩ；  (1) More than 35kV, not less than 2500 M Ω; (1) Above 35kV, no less than 2500 M Ω;  ⑵35kV 以下，不低于 1000MΩ0  (2) Below 35kV and not less than 1000M Ω 0 (2) Below 35kV, no less than 1000MΩ0 | ⑴釆用 2500V 及以上兆殴表； (1) Adopt a megameter of 2500V and above;  (1) Use mega-meter of 2500V and above;  ⑵必要时：怀疑有缺陷时。 (2) When necessary: When a defect is suspected.  ⑵ When necessary: when defects are suspected. |
| 2 | DC voltage of 1mA (U1mA) and leakage current at 0.75U1mA  直流 1mA 电压(U1mA)及 0.75U1mA 下的泄漏电流  Leakage current at 1mA DC voltage (U1mA) and 0.75 U1mA | (1) Before the rainy season  ⑴雷雨季前一次  1. One before the thunderstorm season (2) When necessary  ⑵必要时  ⑵ When necessary | (1）U1mA 实测值与初始值或制造厂规定值比较，变化不应大于±5%； (2)0.75U1mA 下的泄漏电流不应大于 50µA。 (1) Compared with the initial value or the manufacturer's specified value, the change should not be more than ±5%; (2) The leakage current at 0.75U1mA should not be more than 50µA.  (1) The measured value of U1mA shall not change by more than 5% compared with the initial value or the value specified by the manufacturer; (2) The leakage current at 0.75 U1mA shall not be greater than 50 μ A. | ⑴要记录试验时的环境温度和相对湿度；  (1) To record the ambient temperature and relative humidity during the test; (1) Record the ambient temperature and relative humidity during the test;  ⑵测量电流的导线应使用屏蔽线；  ⑵ Shielded wires should be used for measuring current; (2) Shielded wires should be used for measuring current;  ⑶初始值系指交接试验或投产试验时的测量值。  Initial value refers to the measured value during handover test or commissioning test. (3) Initial value refers to the measured value during handover test or commissioning test. |
|  |  |  | 测量运行电压下的全电流、阻性电流或 Measure full current, resistive current or  Measure the total current, resistive current or | ⑴应记录测量时的环境温度、相对湿度和运行电压，测量宜在瓷套表面干燥时进行，应注意相间干扰的影响；  (1) The ambient temperature, relative humidity and operating voltage during measurement should be recorded. The measurement should be carried out when the surface of porcelain sleeve is dry, and attention should be paid to the influence of interphase interference; (1) The ambient temperature, relative humidity and operating voltage during measurement should be recorded. The measurement should be carried out when the surface of the porcelain sleeve is dry, and attention should be paid to the influence of interphase interference; (1) The ambient temperature, relative humidity and operating voltage during measurement should be recorded. The measurement should be carried out when the surface of the porcelain sleeve is dry, and attention should be paid to the influence of interphase interference; (1) The ambient temperature, relative humidity and operating voltage during measurement should be recorded. The measurement should be carried out when the surface of the porcelain sleeve is dry, and attention should be paid to the influence of interphase interference; (1) The ambient temperature, relative humidity and operating voltage during measurement should be recorded. The measurement should be carried out when the surface of the porcelain sleeve is dry, and attention should be paid to the influence of interphase interference; (1) The ambient temperature, relative humidity and operating voltage during measurement should be recorded. The measurement should be carried out when the surface of the porcelain sleeve is dry, and attention should be paid to the influence of interphase interference;  ⑵避雷器(放电计数器)带有全电流在线检测装置的不能代替本项目试验，应定期记录读数，发现异常应及时进行阻性电流测试。  ⑵ The arrester (discharge counter) with full current online detection device cannot replace the test of this project, and the readings should be recorded regularly. If any abnormality is found, the resistive current test should be carried out in time. (2) Lightning arresters (discharge counters) equipped with full-current online detection devices cannot replace the test of this project. Readings should be recorded regularly, and resistive current testing should be carried out in time if abnormalities are found. (2) Lightning arresters (discharge counters) equipped with full-current online detection devices cannot replace the test of this project. Readings should be recorded regularly, and resistive current testing should be carried out in time if abnormalities are found. (2) Lightning arresters (discharge counters) equipped with full-current online detection devices cannot replace the test of this project. Readings should be recorded regularly, and resistive current testing should be carried out in time if abnormalities are found. (2) Lightning arresters (discharge counters) equipped with full-current online detection devices cannot replace the test of this project. Readings should be recorded regularly, and resistive current testing should be carried out in time if abnormalities are found. (2) Lightning arresters (discharge counters) equipped with full-current online detection devices cannot replace the test of this project. Readings should be recorded regularly, and resistive current testing should be carried out in time if abnormalities are found. |
|  |  | ⑴新投运的 110kV 及以上者投 运 3 个  (1) Three newly put into operation 110kV and above (1) Three newly put into operation of 110kV and above are put into operation | 功率损耗，测量值与初始值比较，有明  Power loss, comparison between measured value and initial value, clear Power loss, comparison between measured value and initial value, clear |
| 3 | 运行电压下的交流泄漏电流 AC leakage current at operating voltage  AC Leakage Current at Operating Voltage | 月后测量 1 次；以后每半年 1 次；运  Measure once after a month; Once every six months thereafter; transport Measure once after month; once every six months thereafter; transport  行一年后，每年雷雨季节前 1 次  Once a year after the trip, before the thunderstorm season every year After one year, it will be the first time in the thunderstorm season every year | 显变化时应加强监测，当阻性电流增加  Monitoring should be strengthened when there is obvious change, and when the resistive current increases, Monitoring should be strengthened when there is a significant change, and when the resistive current increases  50%时应该分析原因，加强监测、适当缩  At 50%, the reasons should be analyzed, monitoring should be strengthened, and appropriate shrinkage should be made At 50% of the time, the cause should be analyzed, monitoring should be strengthened, and appropriate reduction should be made. |
|  |  | ⑵必要时  ⑵ When necessary (2) When necessary | 短检测周期；当阻性电流增加 1 倍时，  Short detection period; When the resistive current is doubled, Short detection period; when the resistive current is doubled, |
|  |  |  | 应停电检査。  Check the power outage. Power outage should be conducted for inspection. |

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 4 | Power frequency reference voltage under power frequency reference current  工频参考电流下的工频参考电压  Power frequency reference voltage under power frequency reference current | if necessary  必要时  When necessary | Should comply with the manufacturer's regulations.  应符合制造厂规定。  Should comply with the manufacturer's regulations. | （1）测量环境温度 20±15℃；  (1) Measure the ambient temperature at 20 15 ℃; (1) Measure the ambient temperature at 20±15℃;  （2）测量应每节单独进行，整相避雷器有一节不合格，应更换该节避雷器(或整相更换)，使该相避雷器为合格。  (2) The measurement should be carried out separately in each section. If one section of the phase-aligning arrester is unqualified, the arrester should be replaced (or phase-aligning replacement) to make the phase-aligning arrester qualified. (2) Measurement should be carried out separately for each section. If one section of the whole phase arrester fails, the section of arrester should be replaced (or the whole phase shall be replaced) to make the arrester of the phase qualified. |
| 5 | 底座绝缘电阻 base insulation resistance  Base insulation resistance | ⑴牵引变电所避雷器每年雷雨季前  1. Lightning arrester of traction substation before thunderstorm season every year (1) Traction substation lightning arrester before the annual thunderstorm season  ⑵1〜3 年一次  (2) Once every 1 ~ 3 years (2) Once every 1 to 3 years  ⑶必要时  (3) When necessary 3. When necessary | 自行规定。 Make your own regulations.  Self-regulation. | 釆用 2500V 及以上兆欧表。 Use a megohmmeter of 2500V and above.  Megohms of 2500V and above are used. |
| 6 | Check the action of the discharge counter  检查放电计数器动作情况  Check the action of the discharge counter | ⑴牵引变电所避雷器每年雷雨季前  1. Lightning arrester of traction substation before thunderstorm season every year (1) Traction substation lightning arrester before the annual thunderstorm season  ⑵1〜3 年一次  (2) Once every 1 ~ 3 years (2) Once every 1 to 3 years  ⑶必要时  (3) When necessary 3. When necessary | 测试 3〜5 次，均应正常动作，测试后计数器指示应调到“0”。 Test for 3 to 5 times, and it should operate normally. After the test, the counter indication should be adjusted to "0".  After testing for 3 ~ 5 times, all of them should act normally. After testing, the counter indication should be adjusted to "0". |  |
| 注：每年定期进行运行电压下全电流及阻性电流带电测量的，对序号 1、2、5、6 的项目可不做定期试验。  Note: If the live measurement of full current and resistive current under operating voltage is carried out regularly every year, the items with serial numbers 1, 2, 5 and 6 may not be tested regularly. Note: If live measurement of full current and resistive current under operating voltage is carried out regularly every year, regular tests may not be carried out for items with serial numbers 1, 2, 5, and 6. Note: If live measurement of full current and resistive current under operating voltage is carried out regularly every year, regular tests may not be carried out for items with serial numbers 1, 2, 5, and 6. Note: If live measurement of full current and resistive current under operating voltage is carried out regularly every year, regular tests may not be carried out for items with serial numbers 1, 2, 5, and 6. Note: If live measurement of full current and resistive current under operating voltage is carried out regularly every year, regular tests may not be carried out for items with serial numbers 1, 2, 5, and 6. Note: If live measurement of full current and resistive current under operating voltage is carried out regularly every year, regular tests may not be carried out for items with serial numbers 1, 2, 5, and 6. | | | | |

1. 一般母线的试验项目、周期和要求。

Test items, cycle and requirements of general bus.  
Test items, cycles and requirements for general buses.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 序号  Serial number serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建  The recommended cycle is as follows (or according to the equipment manufacturer) The recommended cycle is as follows (or according to the equipment manufacturer  议的时间周期）  Time period of discussion) Time period of discussion) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | 绝缘电阻  Insulation resistance insulation resistance | ⑴大修后  After overhaul (1) After major repair  ⑵必要时  ⑵ When necessary (2) When necessary | ⑴不应低于 1MΩ/kV  Should not be less than 1M Ω/kV (1) Should not be less than 1MΩ/kV  ⑵35kV 及以下，不低于 1000MΩ  (2) 35kV and below, not less than 1000M Ω (2) 35kV and below, no less than 1000MΩ |  |

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| 2 | 交流耐压试验  AC withstand voltage test AC withstand voltage test | ⑴大修后  After overhaul (1) After major repair  ⑵必要时  ⑵ When necessary (2) When necessary |  |  |

1. 二次回路的试验项目、周期和要求。

Test items, cycle and requirements of secondary circuit.  
Test items, cycles and requirements for the secondary circuit.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |
| 1 | insulation resistance  绝缘电阻  Insulation resistance | (1) After major repair  ⑴大修后  After overhaul (2) Replace the secondary line  ⑵更换二次线  ⑵ Replace the secondary line | ⑴直流小母线和控制盘的电压小母线，在断开所有其他支联支路时不应小于 10MΩ； (1) Small DC bus and small voltage bus of the control panel shall not be less than 10MΩ when disconnecting all other branch branches;  (1) The DC small bus and the voltage small bus of the control panel shall not be less than 10 M Ω when disconnecting all other branches;  ⑵二次回路的每一支路和断路器、隔离开关、操作机构的电源回路不小于 10MΩ；在比较潮湿的地方允许降到 1MΩ。 (2) Each branch of the secondary circuit and the power circuit of the circuit breaker, isolating switch, and operating mechanism shall not be less than 10MΩ; it is allowed to drop to 1MΩ in relatively humid places.  ⑵ The power supply circuit of each branch of the secondary circuit, circuit breaker, isolating switch and operating mechanism shall not be less than 10 M Ω; It is allowed to drop to 1 M Ω in humid places. | Use a 500V or 1000V megohmmeter.  采用 500V 或 1000V 兆欧表。  Use 500V or 1000V megohmmeter. |
| 2 | AC withstand voltage test  交流耐压试验  AC withstand voltage test | (1) After major repair  ⑴大修后  After overhaul (2) Replace the secondary line  ⑵更换二次线  ⑵ Replace the secondary line | Test voltage is 1000 V  试验电压为 1000V  The test voltage is 1000V | ⑴不重要回路可用 2500V 兆欧表试验代替； (1) Non-important circuits can be replaced by 2500V megohmmeter test;  (1) The unimportant circuit can be replaced by 2500V megohmmeter test;  ⑵48V 及以下回路不做交流耐压试验； (2) No AC withstand voltage test shall be conducted for circuits below 48V;  (2) AC withstand voltage test is not done for circuits below 48V;  ⑶带有电子元件的回路试验时应将其取出或两端短接。 (3) When testing a loop with electronic components, it should be taken out or both ends should be shorted.  (3) When testing the circuit with electronic components, it should be taken out or shorted at both ends. |

1. 配电装置和电力布线的试验项目、周期和要求。

Test items, cycles and requirements of distribution equipment and power wiring.  
Test items, cycles and requirements for power distribution equipment and power wiring.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |

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| 1 | insulation resistance  绝缘电阻  Insulation resistance | After equipment overhaul  设备大修后  After equipment overhaul, | ⑴配电装置的每一段绝缘电阻不应小于0.5MΩ；  (1) The insulation resistance of each section of power distribution equipment shall not be less than 0.5 M Ω; (1) The insulation resistance of each section of power distribution equipment shall not be less than 0.5MΩ;  ⑵电力布线绝缘电阻一般不小于 0.5MΩo  ⑵ The insulation resistance of power wiring is generally not less than 0.5 M Ω o (2) The insulation resistance of power wiring is generally not less than 0.5MΩo | ⑴采用 1000V 兆欧表； (1) Use a 1000V megohmmeter;  1. 1000V Megohmmeter;  ⑵测量电力布线绝缘电阻时应将断断器、用电设备、电器及仪表等断开。 (2) When measuring the insulation resistance of power wiring, disconnect the interrupters, electrical equipment, electrical appliances and instruments.  ⑵ When measuring the insulation resistance of power wiring, the breaker, electrical equipment, electrical appliances and instruments shall be disconnected. |
| 2 | AC withstand voltage test for distribution equipment  配电装置的交流耐压试验  AC withstand voltage test of distribution equipment | After equipment overhaul  设备大修后  After equipment overhaul, | The test voltage is 1000 V.  试验电压为 1000V。  The test voltage is 1000V. | ⑴配电装置耐压为各相对地，48V 及以下配电装置不做交流耐压试验；  (1) The withstand voltage of distribution equipment is opposite to ground, and AC withstand voltage test is not done for distribution equipment with 48V and below; (1) The withstand voltage of distribution equipment is relative to the ground, and the AC withstand voltage test is not carried out for distribution equipment of 48V and below;  ⑵可用 2500V 兆欧表试验代替；  ⑵ It can be replaced by 2500V megohmmeter test; (2) It can be replaced by a 2500V megohmmeter test;  ⑶带有电子元件的回路，试验时应将其取出或两端短接。  (3) For circuits with electronic components, they should be taken out or shorted at both ends during test. (3) For circuits with electronic components, they should be taken out or both ends should be shorted during testing. |
| 3 | 检査相位  Check phase Check phase | 更动设备或接线时  When changing equipment or wiring, When changing equipment or wiring | 各相两端及其连接回路的相位应一致  The phases of both ends of each phase and their connecting circuits should be consistent The phases of both ends of each phase and its connected loop shall be consistent |  |

1. 接地装置的试验项目、周期和要求。

Test items, cycle and requirements of grounding device.  
Test items, cycles and requirements for grounding devices.

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| 序号 serial number  Serial number | 项目 project  Project | 建议周期如下（或按设备生产厂商建议的时间周期）  The recommended period is as follows (or according to the time period recommended by the equipment manufacturer) The recommended cycle is as follows (or as recommended by the equipment manufacturer) | 要求 requirements  Requirements | 说明 description  Description |

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| 1 | Grounding resistance of power equipment effectively grounded to the system  有效接地系统的电力设备的接地电阻  Grounding resistance of power equipment in effective grounding system | (1) No more than 6 years  (2) The period can be extended or shortened as appropriate based on the results of the excavation inspection of the grounding grid  ⑴不超过 6 年  1. No more than 6 years  ⑵可以根据该接地网挖开检查的结果斟酌延长或缩短周期  ⑵ The period can be prolonged or shortened according to the results of excavation and inspection of the grounding grid | 应符合以下要求：  The following requirements shall be met:  （1）R≤2000/I Ω  （2）当 I≥4000A 时可取 R≤0.5Ω。  (2) When I ≥ 4000A, R ≤ 0.5 Ω is desirable.  式中 I——经接地网流入地中的短路电流， A；R——考虑到季节变化的最大接地电阻， Ω。  Where I-the short-circuit current flowing into the ground through the grounding grid, A; R--Maximum grounding resistance taking into account seasonal variations, Ω. | ⑴测量接地电阻时，如在必须的最小布极范围内土壤电阻率基本均匀，可采用各种补偿，否则应，采用远离法；  (1) When measuring grounding resistance, if the soil resistivity is basically uniform within the necessary minimum pole distribution range, various compensations can be adopted; Otherwise, the far-away method should be adopted; (1) When measuring the grounding resistance, if the soil resistivity is basically uniform within the necessary minimum range of electrode distribution, various compensation can be used; otherwise, the distance method should be used;  ⑵在高土壤电阻率地区，接地电阻如按规定值要求，在技术经济上极不合理时，允许有较大的数值，但必须釆取措施以保证发生接地短路时，在该接地网上：  ⑵ In areas with high soil resistivity, if the grounding resistance is extremely unreasonable in technology and economy according to the specified value requirements, it is allowed to have a larger value, but measures must be taken to ensure that when grounding short circuit occurs, in the grounding grid: (2) In areas with high soil resistivity, if the grounding resistance meets the specified value requirements and is extremely unreasonable technically and economically, a large value is allowed. However, measures must be taken to ensure that when a grounding short circuit occurs, on the grounding network:   1. 接触电压和跨步电压均不超过允许的数值；   The contact voltage and step voltage shall not exceed the allowable value; Neither the contact voltage nor the step voltage exceeds the allowable values;   1. 不发生高压位引外和低电位引内；   There is no high-voltage potential leading outside and low-potential leading inside; No high-voltage potential leads to the outside and low potential leads to the inside;   1. 3-10kV 阀式避雷器不动作；   3-10kV valve arrester does not operate; 3-10kV valve arrester does not operate;  ⑶每 3 年以及必要时验算一次 I 值，并校验设备接地引下线的热稳定。  (3) Check the I value every 3 years and if necessary, and verify the thermal stability of the grounding down lead of the equipment. (3) Check the I value every 3 years and if necessary, and verify the thermal stability of the equipment grounding down lead. |
| 2 | Grounding resistance of power equipment in non-effectively grounded systems  非有效接地系统的电力设备的接地电阻  Grounding resistance of power equipment in non-effectively grounded system | (1) No more than six years  ⑴不超过六年 (2) The period can be extended or shortened as appropriate based on the results of the excavation inspection of the grounding grid  (1) No more than six years  ⑵可以根据该接地网挖开检查的结果斟酌延长或缩短周期  ⑵ The period can be prolonged or shortened according to the results of excavation and inspection of the grounding grid | ⑴当接地网与 1kV 及以下设备共用接地时，接地电阻 R≤120/I；  (1) When the grounding grid is grounded with equipment of 1kV and below, the grounding resistance R ≤ 120/I; (1) When the grounding network shares grounding with equipment below 1kV, the grounding resistance R≤120/I;  ⑵当接地网仅用于 1kV 以上设备时,接地电阻R≤250/I；  ⑵ When the grounding grid is only used for equipment above 1kV, the grounding resistance R ≤ 250/I; (2) When the grounding grid is only used for equipment above 1kV, the grounding resistance R≤250/I;  ⑶在上述任一情况下，接地电阻一般不得大于10Ω  In either case, the grounding resistance shall generally not be greater than 10 Ω (3) In any of the above cases, the grounding resistance shall generally not exceed 10Ω  式中 I—经接地网流入地中的短路电流，A R—考虑到季节变化最大接地电阻，Ω。  Where I-the short-circuit current flowing into the ground through the grounding grid, A R-the maximum grounding resistance taking into account seasonal changes, Ω. Where I-the short-circuit current flowing into the ground through the grounding grid, and AR-the maximum grounding resistance taking into account seasonal changes, Ω. |  |

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| 3 | 独立避雷针（线）的接地电阻 Ground resistance of independent lightning rod (wire)  Grounding resistance of independent lightning rod (wire) | No more than 6 years  不超过 6 年  No more than 6 years | Should not be greater than 10Ω  不宜大于 10Ω  Should not be greater than 10 Ω | 在高土壤电阻率地区难以将接地电阻降到 10Ω时，允许有较大的数值，但应符合防止避雷针（线）对罐体及管阀等反击的要求。  When it is difficult to reduce the grounding resistance to 10 Ω in areas with high soil resistivity, it is allowed to have a larger value, but it should meet the requirements of preventing lightning rod (wire) from counterattacking the tank body and pipe valve. When it is difficult to reduce the ground resistance to 10Ω in areas with high soil resistivity, a larger value is allowed, but it should meet the requirements of preventing lightning rods (wires) from striking back against tanks, pipes and valves, etc. |
| 4 | 检査有效接地系统的电力设备接引下线与接地网的连接情况 Check the connection between the power equipment connection line of the effective grounding system and the grounding network  Check the connection between the down lead and the grounding grid of the power equipment of the effective grounding system | not exceeding 3 years  不超过 3 年  No more than 3 years | There must be no breaking, loosening or serious corrosion.  不得有开断、松脱或严重腐蚀等现象。  There shall be no breaking, loosening or serious corrosion. | 如采用测量接地引下线与接地网（或相邻设备）之间的电阻来检査其连接情况，可将所测的数据与历次数据比较和相互要求，通过分析决定是否进行挖开检査。  If the connection is checked by measuring the resistance between the grounding down lead and the grounding grid (or adjacent equipment), the measured data can be compared with previous data and asked for each other, and whether to carry out excavation inspection can be decided through analysis. If measuring the resistance between the grounded down conductor and the grounding grid (or adjacent equipment) is used to check the connection, the measured data can be compared with previous data and required each other, and through analysis, decide whether to conduct excavation inspection. |
| 5 | Sample excavation to inspect the corrosion of the grounding grid  抽样开挖检查接地网的腐蚀情况  Sampling excavation to check the corrosion of grounding grid | ⑴本项目只限于已经运行 10 年以上（包括改造后重新运行达到这个年限）的接地网  This project is limited to grounding grids that have been in operation for more than 10 years (including re-operation after transformation to reach this age) (1) This project is limited to grounding grids that have been in operation for more than 10 years (including re-operation after renovation to reach this period)  ⑵以后的检查年限可根据前次开挖检査的结果自行决定  ⑵ The future inspection period can be decided by itself according to the results of previous excavation inspection (2) Future inspection years can be determined based on the results of the previous excavation inspection | There must be no breaking, loosening or serious corrosion.  不得有开断，松脱或严重腐蚀现象。  There shall be no breaking, loosening or serious corrosion. | 可根据电气设备的重要性和施工的安全性，选 5-8 个点沿接地引下线进行开挖检査，如有疑问还应扩大开挖的范围。 According to the importance of electrical equipment and construction safety, 5-8 points can be selected for excavation inspection along the grounding down lead. If there are any doubts, the scope of excavation should be expanded.  According to the importance of electrical equipment and the safety of construction, 5-8 points can be selected for excavation inspection along the grounding down lead, and the excavation scope should be expanded if in doubt. |

1. 电容式电压互感器的电容分压器的试验项目、周期和要求。

Test items, periods and requirements of capacitive voltage dividers for capacitive voltage transformers.  
Test items, cycles and requirements for capacitive voltage dividers of capacitive voltage transformers.

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| serial number  序号  Serial number | project  项目  Project | 建议周期如下（或按设备生产厂商建议的时间  The recommended period is as follows (or according to the time recommended by the equipment manufacturer The recommended cycle is as follows (or as recommended by the equipment manufacturer  周期）  Cycle) cycle) | 要求 requirements  Requirements  求 please  seek | description  说明  Description |
| 1 | 极间绝缘电阻  Interelectrode insulation resistance interelectrode insulation resistance | ⑴投运后 1 年内  (1) Within 1 year after putting into operation (1) Within 1 year after commissioning  ⑵1〜3 年  (2) 13 ~ 3 years (2) 1 to 3 years | 一般不低于 5000MΩ。  Generally not less than 5000M Ω. Generally no less than 5000MΩ. | 用 2500V 兆欧表。  Use a 2500V megohmmeter. Use a 2500V megohmmeter. |

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| --- | --- | --- | --- | --- |
| 2 | capacitance value  电容值  Capacitance value | ⑴投运后 1 年内 (1) Within 1 year after commissioning  (1) Within 1 year after putting into operation  ⑵1〜3 年 (2) 1 to 3 years  (2) 13 ~ 3 years | ⑴每节电容值偏差不超出额定值的-5%〜+10%范围  1. The deviation of capacitance value of each section shall not exceed the range of-5% ~ +10% of the rated value (1) The deviation of capacitance value of each section shall not exceed the range of-5%~+10% of the rated value  ⑵电容值大于出厂值的 102%时应缩短试验周期；  ⑵ When the capacitance value is greater than 102% of the factory value, the test period should be shortened; (2) When the capacitance value is greater than 102% of the factory value, the test cycle should be shortened;  ⑶一相中任两节实测电容值相差不超过 5%。  (3) The difference between the measured capacitance values of any two sections in a phase shall not exceed 5%. (3) The difference in measured capacitance values of any two sections in one phase shall not exceed 5%. | 当釆用电磁单元作为电源测量电容式电压互感器的电容分压器 C1 和 C2 的电容量及 tan δ时，应按制造厂规定进行。 When using an electromagnetic unit as a power supply to measure the capacitance and tan δ of the capacitive voltage dividers C1 and C2 of the capacitive voltage transformer, it should be carried out in accordance with the manufacturer's regulations.  When measuring capacitance and tan δ of capacitive voltage dividers C1 and C2 of capacitive voltage transformers using electromagnetic units as power supply, the measurement shall be carried out according to the manufacturer's regulations. |
| 3 | tanδ | (1) Within 1 year after commissioning  ⑴投运后 1 年内  (1) Within 1 year after putting into operation (2) 1 to 3 years  ⑵1〜3 年  (2) 13 ~ 3 years | 10kV 下的 tanδ值不大于下列数值：油纸绝缘 0.005  The tan δ value at 10kV is not greater than the following values: oil-paper insulation 0.005 The tanδ value at 10kV shall not be greater than the following values: oil-paper insulation 0.005  膜纸复合绝缘 0.002  Film-paper composite insulation 0.002 Film and paper composite insulation 0.002 | ⑴当 tanδ值不符合要求时，可在额定电压下复测，复测值如符合 10kV 下的要求，可继续投运；  (1) When tan δ value does not meet the requirements, it can be re-measured under rated voltage. If the re-measured value meets the requirements under 10kV, it can continue to be put into operation; (1) When the tanδ value does not meet the requirements, it can be re-measured at the rated voltage. If the re-measured value meets the requirements under 10kV, it can continue to be put into operation;  ⑵电容式电压互感器低压电容的试验电压值  ⑵ Test voltage value of low voltage capacitor of capacitive voltage transformer (2) Test voltage value of low-voltage capacitor of capacitive voltage transformer  自定。  Custom. Decide. |
| 4 | 低压端对地绝缘电 阻 Low-voltage terminal ground insulation resistance  Insulation resistance of low voltage terminal to ground | 1〜3 年  13-3 years 1 to 3 years | 一般不低于 100MΩ Generally not less than 100MΩ  Generally not less than 100 M Ω | 采用 1000V 兆欧表 Adopt 1000V megohmmeter  Adopt 1000V Megohm meter |
| 5 | 局部放电试验 partial discharge test  Partial discharge test | 必要时 if necessary  When necessary | 预加电压 0.8×l.3Um,持续时间不小于 10s, 然后在测量电压 1.1Um/√3 下保持 1min,局部放电量一般不大于 10pC。  The pre-applied voltage is 0.8 × l.3 Um, the duration is not less than 10s, and then it is maintained at the measured voltage of 1.1 Um/⑤ 3 for 1min, and the local discharge is generally not more than 10pC. Pre-apply a voltage of 0.8 × l.3Um for a duration of not less than 10 s, and then hold for 1 minute at the measured voltage of 1.1Um/√ 3. The partial discharge is generally no more than 10pC. | 如受试验设备限制预加电压可以适当降低。 If limited by test equipment, the preload voltage can be appropriately reduced.  If limited by the test equipment, the pre-applied voltage can be appropriately reduced. |
| 6 | 工频交流耐压试验 Power frequency AC withstand voltage test  Power frequency AC withstand voltage test | 必要时 if necessary  When necessary | 试验电压为出厂试验电压的 0.8 倍 The test voltage is 0.8 times the factory test voltage  The test voltage is 0.8 times of the factory test voltage |  |

第三部分 接触网运行维修管理

The third part is the operation and maintenance management of catenary  
Part 3 Operation and Maintenance Management of OCS

第一章 一般规定

Chapter I General Provisions  
Chapter 1 General Provisions

1. 接触网运行维修是通过对设备定期检测、分析诊断、质量评价和鉴定，并依据结果实施修理，恢复设备正常运行状态的循环管理过程。主要包括运行、检测、维修等管理工作。

OCS operation and maintenance is a cycle management process through regular inspection, analysis and diagnosis, quality evaluation and appraisal of equipment, and repair according to the results, so as to restore the normal operation state of equipment. Mainly includes operation, testing, maintenance and other management work.  
OCS operation and maintenance is a cyclic management process that restores the normal operating state of the equipment through regular inspection, analysis and diagnosis, quality evaluation and appraisal of the equipment, and implements repairs based on the results. It mainly includes management work such as operation, testing, and maintenance.

1. 基础设施维护公司应设置接触网运行、检测、维修管理机构，配齐相关机具和材料，建立健全技术资料，实行维修成本预算管理，制定设备抢修预案及相关管理制度，不断提高接触网运行管理水平。

Infrastructure maintenance companies should set up catenary operation, inspection and maintenance management institutions, complete relevant machines and materials, establish and improve technical data, implement maintenance cost budget management, formulate equipment emergency repair plans and related management systems, and continuously improve catenary operation management level.  
Infrastructure maintenance companies should set up overhead contact line operation, testing, and maintenance management institutions, equip relevant machines and materials, establish and improve technical data, implement maintenance cost budget management, formulate equipment emergency repair plans and related management systems, and continuously improve the level of overhead contact line operation and management.

1. 接触网设备应充分利用铁路供电安全检测监测系统（6C 系统）等手段，定期进行检测，开展即时、定期分析诊断， 按照标准值、警示值、限界值界定设备状态，划分缺陷等级（两级缺陷），为设备维修提供依据。

Catenary equipment should make full use of railway power supply safety inspection and monitoring system (6C system) and other means, carry out regular inspection, carry out immediate and regular analysis and diagnosis, define equipment status according to standard value, warning value and limit value, and divide defect grade (two-level defect), so as to provide basis for equipment maintenance.  
OCS equipment should make full use of the railway power supply safety inspection and monitoring system (6C system) and other means to conduct regular inspections, carry out immediate and regular analysis and diagnosis, define the equipment status according to standard values, warning values, and limit values, and divide the defect level (two-level defect), providing a basis for equipment maintenance.

铁路供电安全检测监测系统（6C 系统）包括：弓网综合检测装置（1C）、接触网安全巡检装置（2C）、车载接触网运行状态检测装置（3C）、接触网悬挂状态检测监测装置（4C）、受电弓滑板监测装置（5C）和接触网及供电设备地面监测装置（6C）等。

The railway power supply safety detection and monitoring system (6C system) includes pantograph-catenary comprehensive detection device (1C), catenary safety inspection device (2C), vehicle-mounted catenary operation state detection device (3C), catenary suspension state detection and monitoring device (4C), pantograph slide plate monitoring device (5C) and catenary and power supply equipment ground monitoring device (6C), etc.  
The railway power supply safety inspection and monitoring system (6C system) includes: pantograph and catenary comprehensive inspection device (1C), catenary safety inspection device (2C), vehicle-mounted catenary operating status detection device (3C), catenary suspension status detection and monitoring device (4C), pantograph slide monitoring device (5C), and catenary and power supply equipment ground monitoring device (6C), etc.

1. 维修是指在接触网系统实际运行状态出现不允许的偏差或发生故障时，对接触网系统进行必要修复，以恢复接触网系统正常功能的过程。接触网维修分为一级修（临时修）、二级修（综合修）两级修程。

Maintenance refers to the process of repairing the catenary system in order to restore the normal function of the catenary system when the actual operation state of the catenary system has unacceptable deviation or fault. Catenary maintenance is divided into two levels: primary repair (temporary repair) and secondary repair (comprehensive repair).  
Maintenance refers to the process of carrying out necessary repairs to the catenary system to restore the normal function of the catenary system when there is an unacceptable deviation or failure in the actual operating status of the catenary system. OCS maintenance is divided into two levels: first-level maintenance (temporary maintenance) and second-level maintenance (comprehensive maintenance).

1. 达到或超出限界值的一级缺陷纳入一级修（临时修），由接触网运行组及时组织修理；达到或超出警示值且在限界值以内的二级缺陷纳入二级修（综合修），由接触网维修组按计划修理；标准状态是设备最佳运行状态，作为新线投运、大修改造质量验收的依据。

The first-class defects that reach or exceed the threshold value are included in the first-class repair (temporary repair), and the catenary operation group shall organize the repair in time; Secondary defects that reach or exceed the warning value and are within the limit value are included in the secondary repair (comprehensive repair), which is repaired by the catenary maintenance team as planned; Standard state is the best running state of equipment, which serves as the basis for quality acceptance of new line commissioning, overhaul and transformation.  
First-level defects that reach or exceed the limit value are included in first-level maintenance (temporary maintenance), and repairs will be organized by the catenary operation team in a timely manner; second-level defects that reach or exceed the warning value and are within the limit value are included in second-level maintenance (comprehensive maintenance), and repaired by the catenary maintenance team as planned; the standard state is the best operating state of the equipment, which serves as the basis for quality acceptance of new line commissioning, overhaul and transformation.

1. 基础设施维护公司应定期组织接触网动态运行质量评价和设备整体技术状态质量鉴定，不断提高接触网运行管理水平。

Infrastructure maintenance companies should regularly organize the dynamic operation quality evaluation of catenary and the overall technical status quality appraisal of equipment, and continuously improve the operation and management level of catenary.  
Infrastructure maintenance companies should regularly organize the dynamic operation quality evaluation of the catenary and the overall technical status quality appraisal of the equipment, and continuously improve the operation and management level of the catenary.

第二章 运行管理管理机构及职责

Chapter II Operation Management Organization and Responsibilities  
Chapter 2 Operation Management Institutions and Responsibilities

1. 接触网运行管理工作实行统一领导、分级管理的原则，充分发挥各级管理组织的作用。

The principle of unified leadership and hierarchical management shall be implemented in the operation and management of catenary, and the role of management organizations at all levels shall be brought into full play.  
The operation and management of the catenary shall implement the principles of unified leadership and hierarchical management, and give full play to the role of management organizations at all levels.

联营公司：负责全线接触网运营管理工作，确定运行维修方针、原则；制定、批准有关

Associated company: responsible for the operation and management of the whole catenary, and determining the operation and maintenance policies and principles; Formulate and approve relevant  
Joint venture company: responsible for the operation and management of the entire line of catenary, determining operation and maintenance policies and principles; formulating and approving relevant

标准、规范和规章；统一指导、规划接触网维修方式和手段；监督、检查基础设施维护公司接触网运行维修情况。

Standards, norms and regulations; Unified guidance and planning of catenary maintenance methods and means; Supervise and inspect the operation and maintenance of catenary in infrastructure maintenance company.  
Standards, specifications and regulations; unify guidance and planning of catenary maintenance methods and means; supervise and inspect the operation and maintenance of catenary of infrastructure maintenance companies.

基础设施维护公司：贯彻执行联营公司有关规则、规范和标准；组织制定本单位有关标准、制度和办法；制定管理职责和范围；监督、 检查、指导、协调全线接触网运营管理工作；审批新产品试运行和重要设备变更；定期开展设备运行质量评价，安排更新改造工程，增强供电能力，改善设备技术状态，适应运输发展需要。

Infrastructure maintenance company: implement the relevant rules, norms and standards of affiliated companies; Organize the formulation of relevant standards, systems and methods of the unit; Formulate management responsibilities and scope; Supervise, inspect, guide and coordinate the operation and management of the whole catenary; Approve the trial operation of new products and changes of important equipment; Regularly carry out equipment operation quality evaluation, arrange renovation projects, enhance power supply capacity, improve equipment technical status, and meet the needs of transportation development.  
Infrastructure maintenance company: Implement relevant rules, specifications and standards of the associated company; organize the formulation of relevant standards, systems and methods of the unit; formulate management responsibilities and scope; supervise, inspect, guide and coordinate the operation and management of the entire line of contact network; approve new products Trial operation and changes to important equipment; regularly carry out equipment operation quality evaluation, arrange renewal and transformation projects, enhance power supply capabilities, improve equipment technical status, and adapt to the needs of transportation development.

维修基地：贯彻执行上级有关规章、标准和制度；补充制定相关管理标准、工作标准；制定接触网作业指导书；制定生产计划并组织实施；定期检查、分析、鉴定设备运行状态，组织评比和考核；组织技术革新和职工培训，保证设备运行质量和安全可靠供电。

Maintenance base: implement the relevant regulations, standards and systems of higher authorities; Supplement and formulate relevant management standards and work standards; Formulate catenary operation instructions; Make production plan and organize its implementation; Regularly check, analyze and identify the running status of equipment, and organize appraisal and assessment; Organize technical innovation and staff training to ensure equipment operation quality and safe and reliable power supply.  
Maintenance base: Implement relevant rules, standards and systems of superiors; supplement and formulate relevant management standards and work standards; formulate catenary operation instructions; formulate production plans and organize implementation; regularly inspect, analyze, and identify equipment operating status, organize evaluations and assessments; Organize technological innovation and employee training to ensure equipment operation quality and safe and reliable power supply.

1. 维修基地供电队接触网运行组、接触网维修组的设置原则。

Setting principles of catenary operation group and catenary maintenance group of power supply team in maintenance base.  
Principles for setting up the catenary operation group and catenary maintenance group of the power supply team of the maintenance base.

接触网运行组管辖运营里程以 120～180km 为宜，枢纽地区宜单独设置。

The operating mileage under the jurisdiction of OCS operation group should be 120 ~ 180km, and the hub area should be set separately.  
The operating mileage under the jurisdiction of the catenary operation group should be 120 - 180 kilometers, and the hub area should be set up separately.

接触网维修组承担的全线维修，技术科接触网检测专员承担 6C 系统的运用、维护和数据分析等检测任务。

The OCS maintenance team undertakes the whole line maintenance, and the OCS inspection specialist of the technical department undertakes the inspection tasks such as the application, maintenance and data analysis of the 6C system.  
For the entire line of maintenance undertaken by the OCS maintenance team, the OCS inspection specialist of the Technical Section undertakes testing tasks such as the application, maintenance and data analysis of the 6C system.

1. 接触网运行组、接触网维修组主要职责：接触网运行组负责日常运行管理和应急处置，组织接触网一级修（临时修），巡视检查、单项检查、非常规检查、施工配合和应急处置等，对二级修（综合修）结果进行质量验收。

Main responsibilities of OCS operation group and OCS maintenance group: OCS operation group is responsible for daily operation management and emergency treatment, organizing primary repair (temporary repair), patrol inspection, single inspection, unconventional inspection, construction cooperation and emergency treatment of OCS, etc., and conducting quality acceptance of secondary repair (comprehensive repair) results.  
Main responsibilities of the OCS operation team and OCS maintenance team: The OCS operation team is responsible for daily operation management and emergency response, organizing the first-level repair (temporary repair) of the OCS, inspection, individual inspection, unconventional inspection, construction coordination and emergency response, etc., conduct quality acceptance of the results of the second-level repair (comprehensive repair).

接触网维修组负责接触网二级修（综合修）工作，按照月度维修计划，负责接触网设备全面检查、二级修（综合修）和专项整治，采用集中修方式组织实施。

The OCS maintenance team is responsible for the secondary repair (comprehensive repair) of OCS, and is responsible for the comprehensive inspection, secondary repair (comprehensive repair) and special rectification of OCS equipment according to the monthly maintenance plan, and organizes the implementation by means of centralized repair.  
The OCS maintenance team is responsible for the secondary repair (comprehensive repair) of the OCS. According to the monthly maintenance plan, it is responsible for the comprehensive inspection, secondary repair (comprehensive repair) and special rectification of the OCS equipment, and organizes and implements it in a centralized repair method.

技术科接触网检测专员负责 6C 系统综合数据处理中心工作，以及 6C 系统检测装置的维护、运用、管理和检测数据分析。铁路供电安全检测监测装置配置标准见附件 10。

OCS Inspection Specialist of Technical Section is responsible for the work of 6C System Integrated Data Processing Center, as well as the maintenance, operation, management and inspection data analysis of 6C System Inspection Devices. See Annex 10 for the configuration standard of railway power supply safety detection and monitoring device.  
The contact network inspection specialist of the Technical Section is responsible for the work of the 6C system comprehensive data processing center, as well as the maintenance, application, management and inspection data analysis of the 6C system inspection device. See Annex 10 for the configuration standards of railway power supply safety testing and monitoring devices.

设备接管

Equipment takeover  
device takeover

1. 接触网设备开通运行前，应按规定进行检查验收，符合下列条件方可接管运行：

Before the catenary equipment is put into operation, it shall be inspected and accepted according to regulations, and the operation can only be taken over if the following conditions are met:  
Before the catenary equipment is put into operation, inspection and acceptance shall be carried out according to regulations, and the following conditions can be met before it can be taken over:

1. 接触网设备经过验收具备送电开通条件；

The catenary equipment has the conditions for power transmission and opening after acceptance;  
The overhead contact network equipment has been accepted and meets the conditions for power transmission;

1. 危及供电安全的树木清理、35kV 以下跨越线迁改、侵限建筑物拆除均已完成，接触网设备已采取必要的防鸟措施；

The clearing of trees endangering the safety of power supply, the relocation of crossing lines below 35kV, and the demolition of buildings invading the limit have all been completed, and the catenary equipment has taken necessary bird prevention measures;  
The cleaning of trees that endanger power supply safety, the relocation and reconstruction of crossing lines below 35kV, and the demolition of buildings that violate the limit have all been completed, and necessary bird prevention measures have been taken for contact line equipment;

1. 维修基地的房屋、水电、通讯、网络和道路等生产、生活设施已竣工，并交付使

The production and living facilities such as houses, water and electricity, communication, network and roads of the maintenance base have been completed and delivered to make  
The production and living facilities such as houses, water and electricity, communications, networks and roads of the maintenance base have been completed and delivered to the site.

用；

Use;  
Use;

1. 维修基地开展检测、维修以及抢修工作所需的工机具、材料等配备齐全。接触网作业需要的主要工机具配置标准见附件 11；

The maintenance base is fully equipped with tools and materials required for inspection, maintenance and emergency repair. See Annex 11 for the configuration standards of main tools and tools required for catenary operation;  
The maintenance base is fully equipped with tools, tools, materials, etc. required to carry out inspection, maintenance and emergency repair work. See Annex 11 for the configuration standards of main tools and tools required for catenary operation;

1. 联营公司、基础设施维护公司收到开通所需的竣工文件和技术资料。

Associates and infrastructure maintenance companies receive the completion documents and technical data required for opening.  
The associated company and infrastructure maintenance company receive the completion documents and technical data required for opening up.

1. 接触网设备开通前，设计、施工、供应商等企业，向基础设施维护公司提供下列书面和电子版技术资料：

Before the catenary equipment is opened, the design, construction, suppliers and other enterprises shall provide the following written and electronic technical data to the infrastructure maintenance company:  
Before the opening of overhead contact network equipment, design, construction, suppliers and other companies will provide the following written and electronic technical materials to the infrastructure maintenance company:

1. 接触网竣工工程数量表；

Quantity table of catenary completed projects;  
Table of quantity of OCS completed projects;

1. 接触网竣工图纸。主要包括供电分段示意图，车站、区间接触网平面布置图，供电线路平面布置图，接触网装配图，设备零件图及安装曲线，接触线磨耗换算表等；

As-built drawings of catenary. It mainly includes power supply subsection schematic diagram, station and section catenary layout, power supply line layout, catenary assembly diagram, equipment parts diagram and installation curve, contact line wear conversion table, etc.  
As-built drawings of the catenary. It mainly includes power supply section schematic diagram, station and section catenary layout plan, power supply line layout plan, catenary assembly drawing, equipment parts drawing and installation curve, contact line wear conversion table, etc.;

1. 工程施工记录。主要包括隐蔽工程记录，锚栓拉拔试验记录，轨面标准线记录（主要包括支柱侧面限界、外轨超高等），不同电压等级附加导线、引线、接触悬挂等线索交叉时的最小间距及对地距离等；

Engineering construction records. It mainly includes concealed engineering records, anchor bolt pull-out test records, rail surface standard line records (mainly including pillar side clearance, outer rail superelevation, etc.), minimum spacing and ground distance when clues such as additional wires, leads and contact suspension of different voltage levels cross, etc.;  
Engineering construction records. It mainly includes concealed engineering records, anchor bolt pull-out test records, rail surface standard line records (mainly including pillar side limits, outer rail super-high, etc.), minimum spacing and distance to the ground when additional wires, leads, contact suspensions and other clues intersect with different voltage levels;

1. 每根支柱装配图表（主要包括定位、支持装置、吊弦等）；

Assembly chart of each pillar (mainly including positioning, supporting devices, hanging strings, etc.);  
Assembly diagram of each pillar (mainly including positioning, supporting devices, hanging strings, etc.);

1. 各种线索、零部件、设备安装档案（主要包括生产厂家、批次、安装地点和安装时间等）。

All kinds of clues, parts and equipment installation files (mainly including manufacturer, batch, installation place and installation time, etc.).  
Various clues, parts and equipment installation files (mainly including manufacturer, batch, installation location and installation time, etc.).

1. 设备、零部件、金具、器材的技术规格、合格证、出厂试验记录和试验报告、安装维护手册（使用说明书） ，承力索、接触线、绝缘部件及接触网零部件等抽样检验报告，电缆相关资料（主要包括电缆及附件合格证、出厂试验报告、现场试验报告、电缆清册、电缆路径图等）。

Technical specifications and certificates of equipment, parts, fittings and equipment, factory test records and test reports, installation and maintenance manuals (operating instructions), sampling inspection reports of load-bearing cables, contact wires, insulation components and catenary parts, and cable-related data (mainly including cable and accessories certificates, factory test reports, field test reports, cable inventory, cable path diagrams, etc.).  
Technical specifications, certificates of conformity, delivery test records and test reports, installation and maintenance manuals (instructions for use) of equipment, parts, fittings, and equipment, sampling inspection reports of load-bearing cables, contact wires, insulation parts and catenary parts, etc., cable-related information (mainly including cable and accessory certificate, delivery test report, field test report, cable list, cable path diagram, etc.).

1. 项目可行性研究、初步设计及其批复文件、施工设计（含变更设计）、图纸及审核意见资料。

Project feasibility study, preliminary design and its approval documents, construction design (including changed design), drawings and audit opinions.  
Project feasibility study, preliminary design and its approval documents, construction design (including change design), drawings and review opinion data.

1. 设备招标技术规格书、采购的产品供应合同以及施工单位工程质量保证合同。

Technical specifications for equipment bidding, supply contracts for purchased products and engineering quality assurance contracts of construction units.  
Equipment bidding technical specifications, purchased product supply contracts and construction unit project quality assurance contracts.

1. 上跨接触网电线路（主要包括上跨电线路名称、位置、电压等级、上跨线高度、产权单位及联系方式等）、跨越接触网的构筑物（主要包括构筑物名称、位置、最近的构筑物墩距线路中心的距离，接触网带电部分距构筑物最小距离、产权单位及联系方式等）有关资料。

Relevant information of overhead contact line (mainly including the name, location, voltage grade, height, property right unit and contact information of overhead contact line) and overhead contact line structures (mainly including the name and location of the structure, the distance between the nearest structure pier and the center of the line, the minimum distance between the live part of overhead contact line and the structure, property right unit and contact information, etc.).  
Relevant information on the electrical line across the overhead contact line (mainly including the name, location, voltage level, height of the overhead contact line, property right unit and contact information, etc.), the structure crossing the overhead contact line (mainly including the name, location of the structure, distance from the nearest structure pier to the center of the line, the minimum distance from the live part of the overhead contact line to the structure, property right unit and contact information, etc.).

1. 开通前最后一次接触网几何参数静态测量数据、波形图，动态检测波形图及检测报告。

Static measurement data, waveform diagram, dynamic detection waveform diagram and detection report of the last catenary geometric parameters before opening.  
The static measurement data, waveform diagram, dynamic detection waveform diagram and test report of the last OCS geometric parameters before opening.

1. 接触网设备投入运行前，基础设施维护公司要做好运行准备工作，配齐并培训运行维修人员，组织学习有关规章制度，熟悉即将接管的设备；配合有关部门共同做好电气化铁路安全知识的宣传教育工作。

Before the catenary equipment is put into operation, the infrastructure maintenance company should make good preparations for operation, complete and train the operation and maintenance personnel, organize the study of relevant rules and regulations, and be familiar with the equipment to be taken over; Cooperate with relevant departments to do a good job in publicity and education of electrified railway safety knowledge.  
Before the catenary equipment is put into operation, the infrastructure maintenance company must prepare for operation, equip and train operation and maintenance personnel, organize the study of relevant rules and regulations, and be familiar with the equipment to be taken over; cooperate with relevant departments to jointly carry out publicity and education on electrified railway safety knowledge.

1. 为保证电气化区段的可靠供电，一般不得从接触网上引接非牵引负荷。对当地车

In order to ensure reliable power supply in electrified sections, non-traction loads are generally not allowed to be connected from the contact network. For local cars  
In order to ensure reliable power supply in the electrified section, non-traction loads are generally not allowed to be connected from the catenary. For local cars

站无电源，只能利用接触网供电者，经联营公司批准可允许由车站接触网引接少量的非牵引负荷，基础设施维护公司与使用部门应明确分界，各自对分管设备加强管理，认真维护保养，确保接触网的正常供电。

If the station has no power supply and can only use the catenary for power supply, a small amount of non-traction load can be connected by the catenary of the station with the approval of the affiliated company. The infrastructure maintenance company and the user department should clearly define the boundary, strengthen the management of the equipment in charge, and carefully maintain and ensure the normal power supply of the catenary.  
If the station has no power supply and can only use the catenary for power supply, a small amount of non-traction loads may be allowed to be connected by the station catenary with the approval of the joint venture company. The infrastructure maintenance company and the user department should have a clear boundary, strengthen management of the equipment in charge, and carefully maintain and ensure the normal power supply of the catenary.

1. 为保证接触网与线路的相对位置，应在接触网支柱的线路侧或站台侧墙、隧道一侧的边墙上标出轨面标准线。

In order to ensure the relative position between the catenary and the line, the standard line of the rail surface shall be marked on the line side of the catenary pillar or the side wall of the platform and the side wall of the tunnel.  
In order to ensure the relative position of the catenary and the line, the rail surface standard line should be marked on the line side of the catenary pillar or the platform side wall or the side wall on one side of the tunnel.

在电气化铁路竣工时，由施工企业标出轨面标准线，开通前由基础设施维护公司共同复查确认。每年对轨面标准线复测一次，复测结果与原轨面标准线误差不得大于±30mm。特殊情况需调整轨面标准线时，由基础设施维护公司批准。基础设施维护公司负责轨面标准线的日常管理，保持其清晰醒目。

When the electrified railway is completed, the construction enterprise shall mark the derailment surface standard line, and the infrastructure maintenance company shall jointly review and confirm it before opening. Re-test the standard line of rail surface once a year, and the error between the re-test result and the original standard line of rail surface shall not be greater than 30mm. When the standard line of rail surface needs to be adjusted under special circumstances, it shall be approved by the infrastructure maintenance company. The infrastructure maintenance company is responsible for the daily management of the track surface standard line to keep it clear and eye-catching.  
When the electrified railway is completed, the construction company will mark the standard track line, and the infrastructure maintenance company will jointly review and confirm it before opening. The rail surface standard line shall be re-measured once a year, and the error between the re-measurement results and the original rail surface standard line shall not exceed ±30 mm. When it is necessary to adjust the rail surface standard line under special circumstances, it shall be approved by the infrastructure maintenance company. The infrastructure maintenance company is responsible for the daily management of the rail surface standard line and keeps it clear and eye-catching.

1. 位于轨道侧的回流装置维修分工如下：吸上线与扼流变压器连接时，连接板（端子）由所在维修基地电务队负责，连接板（端子）上的螺栓和吸上线由所在维修基地供电队负责。

The maintenance division of the backflow device located on the track side is as follows: when the suction line is connected with the choke transformer, the electrical service team of the maintenance base is responsible for the connection plate (terminal), and the power supply team of the maintenance base is responsible for the bolts and suction line on the connection plate (terminal).  
The maintenance division of labor for the return device located on the track side is as follows: When the suction line is connected to the choke transformer, the connection plate (terminal) is the responsibility of the electrical service team of the maintenance base, and the bolts on the connection plate (terminal) and the suction line are the responsibility of the power supply team of the maintenance base.

1. 吸上线与钢轨相连接时，吸上线及其与钢轨连接的附件由所在维修基地供电队负责。供电队作业，必要时工务队、电务队派人配合。

When the suction line is connected with the rail, the power supply team of the maintenance base is responsible for the suction line and its accessories connected with the rail. The power supply team shall work, and when necessary, the public works team and the electricity service team shall send people to cooperate.  
When the suction line is connected to the rail, the suction line and its accessories connected to the rail shall be the responsibility of the power supply team of the maintenance base. When the power supply team operates, when necessary, the Public Works Team and the Signal and Communications Team will send people to cooperate.

1. 接触网远动隔离开关维修分工如下： 引入被控站的通信光缆及通信光缆配线架

The maintenance division of OCS telecontrol isolating switch is as follows: the communication optical cable introduced into the controlled station and the communication optical cable distribution frame  
The maintenance division of overhead contact network remote isolating switch is as follows: Communication optical cables and communication optical cable distribution frames introduced into controlled stations

（盒），以被控站通信配线架（盒）的活动连接器为分界点。活动连接器（含）至通信设备由所在维修基地电务队的通信综合维护组负责，活动连接器（不含）至供电设备的跳纤、尾纤等由所在维修基地供电队负责。

(Box), taking the movable connector of the communication distribution frame (box) of the controlled station as the demarcation point. The communication integrated maintenance team of the telecommunication team of the maintenance base is responsible for the movable connector (inclusive) to the communication equipment, and the power supply team of the maintenance base is responsible for the fiber jumping and pigtail of the movable connector (excluding) to the power supply equipment.  
(Box), with the movable connector of the communication distribution frame (box) of the controlled station as the dividing point. The communication comprehensive maintenance team of the electrical and telecommunications team of the maintenance base is responsible for the movable connector (inclusive) to the communication equipment, and the fiber skipping and pigtail of the movable connector (excluding) to the power supply equipment are responsible for the power supply team of the maintenance base.

1. 根据线路等级、专业技术力量、生产力布局、劳动力现状、设备运行状态、经济技术效益等实际情况，对部分设备、作业项目和线路，可实施委托维修或管理。

According to the actual situation of line grade, professional and technical force, productivity layout, labor force status, equipment operation status, economic and technical benefits, etc., some equipment, operation items and lines can be entrusted for maintenance or management.  
According to the actual situation such as line level, professional technical strength, productivity layout, current labor force, equipment operating status, and economic and technical benefits, some equipment, operation items and lines can be repaired or managed.

技术管理

Technical management  
technical management

1. 在接触网投入运行时，各维修基地的供电队应建立正常的生产秩序，制定并落实各项制度，备齐技术文件和资料，建立各项原始记录，按时填报台账报表。基础设施维护公司技术科应有下列技术文件和资料：

When the catenary is put into operation, the power supply team of each maintenance base shall establish normal production order, formulate and implement various systems, prepare technical documents and materials, establish various original records, and fill in the ledger report on time. The technical department of the infrastructure maintenance company shall have the following technical documents and materials:  
When the catenary is put into operation, the power supply teams of each maintenance base should establish normal production order, formulate and implement various systems, prepare technical documents and materials, establish various original records, and fill in ledger reports on time. The technical department of the infrastructure maintenance company shall have the following technical documents and materials:

1. 联营公司、基础设施维护公司有关规章、制度、办法和措施；

Relevant rules, regulations, methods and measures of affiliated companies and infrastructure maintenance companies;  
Relevant rules, systems, methods and measures of joint ventures and infrastructure maintenance companies;

1. 接触网设备有关标准和作业指导书；

Relevant standards and operation instructions for catenary equipment;  
Relevant standards and operation instructions for catenary equipment;

1. 接触网零部件技术条件、试验方法及图册；

Technical conditions, test methods and atlas of catenary parts;  
Technical conditions, test methods and atlas of catenary parts;

1. 一杆一档管理台账和设备技术履历；

One-pole and one-file management ledger and equipment technical resume;  
One-shot management ledger and equipment technical resume;

1. 与相关单位设备分界协议，管内设备及各专业分工规定；

Equipment demarcation agreement with relevant units, in-pipe equipment and division of labor regulations for various specialties;  
Equipment demarcation agreements with relevant units, and regulations on the division of labor for equipment and various specialties within the management;

1. 供电 LKJ 数据和设备建筑限界资料，自动过分相地面磁感应装置，分相断电标、合电标的位置，关节式分相无电区、中性段长度，电力机车、动车组禁停标位置资料；

Power supply LKJ data and equipment building clearance data, automatic over-phase ground magnetic induction device, split-phase power-off mark, position of power-off mark, articulated split-phase no-power zone, neutral section length, position data of electric locomotive and EMU no-stop mark;  
Power supply LKJ data and equipment building limit data, automatic passing phase ground magnetic induction device, position of phase-splitting power off mark and power-closing mark, length of articulated phase-splitting no-power zone and neutral section, position data of electric locomotives and EMU prohibited stop mark;

1. 第 133 条规定的技术资料。

Technical data specified in Article 133.  
Technical data specified in Article 133.

1. 接触网运行组、接触网维修组都应分别备有下列技术资料：

The catenary operation group and catenary maintenance group shall have the following technical data respectively:  
Both the catenary operation group and the catenary maintenance group shall be equipped with the following technical data:

|  |  |
| --- | --- |
| 序号  Serial number serial number | 技术资料名称  Name of technical data Name of technical data |
| 1 | 供电分段示意图  Schematic diagram of power supply section Schematic diagram of power supply sections |
| 2 | 管辖范围内的接触网平面布置图、装配图、安装曲线  Floor layout, assembly drawing and installation curve of catenary within the jurisdiction Contact line layout, assembly drawings, installation curves within jurisdiction |
| 3 | 接触网“一杆一档”  OCS "One Pole and One Gear" Contact network "one pole, one gear" |
| 4 | 作业指导书  Work instruction work instruction |
| 5 | 电分段、电分相结构图  Structural diagram of electrical segmentation and electrical phase separation Structural diagram of electrical segmentation and electrical phase separation |
| 6 | 上跨接触网电线路、构筑物有关资料  Relevant information on electrical lines and structures across catenary Relevant information on electrical lines and structures of the overhead catenary |
| 7 | 隔离(负荷)开关、避雷装置、绝缘器等设备安装调试、使用说明等  Installation and debugging of isolation (load) switch, lightning protection device, insulator and other equipment, instructions for use, etc. Installation, commissioning, use instructions, etc. of isolation (load) switches, lightning protection devices, insulators and other equipment |
| 8 | 设备和工具试验记录  Test records of equipment and tools Equipment and tool test records |
| 9 | 有机绝缘部件寿命管理记录  Life management record of organic insulating components Life management records of organic insulating parts |
| 10 | 接触网外部环境有关资料（防洪重点处所、周边污染源、危树等）  Relevant information on the external environment of catenary (key flood control places, surrounding pollution sources, dangerous trees, etc.) Relevant information on the external environment of the OCS (key flood control places, surrounding pollution sources, dangerous trees, etc.) |
| 11 | 接触线磨耗换算表  Contact wire wear conversion table Contact wire wear conversion table |
| 12 | 轨面标准线记录  Track surface standard line recording Track surface standard line record |
| 13 | 有关隐蔽工程记录  Records of concealed works Relevant records of concealed works |
| 14 | 管内设备更新改造情况记录（包括时间、地点、更新改造内容、质量评定等）  Record of renewal and transformation of equipment in pipe (including time, place, renewal and transformation content, quality evaluation, etc.) Records of equipment renewal and transformation in the pipeline (including time, place, renewal and transformation content, quality assessment, etc.) |
| 15 | 供电 LKJ 数据和设备建筑限界资料  Power supply LKJ data and equipment building clearance data Power supply LKJ data and equipment building clearance data |
| 16 | 自动过分相地面磁感应器资料  Data of automatic cross-phase ground magnetic sensor Automatic phase transition ground magnetic sensor data |
| 17 | 接触网几何参数静态测量数据、波形图  Static measurement data and waveform diagram of catenary geometric parameters Static measurement data and waveform diagram of OCS geometric parameters |
| 18 | 接触网设备履历  CV of catenary equipment Contact network equipment history |
| 19 | 作业门、可调用视频资料的探头位置  Operation door, which can call the probe position of video data Operation door and probe position that can call video data |

1. 接触网运行维护应根据环境、气候特点，针对风、洪（雨）、雷、污（雾）闪、锈蚀、鸟害、异物、危树等影响供电安全的外部环境因素，建立有效机制，减少对接触网设备运行安全的影响。

According to the characteristics of environment and climate, the operation and maintenance of catenary should establish an effective mechanism to reduce the impact on the operation safety of catenary equipment, aiming at the external environmental factors affecting the power supply safety, such as wind, flood (rain), thunder, pollution (fog) flash, corrosion, bird damage, foreign matter and dangerous trees.  
The operation and maintenance of the catenary should be based on the characteristics of the environment and climate, and effective mechanisms should be established for external environmental factors that affect power supply safety such as wind, flood (rain), thunder, pollution (fog) flash, rust, bird damage, foreign matter, and dangerous trees. Impact on the operation safety of catenary equipment.

1. 基础设施维护公司技术科、维修基地供电队、接触网运行组、接触网维修组相关人员应定期对技术资料进行检查，并不断修订完善，确保技术资料完整准确。

Relevant personnel of technical department of infrastructure maintenance company, power supply team of maintenance base, catenary operation group and catenary maintenance group shall regularly check the technical data, and constantly revise and improve them to ensure the completeness and accuracy of the technical data.  
Relevant personnel from the technical department of the infrastructure maintenance company, the power supply team of the maintenance base, the catenary operation team, and the catenary maintenance team should regularly inspect the technical data and constantly revise and improve it to ensure that the technical data is complete and accurate.

1. 接触网使用的工器具、仪器仪表，应由具有资质的机构按规定进行检定或校准。

Tools, instruments and meters used in catenary shall be verified or calibrated by qualified institutions according to regulations.  
Tools, instruments and meters used in the catenary shall be verified or calibrated by qualified institutions in accordance with regulations.

1. 接触网设备统计单位包括运营里程、正线公里、接触网延展公里、接触网换算公

The statistical units of catenary equipment include operating mileage, main line kilometers, catenary extension kilometers and catenary conversion public  
The statistical units of catenary equipment include operating mileage, main line kilometers, catenary extension kilometers, and catenary conversion kilometers.

里。

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Li.

运营里程指线路起点至终点之间的距离，为起、终点公里标之差。单位：公里。正线公里指正线线路的延展长度之和。单位：公里。

Operating mileage refers to the distance between the starting point and the ending point of the line, which is the difference between the starting point and the ending point. Unit: Kilometers. Main line kilometer refers to the sum of the extended lengths of the main line. Unit: Kilometers.  
Operating mileage refers to the distance between the starting point and the ending point of the line, and is the difference between the starting point and the ending point. Unit: Kilometers. Main line kilometer refers to the sum of the extension lengths of the line. Unit: Kilometers.

接触网延展公里指接触网接触导线长度之和。单位：条公里。

Catenary extension kilometer refers to the sum of the length of catenary contact wires. Unit: kilometres.  
The extension of the catenary kilometer refers to the sum of the lengths of the contact wires of the catenary. Unit: Kilometers.

接触网换算公里指将接触网不同设备按照系数换算为线条公里的数量总和。单位：换算条公里。

Catenary conversion kilometers refers to the sum of the number of different catenary devices converted into line kilometers according to coefficients. Unit: Conversion kilometres.  
OCS conversion kilometers refers to the conversion of different OCS equipment into the total number of line kilometers according to coefficients. Unit: Convert kilometers.

换算公里数量＝∑（设备数量×换算系数）。各设备及部件的换算系数为：

Conversion Kilometer Quantity = Σ (Equipment Quantity × Conversion Factor). The conversion factor of each equipment and component is:  
Converted kilometers = ∑ (equipment quantity × conversion factor). The conversion factors for each equipment and component are:

|  |  |  |  |
| --- | --- | --- | --- |
| 序号  Serial number serial number | 设备及部件名称  Names of equipment and components Equipment and component name | 单位  Unit units | 换算系数  Conversion factor conversion factor |
| 1 | 正、站线接触网延展公里  The catenary of the main and station lines extends kilometers Extension of contact network on main and station lines for kilometers | 公里  kilometres km | 1.00 |
| 2 | 隧道内（含桥梁）悬挂延展公里另增  The suspension extension kilometers in the tunnel (including bridges) will be increased Suspension extension in tunnels (including bridges) increases by kilometers | 公里  kilometres km | 0.30 |
| 3 | 附加导线延展公里（供电线、回流线、架空地线、避雷线）  Extension km of additional conductors (power supply line, return line, overhead ground wire, lightning protection line) Additional conductors extend for kilometers (power supply lines, return lines, overhead ground wires, lightning protection wires) | 公里  kilometres km | 0.20 |
| 附加导线延展公里（正馈线、保护线）  Extension km of additional conductors (positive feeder, protection line) Additional conductor extends kilometers (positive feeder, protective line) | 公里  kilometres km | 0.40 |
| 附加导线延展公里（双正馈线、保护线）  Extension km of additional conductor (double positive feeder, protection line) Additional conductor extends kilometers (double positive feeder, protection line) | 公里  kilometres km | 0.60 |
| 4 | 高压电缆  High voltage cable high-voltage cable | 公里  kilometres km | 0.80 |
| 5 | 限界门  Gauge gate limit gate | 处  Department at | 0.15 |
| 6 | 线岔（交叉）  Line bifurcation (crossing) Junction (crossing) | 组  Group group | 0.12 |
| 线岔（无交叉）  Line bifurcation (without crossing) Branch crossing (no crossing) | 组  Group group | 0.25 |
| 7 | 隔离开关（手动）  Disconnector (manual) Isolation switch (manual) | 台  Taiwan Taiwan | 0.12 |
| 隔离开关（电动）  Disconnector (electric) Isolation switch (electric) | 台  Taiwan Taiwan | 0.20 |
| 隔离开关（负荷）  Disconnector (load) Isolating switch (load) | 台  Taiwan Taiwan | 0.30 |
| 8 | 分段、分相绝缘器  Sectional and phase-separated insulator Sectional and split-phase insulators | 台  Taiwan Taiwan | 0.12 |
| 9 | 避雷器  Lightning arrester arrester | 台  Taiwan Taiwan | 0.05 |
| 10 | 软（硬）横跨  Soft (hard) spanning soft (hard) span | 组  Group group | 0.13 |
| 11 | 越级变  Leapfrog change leapfrog transformation | 台  Taiwan Taiwan | 0.15 |
| 12 | 接触网末端测试装置  Catenary terminal test device Contact line end testing device | 套  sleeve set | 0.05 |
| 13 | 中心锚结  Central anchoring mid-point anchor | 组  Group group | 0.10 |
| 14 | 锚段关节  Anchor joint anchor section joint | 组  Group group | 0.25 |
| 15 | 补偿装置（含下锚拉线）  Compensation device (including lower anchor cable) Compensation device (including anchor cable) | 组  Group group | 0.10 |
| 16 | 关节式分相（含自动过分相装置）  Articulated phase separation (including automatic phase passing device) Articulated phase separation (including automatic phase passing device) | 组  Group group | 0.45 |
| 17 | 隔离开关远动控制系统  Remote control system of isolating switch Isolation switch remote control system | 套  sleeve set | 5.00 |

1. 运行接触网有变更者，由基础设施维护公司报联营公司审批：

If there is any change in the operation of catenary, the infrastructure maintenance company shall report it to the associated company for examination and approval:  
If there is any change in the operating contact network, the infrastructure maintenance company shall report to the associate company for approval:

1. 由于接触网变化而降低带电或停电通过超限货物列车的高度和宽度；

Reduce the height and width of live or power-off freight trains passing through the overrun due to the change of catenary;  
Reduce the height and width of over-limit freight trains with electricity or power failure due to changes in the catenary;

1. 变更接触网边界；

Change the boundary of catenary;  
Changing the boundary of the contact line;

1. 变更悬挂类型；

Change the suspension type;  
Change the suspension type;

1. 变更接触线、承力索、附加导线材质和截面；

Change the material and section of contact wire, load-bearing cable and additional wire;  
Change the materials and sections of contact wires, load-bearing cables, and additional wires;

1. 拆除或长期停用接触网；

Dismantle or stop the catenary for a long time;  
Remove or permanently deactivate the contact line;

1. 变更绝缘水平；

Change the insulation level;  
Change insulation levels;

1. 变更接触网分段（相）位置和开关操作方式；

Change the subsection (phase) position of catenary and switch operation mode;  
Change the contact line section (phase) position and switch operation method;

1. 非联营公司产权专用线架设接触网的供电和开通方案；

Power supply and opening scheme for erecting catenary on special lines with property rights of non-affiliated companies;  
Power supply and opening plan for building overhead contact network with exclusive property rights lines of non-affiliated companies;

1. 改变供电方式或供电单元。

Change the power supply mode or power supply unit.  
Change the power supply method or power supply unit.

计划与天窗

Plans and skylights  
Plan and skylight

1. 接触网生产计划包括年度检测、维修计划和月度维修计划三部分。

OCS production plan includes three parts: annual inspection, maintenance plan and monthly maintenance plan.  
The OCS production plan includes three parts: annual inspection, maintenance plan and monthly maintenance plan.

1. 年度检测和维修计划，由维修基地供电队于前一年的 11 月底以前分别下达到接

The annual inspection and maintenance plan shall be received by the power supply team of the maintenance base before the end of November of the previous year  
The annual inspection and maintenance plan shall be issued to and received by the power supply team of the maintenance base before the end of November of the previous year.

触网运行组和接触网维修组，同时报基础设施维护公司。月度维修计划由供电队提前 1 个月编制后下达班组。

The catenary operation group and catenary maintenance group shall be reported to the infrastructure maintenance company at the same time. The monthly maintenance plan shall be prepared by the power supply team one month in advance and then issued to the team.  
Contact the network operation group and contact network maintenance group, and report to the infrastructure maintenance company at the same time. The monthly maintenance plan is prepared by the power supply team one month in advance and then distributed to the team.

1. 鉴于各地区设备性能及运行条件不尽相同，基础设施维护公司可调整检测的项目、周期和范围，并报联营公司核备。

In view of the different equipment performance and operating conditions in different regions, the infrastructure maintenance company can adjust the inspection items, cycles and scope, and report to the affiliated company for approval.  
In view of the differences in equipment performance and operating conditions in different regions, infrastructure maintenance companies can adjust the testing items, cycles and scope and report them to the associated company for approval.

1. 为保证定期检查和及时处理设备缺陷，在列车运行图中须预留接触网维修“天窗”。对较大车站（如枢纽、区段站等）和必须利用垂直“天窗”作业的区段，应根据设备状况定期安排“天窗”停电维修。

In order to ensure regular inspection and timely treatment of equipment defects, a "skylight" for catenary maintenance must be reserved in the train operation diagram. For larger stations (such as hubs, section stations, etc.) and sections where vertical "skylights" must be used for operation, the "skylights" should be regularly arranged for power outage maintenance according to equipment conditions.  
In order to ensure regular inspections and timely treatment of equipment defects, a "skylight" for contact network maintenance must be reserved in the train operation diagram. For large stations (such as hubs, section stations, etc.) and sections that must use vertical "skylight" operations,"skylight" power outage maintenance should be arranged regularly based on equipment conditions.

对接触网进行批量零部件更换时，天窗计划原则上应逐日连续安排。

When replacing parts of catenary in batches, the skylight plan should be arranged continuously day by day in principle.  
When replacing batches of parts and components for the catenary, the skylight plan should in principle be arranged continuously day by day.

1. 列车调度员和工电供调度员要密切配合，按“天窗”时间组织接触网停电维修。如因运输需要等原因必须取消“天窗”时，应按照有关规定执行。

Train dispatchers and power supply dispatchers should cooperate closely and organize catenary power outage maintenance according to the "skylight" time. If the "skylight" must be cancelled due to transportation needs and other reasons, it should be implemented in accordance with relevant regulations.  
Train dispatchers and industrial and power supply dispatchers must cooperate closely to organize overhead contact network power outages and maintenance according to the "skylight" time. If the "skylight" must be cancelled due to transportation needs and other reasons, relevant regulations should be followed.

遇有危及安全的故障或缺陷必须立即停电维修时，工电供调度员应于停电前通知列车调度员，列车调度员根据工电供调度员停电通知及时发布相关行车调度命令。

In case of safety-endangering faults or defects that must be immediately cut off for maintenance, the power supply dispatcher shall notify the train dispatcher before the power outage, and the train dispatcher shall issue relevant traffic dispatching orders in time according to the power outage notice of the power supply dispatcher.  
When a fault or defect that endangers safety and requires immediate power outage for maintenance, the industrial and power supply dispatcher shall notify the train dispatcher before the power outage, and the train dispatcher shall promptly issue relevant train dispatching orders according to the industrial and power supply dispatcher's power outage notice.

1. 供电队要做好检测、维修组织工作，实施周期不宜超过规定周期的 20%（按天计算）。

The power supply team should do a good job in inspection and maintenance organization, and the implementation period should not exceed 20% of the specified period (calculated by day).  
The power supply team must organize inspection and maintenance, and the implementation cycle should not exceed 20% of the specified cycle (calculated in days).

1. 基础设施维护公司各作业组、各工种（包括变电、电力等）在同一停电范围、同一封锁区段内作业，应尽量安排同时进行。

Each operation group and type of work (including substation, power, etc.) of the infrastructure maintenance company shall work in the same power outage range and the same blocked section, and shall be arranged at the same time as far as possible.  
If each operation group and type of work (including power transformation, electricity, etc.) of the infrastructure maintenance company operates in the same power outage range and the same blockade section, it should be arranged to operate simultaneously as much as possible.

质量管理

Quality management  
quality management

1. 为保证维修质量，接触网用料入库前，验收部门应对接触网重要零部件和线材进行检查，确认出厂合格证、检验报告与产品一致后实施验收，向基础设施维护公司提供验收报告，否则不得上线使用。

In order to ensure the maintenance quality, before the catenary materials are put into storage, the acceptance department shall inspect the important parts and wires of the catenary, confirm that the factory certificate and inspection report are consistent with the products, and then implement the acceptance, and provide the acceptance report to the infrastructure maintenance company, otherwise it shall not be put into use.  
In order to ensure the quality of maintenance, before the materials for the catenary are put into storage, the acceptance department should inspect the important parts and wires of the catenary, confirm that the factory certificate and inspection report are consistent with the product, and implement acceptance, and provide the acceptance report to the infrastructure maintenance company. Otherwise, it is not allowed to be used online.

1. 更换线索、零部件、支柱、绝缘部件后，应记录所更换设备的名称、材质、型号、厂家等信息，并修订相关技术资料。

After replacing clues, parts, struts and insulating parts, the name, material, model and manufacturer of the replaced equipment shall be recorded, and relevant technical data shall be revised.  
After replacing clues, parts, pillars, and insulating parts, the name, material, model, manufacturer and other information of the equipment replaced should be recorded, and relevant technical data should be revised.

1. 接触网运行组一级修（临时修）或单项设备检查完成后，由当日作业负责人负责检查验收，确认作业质量。接触网维修组进行的所有作业，接触网运行组应进行质量检查验收。

After the first-level repair (temporary repair) or single equipment inspection of OCS operation group is completed, the person in charge of operation on that day shall be responsible for inspection and acceptance to confirm the operation quality. For all operations carried out by the OCS maintenance group, the OCS operation group shall conduct quality inspection and acceptance.  
After the first-level repair (temporary repair) or individual equipment inspection of the catenary operation group is completed, the person in charge of the operation of the day is responsible for inspection and acceptance to confirm the operation quality. For all operations carried out by the catenary maintenance team, the catenary operation team shall conduct quality inspection and acceptance.

1. 接触网维修组应及时将相应区段的即时分析、定期分析以及缺陷通知单报基础设

The OCS maintenance team shall timely report the immediate analysis, periodic analysis and defect notice of the corresponding section to the basic equipment  
The OCS maintenance team shall promptly report the immediate analysis, regular analysis and defect notice of the corresponding section to the basic equipment

施维护公司技术科，由技术科下达至接触网运行组、接触网维修组；维修工作完成后，接触网运行组、接触网维修组应将缺陷反馈单反馈技术科，维修记录留存备查。

The technical department of the maintenance company shall be assigned to the catenary operation group and catenary maintenance group by the technical department; After the maintenance work is completed, the OCS operation group and OCS maintenance group shall feed back the defect feedback sheet to the technical department, and keep the maintenance records for future reference.  
The technical department of the company shall issue it to the catenary operation group and the catenary maintenance group; after the maintenance work is completed, the catenary operation group and the catenary maintenance group shall feed the defect feedback sheet back to the technical department, and the maintenance records shall be kept for future reference.

1. 供电队负责组织接触网设备更换检查验收工作。设备更换完工，经供电队验收并签认后，由基础设施维护公司组织现场检查验收。

The power supply team is responsible for organizing the inspection and acceptance of catenary equipment replacement. After the equipment replacement is completed and accepted and signed by the power supply team, the infrastructure maintenance company shall organize on-site inspection and acceptance.  
The power supply team is responsible for organizing the replacement, inspection and acceptance of catenary equipment. After the equipment replacement is completed, it is accepted and signed by the power supply team, and the infrastructure maintenance company will organize on-site inspection and acceptance.

1. 接触网运行组、接触网维修组应分别建立相关记录（见附件 12），实现网络化管理和数据共享。

The catenary operation group and catenary maintenance group shall establish relevant records respectively (see Annex 12) to realize network management and data sharing.  
The catenary operation group and the catenary maintenance group shall establish relevant records (see Annex 12) respectively to achieve network management and data sharing.

1. 接触网运行维修要落实记名制度。每次作业完成后应及时填写相应记录并签认。供电队队长和维修基地主任要定期检查各项任务完成情况并签认。

The registration system should be implemented in the operation and maintenance of catenary. After each operation is completed, the corresponding records should be filled in and signed in time. The captain of the power supply team and the director of the maintenance base shall regularly check the completion of various tasks and sign them.  
A registration system must be implemented for the operation and maintenance of the contact network. After each operation is completed, the corresponding records should be filled in and signed in time. The power supply team leader and maintenance base director must regularly check the completion of various tasks and sign off.

1. 供电队每月、技术科每季度应组织开展接触网运行质量分析，并分别编制质量分析报告。

The power supply team shall organize and carry out catenary operation quality analysis every month and every quarter, and prepare quality analysis reports respectively.  
The power supply team and the technical department shall organize and carry out contact line operation quality analysis every month and prepare quality analysis reports respectively.

1. 质量分析应根据接触网检测和运行过程中存在问题，对接触网质量状态进行综合诊断，找出设备在运行中出现的特殊性、普遍性问题及质量状态变化规律，针对反映出的质量问题，制定整治措施，纳入维修计划。质量分析报告主要内容包括：

Quality analysis should comprehensively diagnose the quality status of catenary according to the problems existing in the inspection and operation of catenary, find out the particularity and universality problems and the change law of quality status in the operation of equipment, and formulate remediation measures and bring them into the maintenance plan according to the reflected quality problems. The main contents of the quality analysis report include:  
Quality analysis should comprehensively diagnose the quality status of the catenary based on the problems existing in the inspection and operation of the catenary, find out the special and universal problems and the change laws of the quality status that arise during the operation of the equipment, and formulate rectification measures based on the reflected quality problems and incorporate them into the maintenance plan. The main contents of the quality analysis report include:

1. 检测、维修计划完成情况；

Complete the inspection and maintenance plan;  
Completion of testing and maintenance plans;

1. 检测、维修及设备运行中发现的具体问题；

Specific problems found in inspection, maintenance and equipment operation;  
Specific problems found during testing, maintenance and equipment operation;

1. 产生问题的原因分析及采取的措施；

Analysis of the causes of the problems and the measures taken;  
Analysis of the causes of the problems and measures taken;

1. 接触网质量状态的变化规律和趋势。

Variation law and trend of catenary quality state.  
Change laws and trends of the quality status of catenary.

1. 基础设施维护公司组织供电队定期对接触网动态运行质量进行评价，每年 10 月底前对设备整体技术状态进行质量鉴定。对季节变换、频繁发生故障等特殊情况可不定期组织质量评价。

The infrastructure maintenance company organizes the power supply team to evaluate the dynamic operation quality of the catenary regularly, and appraise the overall technical status of the equipment before the end of October every year. Quality evaluation can be organized irregularly under special circumstances such as seasonal changes and frequent failures.  
The infrastructure maintenance company organizes the power supply team to regularly evaluate the dynamic operation quality of the catenary, and conducts quality appraisal of the overall technical status of the equipment before the end of October every year. Quality evaluations can be organized from time to time for special circumstances such as seasonal changes and frequent failures.

成本管理

Cost management  
cost management

1. 接触网设备维修成本实行预算管理。对达到寿命周期的设备更换在预算内实行项目管理。

The maintenance cost of catenary equipment shall be managed by budget. Implement project management within budget for equipment replacement reaching life cycle.  
The maintenance cost of catenary equipment is subject to budget management. Implement project management within budget for equipment replacements that reach their life cycle.

1. 基础设施维护公司应根据接触网设备使用状况，科学合理安排维修费用，保证接触网设备维修工作顺利实施。

Infrastructure maintenance companies should scientifically and reasonably arrange maintenance costs according to the use status of catenary equipment to ensure the smooth implementation of catenary equipment maintenance.  
Infrastructure maintenance companies should scientifically and reasonably arrange maintenance costs based on the use status of catenary equipment to ensure the smooth implementation of catenary equipment maintenance work.

1. 维修基地供电队应根据预算对成本费用预测、分析和审核。

The maintenance base power supply team shall forecast, analyze and review the cost according to the budget.  
The power supply team of the maintenance base shall predict, analyze and review the costs according to the budget.

1. 基础设施维护公司应建立以预算管理为核心的成本核算体系，以及维修基地、供电队、供电组预算责任考核机制，发挥主要职能科室的作用，加强成本管理，严格成本控制。

Infrastructure maintenance companies should establish a cost accounting system with budget management as the core, and a budget responsibility assessment mechanism for maintenance bases, power supply teams and power supply groups, give full play to the role of major functional departments, strengthen cost management and strictly control costs.  
Infrastructure maintenance companies should establish a cost accounting system with budget management as the core, as well as a budget responsibility assessment mechanism for maintenance bases, power supply teams, and power supply groups, give full play to the role of major functional departments, strengthen cost management, and strictly control cost.

1. 基础设施维护公司应定期召开经济活动分析会，检查成本费用情况，分析超支原

The infrastructure maintenance company shall hold regular economic activity analysis meetings to check the cost and expenses and analyze the overspending  
Infrastructure maintenance companies should hold regular economic activity analysis meetings to check costs and expenses and analyze the causes of overruns.

因，提出整改措施；应大力开展技术革新活动，努力降低能源、材料消耗，严禁支出超预算。

Because, put forward corrective measures; We should vigorously carry out technological innovation activities, strive to reduce energy and material consumption, and prohibit expenditure exceeding budget.  
Therefore, propose rectification measures; vigorously carry out technological innovation activities, strive to reduce energy and material consumption, and strictly prohibit expenditures exceeding budgets.

新产品试运行

Trial operation of new products  
Trial run of new products

1. 在运营接触网线路上进行新产品试运行时，技术科应事先提出书面申请报告，按规定权限报有关部门，经批准并与承接试运行任务的供电队签订协议后方可实施。新产品试运行申请报告应包括下列内容：

When a new product is put into trial operation on the operating catenary line, the technical department shall submit a written application report in advance, report it to the relevant departments according to the prescribed authority, and implement it only after approval and signing an agreement with the power supply team undertaking the trial operation task. The application report for trial operation of new products shall include the following contents:  
When conducting trial operation of new products on the operating catenary line, the technical department shall submit a written application report in advance and report it to the relevant department according to the prescribed authority. It can be implemented only after approval and signing an agreement with the power supply team undertaking the trial operation task. The new product commissioning application report shall include the following contents:

1. 产品生产及管理条件；

Production and management conditions of products;  
Product production and management conditions;

1. 产品研制报告；

Product development report;  
Product development report;

1. 产品技术条件及型式试验报告；

Product technical conditions and type test report;  
Product technical conditions and type test report;

1. 安装维修及使用说明；

Installation, maintenance and instructions for use;  
Installation, maintenance and use instructions;

1. 拟安装地点、试运行期限，以及试运行中需检测内容。

Proposed installation location, trial operation period, and contents to be tested during trial operation.  
Proposed installation location, commissioning period, and content to be tested during commissioning.

1. 承力索、接触线试运行由基础设施维护公司审批，其余设备及零部件试运行申请报告应供电队审查，由基础设施维护公司批准。

The trial operation of load-bearing cables and contact lines shall be approved by the infrastructure maintenance company, and the trial operation application report of other equipment and parts shall be reviewed by the power supply team and approved by the infrastructure maintenance company.  
The trial operation of power bearing cables and contact wires shall be approved by the infrastructure maintenance company, and the trial operation application report of other equipment and parts shall be reviewed by the power supply team and approved by the infrastructure maintenance company.

1. 供电队承接试运行任务后应及时组织实施。试运行期间要按规定加强监测、检查和维护，认真记录分析运行情况。试运行期满后提交新产品试运行报告。

The power supply team shall organize the implementation in time after undertaking the trial operation task. During the trial operation, monitoring, inspection and maintenance should be strengthened according to regulations, and the operation situation should be carefully recorded and analyzed. Submit the trial operation report of new products after the trial operation expires.  
After the power supply team undertakes the trial operation task, it shall organize and implement it in a timely manner. During the trial operation, monitoring, inspection and maintenance must be strengthened according to regulations, and the operation conditions must be carefully recorded and analyzed. Submit a new product trial operation report after the trial operation expires.

1. 供电队出具的试运行报告需经基础设施维护公司审批后，方能交给技术科。未经基础设施维护公司审批的试运行报告无效。

The trial operation report issued by the power supply team shall be approved by the infrastructure maintenance company before being submitted to the technical department. The test run report without the approval of the infrastructure maintenance company is invalid.  
The commissioning report issued by the power supply team must be approved by the infrastructure maintenance company before it can be submitted to the technical department. Commissioning reports that are not approved by the infrastructure maintenance company are invalid.

1. 新产品试运行期一般不少于 1 年。遇有产品质量缺陷危及安全时必须立即拆除，同时做好记录并通知研制单位。

The trial operation period of new products is generally not less than 1 year. In case of product quality defects endangering safety, it must be removed immediately, and records should be made and notified to the research unit.  
The trial operation period of new products is generally no less than 1 year. In case of product quality defects that endanger safety, they must be dismantled immediately, and records should be made and the development unit should be notified.

第三章 检测与分析诊断检测

Chapter III Detection and Analysis Diagnostic Detection  
Chapter 3 Testing and Analysis Diagnostic Testing

1. 检测是指利用仪器、设备或人工等方式，对接触网进行检查测量，掌握设备质量及运行状态的过程。包含监测、静态与动态检测、检查、零部件检验四部分。检测后必须进行分析诊断，并以此作为编制维修计划的依据。

Testing refers to the process of checking and measuring the catenary by means of instruments, equipment or manpower, and mastering the quality and running status of equipment. It includes four parts: monitoring, static and dynamic detection, inspection and parts inspection. After testing, analysis and diagnosis must be carried out, which can be used as the basis for compiling maintenance plan.  
Inspection refers to the process of inspecting and measuring the catenary by using instruments, equipment or labor to grasp the quality and operating status of the equipment. It includes four parts: monitoring, static and dynamic testing, inspection, and parts inspection. Analysis and diagnosis must be carried out after testing and used as the basis for preparing maintenance plans.

监测

monitoring  
monitoring

1. 监测是对接触网外观、零部件状态、主导电回路、绝缘状况、外部环境和弓网配合等运行状态进行监视测量的过程，分为移动视频监测和定点监测两种方式。

Monitoring is a process of monitoring and measuring the appearance of catenary, parts status, main electrical circuit, insulation status, external environment and pantograph-catenary cooperation, which is divided into two ways: mobile video monitoring and fixed-point monitoring.  
Monitoring is the process of monitoring and measuring the operating conditions of the catenary appearance, parts status, main conductive circuit, insulation status, external environment and coordination with the pantograph and catenary. It is divided into two methods: mobile video monitoring and fixed-point monitoring.

1. 移动视频监测。利用安装在检测车辆、机车或动车组上的监测设备对接触网进行外观检查。主要包括接触网安全巡检装置（2C）、车载接触网运行状态检测装置（3C）、接 触网悬挂状态检测监测装置（4C）。

Mobile video surveillance. Visual inspection of catenary is carried out by monitoring equipment installed on inspection vehicles, locomotives or EMUs. It mainly comprises a catenary safety inspection device (2C), a vehicle-mounted catenary operation state detection device (3C) and a catenary suspension state detection and monitoring device (4C).  
Mobile video monitoring. Conduct a visual inspection of the catenary using monitoring equipment installed on the test vehicle, locomotive or EMU. It mainly includes the catenary safety inspection device (2C), the vehicle-mounted catenary operating state detection device (3C), and the catenary suspension state detection and monitoring device (4C).

1. 定点监测。利用安装在接触网关键处所、特殊地点的监测设备，监测列车通过时接触网或受电弓状态，接触网设备绝缘状态、温度、位移变化，以及外部环境是否存在异常。主要包括受电弓滑板监测装置（5C）、接触网及供电设备地面监测装置（6C）。

Fixed-point monitoring. Monitoring equipment installed at key places and special places of catenary is used to monitor the status of catenary or pantograph, insulation status of catenary equipment, temperature and displacement changes, and whether there is abnormality in external environment. It mainly includes pantograph slide plate monitoring device (5C), catenary and power supply equipment ground monitoring device (6C).  
Targeted monitoring. Use monitoring equipment installed in key locations and special locations of the catenary to monitor the status of the catenary or pantograph when the train passes through, changes in the insulation status, temperature, and displacement of the catenary equipment, and whether there are abnormalities in the external environment. It mainly includes the pantograph slide monitoring device (5C), the contact line and power supply equipment ground monitoring device (6C).

1. 接触网安全巡检装置（2C）周期：10 天。

OCS safety inspection device (2C) cycle: 10 days.  
Contact line safety inspection device (2C) cycle: 10 days.

主要内容：监测接触网设备有无明显脱、断、偏移及其他异常情况，有无鸟巢、危树等可能危及接触网供电的周边环境因素，有无侵入限界、妨碍机车车辆运行的障碍等。

Main contents: Monitor whether the catenary equipment is obviously disconnected, broken, offset and other abnormal conditions, whether there are surrounding environmental factors such as bird's nest and dangerous trees that may endanger the power supply of catenary, whether there are obstacles that invade the gauge and hinder the operation of locomotives and rolling stock, etc.  
Main contents: Monitor whether the overhead contact line equipment has obvious detachment, breakage, deviation and other abnormal conditions, whether there are surrounding environmental factors such as bird nests and dangerous trees that may endanger the power supply of the overhead contact line, whether there are obstacles that invade the boundaries, hinder the operation of locomotives, etc.

1. 车载接触网运行状态检测装置（3C）周期：实时或定期。

Vehicle-mounted catenary running state detection device (3C) cycle: real-time or regular.  
Vehicle catenary operating status detection device (3C) cycle: real-time or regular.

主要内容：监测接触网与受电弓运行状态、接触网温度等。 180．接触网悬挂状态检测监测装置（4C）

Main contents: Monitor the running state of catenary and pantograph, catenary temperature, etc. 180. Catenary suspension status detection and monitoring device (4C)  
Main content: Monitor the operating status of catenary and pantograph, catenary temperature, etc. 180. Contact line suspension status detection and monitoring device (4C)

周期：6 个月。

Cycle: 6 months.  
Cycle: 6 months.

主要内容：监测接触网设备零部件有无烧伤、缺失、断裂、松动及其他异常情况。 181．受电弓滑板监测装置（5C）

Main contents: Monitor whether the parts of catenary equipment are burned, missing, broken, loose and other abnormal conditions. 181. Pantograph Slide Monitoring Device (5C)  
Main content: Monitor contact line equipment components for burns, missing, broken, loose and other abnormalities. 181. Pantograph slide monitoring device (5C)

周期：实时或定期。

Cycle: Real-time or regular.  
Cycle: real-time or regular.

主要内容：监测受电弓有无异常状态。 182．接触网及供电设备地面监测装置（6C）

Main contents: Monitor whether there is abnormal state of pantograph. 182. Ground monitoring device for catenary and power supply equipment (6C)  
Main content: Monitor the pantograph for abnormal conditions. 182. Ground monitoring device for catenary and power supply equipment (6C)

1. 绝缘部件状态监测。Ⅲ、Ⅳ污秽等级区段应建立领示点，优先采用在线实时监测装置。

Condition monitoring of insulating parts. Pilot points should be established in pollution grade III and IV sections, and online real-time monitoring devices should be preferred.  
Monitoring the condition of insulating parts. Pilot points should be established in the III and IV pollution level sections, and online real-time monitoring devices should be preferred.

周期：（a）在线监测装置：实时；

Cycle: (a) Online monitoring device: real-time;  
Cycle: (a) Online monitoring device: real-time;

（b）其他方式监测：6 个月。

(b) Alternative monitoring: 6 months.  
(b) Monitoring by other methods: 6 months.

主要内容：监测领示点绝缘部件附盐密度或泄漏电流。

Main contents: Monitor the salt density or leakage current of insulation parts at pilot points.  
Main content: Monitor the salt density or leakage current of insulating parts at pilot points.

1. 主导电回路电气节点监测。优先采用在线实时监测装置。周期：（a）在线监测装置：实时；

Monitoring of electrical nodes in main electrical circuit. On-line real-time monitoring devices are preferred. Cycle: (a) Online monitoring device: real-time;  
Monitoring of electrical nodes in the main conductive loop. Priority is given to online real-time monitoring devices. Cycle: (a) Online monitoring device: real-time;

* 1. 示温贴片监测：利用全面检查、步行巡视等方式确认；

Monitoring of temperature indicator patch: confirm by means of comprehensive inspection and walking patrol;  
Temperature indicating patch monitoring: use comprehensive inspection, walking patrol, etc. to confirm;

* 1. 利用紫外成像仪监测电缆终端或中间接头状态（有条件时）：12 个月；

Monitor the status of cable terminal or intermediate joint by ultraviolet imager (when conditions permit): 12 months;  
Monitor the status of cable terminals or intermediate joints with ultraviolet imaging equipment (when conditions permit): 12 months;

* 1. 利用红外热像仪测量电气节点接触状态（有条件时）：12 个月。

Measure the contact state of electrical nodes by infrared thermal imager (when conditions permit): 12 months.  
Measure the contact status of electrical nodes using an infrared camera (when conditions permit): 12 months.

主要内容：监测供电线接续点、电连接线夹、隔离开关设备线夹及触头、吸上线接续点、电缆终端或中间接头等有无过热现象。

Main contents: Monitor whether there is overheating phenomenon in connection points of power supply lines, electrical connection clamps, clamps and contacts of isolating switchgear, connection points of suction lines, cable terminals or intermediate and indirect heads, etc.  
Main content: Monitor for overheating at power supply line connection points, electrical connection clips, isolating switch equipment clips and contacts, suction line connection points, cable terminals or intermediate joints, etc.

利用红外热像仪监测电气节点状态，应选择在被测点有持续负荷电流时进行。

Using infrared thermal imager to monitor the status of electrical nodes, it should be carried out when there is continuous load current at the measured point.  
Using infrared thermal imaging cameras to monitor the status of electrical nodes should be selected when there is continuous load current at the measured point.

利用示温贴片监测电气节点状态时，示温贴片应保持清洁，粘贴位置应能够准确反映线夹温度变化并宜于地面观察。

When monitoring the status of electrical nodes with temperature indicator patches, the temperature indicator patches should be kept clean, and the pasting position should accurately reflect the temperature change of clamps and be suitable for ground observation.  
When using a temperature-indicating patch to monitor the status of electrical nodes, the temperature-indicating patch should be kept clean, and the pasting position should be able to accurately reflect the temperature changes of the clip and be suitable for ground observation.

静态与动态检测

Static and dynamic detection  
Static and dynamic detection

1. 静态检测是指利用运行检测车辆在接触网静止状态下进行非接触式测量，或人工使用仪器、工具测量接触网技术状态。

Static detection refers to non-contact measurement by using running detection vehicles in the static state of catenary, or manually using instruments and tools to measure the technical state of catenary.  
Static testing refers to the use of operating testing vehicles to conduct non-contact measurement when the catenary is still, or the manual use of instruments and tools to measure the technical status of the catenary.

1. 周期：6 个月。项目：（a）线岔；

Cycle: 6 months. Items: (a) Line bifurcation;  
Cycle: 6 months. Project: (a) Crossing;

（b）自动过分相地面磁感应器。

(b) Automatic cross-phase ground magnetic sensors.  
(b) Automatic phase shifting ground magnetic sensors.

1. 周期：12 个月。

Cycle: 12 months.  
Cycle: 12 months.

项目：（a）接触线几何参数（接触线拉出值、跨中偏移值、接触线高度、接触线坡度）；

Items: (a) Geometric parameters of contact line (contact line pull-out value, mid-span offset value, contact line height, contact line slope);  
Items: (a) Contact line geometric parameters (contact line pull-out value, mid-span offset value, contact line height, contact line slope);

1. 绝缘锚段关节、关节式分相；

Insulated anchor joint, joint phase separation;  
Insulating anchor section articulated and articulated phase separation;

1. 轨面标准线。

Standard line of rail surface.  
Rail surface standard line.

1. 周期：36 个月。

Cycle: 36 months.  
Cycle: 36 months.

项目：（a）非绝缘锚段关节；

Items: (a) Non-insulated anchor joint;  
Project: (a) Uninsulated anchor segment joints;

（b）补偿装置。

(b) Compensating devices.  
(b) Compensation device.

1. 周期：60 个月。项目：接地电阻。

Cycle: 60 months. Item: Grounding resistance.  
Cycle: 60 months. Project: Ground resistance.

1. 不定期检测项目：对动态检测超限处所进行静态复核、确认。上述未明确的设备和项目，纳入检查内容。

Irregular inspection items: static review and confirmation of the places where the dynamic inspection exceeds the limit. The above-mentioned unclear equipment and items shall be included in the inspection contents.  
Unscheduled inspection items: Conduct static review and confirmation of places where the dynamic inspection exceeds the limit. The above-mentioned unclear equipment and items will be included in the inspection content.

1. 动态检测是指利用弓网综合检测装置（1C）、车载接触网运行状态检测装置（3C）等手段，测量接触网技术状态及弓网接触取流状态。

Dynamic detection refers to measuring the technical state of catenary and the current extraction state of pantograph-catenary contact by means of pantograph-catenary comprehensive detection device (1C) and vehicle-mounted catenary operation state detection device (3C).  
Dynamic detection refers to measuring the technical status of the catenary and the contact current taking status of the catenary by means such as the comprehensive detection device (1C) and the vehicle-mounted catenary operating status detection device (3C).

1. 弓网综合检测装置（1C）周期：3 个月。

Cycle of pantograph-catenary comprehensive detection device (1C): 3 months.  
The cycle of the Pantograph Comprehensive Inspection Device (1C): 3 months.

项目：（a）接触线动态拉出值、高度；

Items: (a) Dynamic pull-out value and height of contact wire;  
Project: (a) Dynamic pull-out value and height of contact wire;

1. 硬点、一跨内接触线高差；

Hard point, height difference of contact line within one span;  
Hard points and contact line height difference within one span;

1. 弓网接触力、燃弧、接触线抬升量； 4.接触网电压。

Pantograph-catenary contact force, arc and contact line uplift; 4. Catenary voltage.  
Pantograph contact force, arcing, contact line lift; 4. Contact line voltage.

1. 车载接触网运行状态检测装置（3C）

Vehicle-mounted catenary running state detection device (3C)  
On-board catenary operating status detection device (3C)

周期：实时或定期。

Cycle: Real-time or regular.  
Cycle: real-time or regular.

项目：（a）接触线动态拉出值、高度、接触线的相互位置；

Items: (a) Dynamic pull-out value of contact wires, height and mutual position of contact wires;  
Items: (a) Dynamic pull-out value, height, and mutual position of contact wires;

1. 燃弧次数、燃弧时间、燃弧率；

Arc times, arc time and arc rate;  
Number of arcing, arcing time, arcing rate;

1. 接触网温度。

Catenary temperature.  
Contact line temperature.

检查

check  
check

1. 检查分为巡视检查、全面检查、单项设备检查和非常规检查。

Inspection is divided into patrol inspection, comprehensive inspection, single equipment inspection and unconventional inspection.  
The inspections are divided into patrol inspections, comprehensive inspections, individual equipment inspections and unconventional inspections.

巡视检查是对接触网外观、绝缘部件状态、外部环境及电力机车、动车组取流情况进行目视检查，分为步行巡视检查和登乘巡视检查。

Patrol inspection is a visual inspection of catenary appearance, insulation component status, external environment and current extraction of electric locomotives and EMUs, which is divided into walking patrol inspection and boarding patrol inspection.  
Inspection is a visual inspection of the appearance of the contact line, the status of insulation parts, the external environment and the current intake of electric locomotives and EMU. It is divided into walking inspection and boarding inspection.

全面检查、单项设备检查具有检查、测量和试验等多重职能。针对无法或不易通过静态和动态检测、监测手段掌握设备及零部件运行状态的所有项目，利用天窗在接触网作业车作业平台、车梯或支柱上进行近距离检查，并进行必要的测量和试验等。全面检查是对所有设备进行检查；单项设备检查是对个别设备进行专项检查，并兼有维护保养职能。

Comprehensive inspection and single equipment inspection have multiple functions such as inspection, measurement and test. For all items that can't or can't master the running status of equipment and parts by static and dynamic detection and monitoring means, use skylights to carry out close inspection on the working platform, ladder or pillar of catenary working vehicle, and carry out necessary measurements and tests. Comprehensive inspection is to inspect all equipment; Single equipment inspection is a special inspection of individual equipment, and has the function of maintenance.  
Comprehensive inspection and individual equipment inspection have multiple functions such as inspection, measurement and testing. For all items where the operating status of equipment and parts cannot or cannot be grasped through static and dynamic testing and monitoring means, use sunlights to conduct close inspections on the operating platform, ladder or pillar of the catenary work vehicle, and carry out necessary measurements and tests. etc. A comprehensive inspection is to inspect all equipment; a single equipment inspection is to conduct a special inspection of individual equipment and has maintenance functions.

非常规检查通常在特殊情况下或根据需要进行。 186．步行巡视检查

Unconventional inspections are usually carried out under special circumstances or as needed. 186. Walking patrol inspection  
Non-routine inspections are usually carried out under special circumstances or as needed. 186. Walking inspection

周期：对接触网安全巡检装置不易到达的专用线、联络线、支线、车站侧线、远离线路的供电线等处所，巡视周期 1 个月；对接触网安全巡检装置能够到达的线路，巡视周期 3 个月。

Period: For special lines, tie lines, branch lines, station side lines, power supply lines far away from the lines, etc., which are difficult to reach by the catenary safety inspection device, the inspection period is 1 month; For the lines that can be reached by the catenary safety inspection device, the inspection period is 3 months.  
Cycle: For special lines, tie lines, branch lines, station sidings, power supply lines far away from the lines and other places that are not easy to reach by the catenary safety inspection device, the inspection cycle is 1 month; for lines that can be reached by the catenary safety inspection device, the inspection cycle is 3 months.

主要内容：

Main contents:  
Main content:

1. 有无侵入限界、妨碍列车运行的障碍。

Whether there are any obstacles that invade the gauge and hinder the train operation.  
Whether there are obstacles that intrude into the clearance and hinder the operation of the train.

1. 各种线索（包括供电线、回流线、吸上线和软横跨线索等）、零部件、各种供电附属设施等有无烧损、松脱、偏移等情况。

Whether all kinds of clues (including power supply line, return line, suction line and soft cross line, etc.), parts and various power supply ancillary facilities are burned, loosened and deviated.  
Whether various clues (including power supply lines, return lines, suction lines and soft crossing clues, etc.), parts and components, various power supply auxiliary facilities, etc. are burned, loose, offset, etc.

1. 补偿装置有无损坏，动作是否灵活。

Whether the compensation device is damaged or not, and whether the action is flexible.  
Whether the compensation device is damaged and whether the action is flexible.

1. 绝缘部件（包括避雷器、电缆终端）有无破损和闪络。

Damage and flashover of insulating parts (including lightning arrester and cable terminal).  
Check for damage and flashover of insulating parts (including lightning arresters, cable terminals).

1. 吸上线及各部地线的连接是否良好。

Whether the connection between the suction wire and the ground wire of each part is good.  
Whether the connection between the suction wires and ground wires of each part is good.

1. 支柱、拉线与基础有无破损、下陷、变形等异常。

Whether there are any abnormalities such as damage, subsidence and deformation of pillars, stay wires and foundations.  
Whether there are any abnormalities such as damage, subsidence, deformation, etc. in the pillars, cables and foundations.

1. 限界门、安全挡板或网栅、各种标识是否齐全、完整。

Whether the clearance door, safety baffle or grid and various marks are complete and complete.  
Whether the clearance door, safety baffle or grid, and various signs are complete and complete.

1. 自动过分相地面磁感应器有无缺损、破裂或丢失。

Whether the ground magnetic sensor of automatic passing phase is defective, broken or lost.  
Whether there is any defect, rupture or loss of the automatic phase passing ground magnetic sensor.

1. 有无因塌方、落石、山洪水害、施工作业及其他周边环境等危及接触网供电和行车安全的现象。

Whether there are any phenomena that endanger the power supply and driving safety of catenary due to landslides, falling rocks, mountain torrents, construction operations and other surrounding environments.  
Whether there are any phenomena that endanger OCS power supply and driving safety due to landslides, rockfalls, flash floods, construction operations and other surrounding environments.

1. 登乘巡视检查周期：需要时。

Boarding patrol inspection cycle: when necessary.  
Boarding inspection cycle: When necessary.

主要内容：接触网状态及外部环境，有无侵入限界、妨碍列车运行的障碍，有无因异物、落石、山洪水害、施工作业及其他周边环境等危及接触网供电和行车安全的现象。绝缘部件有无闪络放电现象以及电力机车、动车组受电弓取流情况。

Main contents: OCS status and external environment, whether there are obstacles that invade the gauge and hinder train operation, and whether there are phenomena that endanger OCS power supply and driving safety due to foreign bodies, falling rocks, mountain torrents, construction operations and other surrounding environments. Whether there is flashover discharge phenomenon in insulating parts and pantograph current extraction of electric locomotives and EMUs.  
Main contents: The status of the OCS and the external environment, whether there are obstacles that invade the limit and hinder the operation of the train, whether there are phenomena that endanger the OCS power supply and driving safety due to foreign matter, falling rocks, mountain floods, construction operations and other surrounding environments. Whether there is flashover discharge on insulating parts and current taking from pantographs of electric locomotives and EMU.

1. 供电队队长每半年对管内设备至少巡视检查 1 次，维修基地主任每年对管内关键

The captain of the power supply team shall patrol and inspect the equipment in the pipe at least once every six months, and the director of the maintenance base shall inspect the key points in the pipe every year  
The leader of the power supply team inspects the equipment in the pipeline at least once every six months, and the director of the maintenance base inspects the key points in the pipeline every year.

设备至少巡视检查 1 次。 189．全面检查

Patrol the equipment at least once. 189. Comprehensive inspection  
Equipment shall be inspected at least once. 189. comprehensive inspection

周期：36 个月。主要内容：

Cycle: 36 months. Main contents:  
Cycle: 36 months. Main content:

1. 无法或不易通过监测、检测或其他检查手段掌握设备运行状态的所有项目，如接触悬挂、定位支撑装置、支柱（含拉线）和基础、附加悬挂、接地装置、标识等螺栓是否齐全，有无松脱现象，零部件安装方式是否正确、有无裂纹、变形、烧伤，线索有无锈蚀、散股、断股、烧伤等。

It is impossible or difficult to master the running status of equipment by monitoring, testing or other inspection means, such as whether the bolts such as contact suspension, positioning support device, strut (including stay wire) and foundation, additional suspension, grounding device and identification are complete and loose, whether the installation mode of parts is correct, whether there are cracks, deformation and burns, and whether the clues are rusted, scattered, broken and burned, etc.  
All items that cannot or cannot easily grasp the operating status of the equipment through monitoring, testing or other inspection means, such as whether the bolts such as contact suspension, positioning support devices, pillars (including pull wires) and foundations, additional suspension, grounding devices, signs, etc. are complete and whether there are any loose phenomena, whether the parts are installed correctly, whether there are cracks, deformation, burns, clues whether there are rust, loose strands, etc.

1. 重点处所的附加导线对地距离及线索、引线、接触悬挂间距测量，接触线重点磨耗测量，高压电缆绝缘测试。

Measure the distance between additional wires and ground and the distance between clues, leads and contact suspension in key places, measure the key wear of contact wires, and test the insulation of high-voltage cables.  
Measurement of the ground distance and spacing between wires, leads, and contact suspension of additional wires in key places, measurement of key wear of contact wires, and insulation testing of high-voltage cables.

1. 利用接触网作业车检测受电弓检查动态包络线。 190．单项设备检查

Using catenary operation vehicle to detect pantograph and check dynamic envelope. 190. Inspection of individual equipment  
Use the catenary operating vehicle to detect the pantograph and check the dynamic envelope line. 190. Inspection of individual equipment

周期和项目：

Cycles and projects:  
Cycles and projects:

（1）6 个月检查 1 次的项目：

(1) Items checked once every 6 months:  
(1) Items inspected once every 6 months:

1. 分段绝缘器；

Sectional insulator;  
Sectional insulators;

1. 分相绝缘器；

Split-phase insulator;  
Phase-separated insulators;

1. 远动隔离开关及其操作机构。

Telecontrol isolating switch and its operating mechanism.  
Remote actuation isolating switch and its operating mechanism.

（2）12 个月检查 1 次的项目：

(2) Items checked once every 12 months:  
(2) Items inspected once every 12 months:

1. 避雷装置（雷雨季节前，含接地电阻测量）；

Lightning protection device (before thunderstorm season, including grounding resistance measurement);  
Lightning protection device (before thunderstorm season, including grounding resistance measurement);

1. 非远动隔离开关；

Non-telecontrol isolating switch;  
Non-remote actuation isolating switch;

1. 高压电缆及附件。

High voltage cables and accessories.  
High-voltage cables and accessories.

1. 非常规检查是指在特殊情况下进行的状态检查。一般用于在接触网发生跳闸、故障或出现极端天气气候条件和灾害后，对相应接触网设备状态变化、损伤、损坏情况进行检

Unconventional inspection refers to the status inspection under special circumstances. Generally, it is used to check the state change, damage and damage of the corresponding catenary equipment after the catenary trips, faults or extreme weather and climate conditions and disasters  
Extraordinary inspections refer to status inspections carried out under special circumstances. Generally used to inspect the status changes, damage and damage of the corresponding contact line equipment after the contact line trips, faults, or extreme weather, climate conditions and disasters occur.

查。非常规检查的范围和手段根据检查目的确定。

Check. The scope and means of non-routine inspection shall be determined according to the inspection purpose.  
Check. The scope and means of non-routine inspections are determined according to the purpose of the inspection.

零部件检验

Parts inspection  
Parts inspection

1. 零部件检验是指对拆卸送检的接触网零部件进行外观检查、补充特殊试验等，确认其质量状态的过程。零部件性能下降、状态劣化，判定即将或基本达到寿命时，应进行更换。

Parts inspection refers to the process of appearance inspection, supplementary special tests, etc., and confirming the quality status of catenary parts that are disassembled and sent for inspection. When the performance of parts declines, the state deteriorates, and it is judged that they are about to reach or basically reach their service life, they should be replaced.  
Parts inspection refers to the process of conducting visual inspection, supplementary special tests, etc. on the catenary parts that are disassembled and submitted for inspection to confirm their quality status. Parts should be replaced when the performance and condition of components degrade, and it is determined that their life is about to reach or basically reaching their end.

1. 当接触网零部件接近预期寿命，或日常检查发现存在质量隐患、无法确认其能否在预期寿命周期内安全运行时，应对该类批零部件进行抽样质量检验。

When the catenary parts are close to the expected life, or there are potential quality hazards found in daily inspection, and it is impossible to confirm whether they can operate safely in the expected life cycle, sampling quality inspection shall be carried out for such batch parts.  
When contact line parts are close to the expected life, or when daily inspections find quality hazards and it is impossible to confirm whether they can operate safely within the expected life cycle, sampling quality inspection of such batches of parts should be conducted.

1. 对满足下列情况之一，应根据分析结果进行专项或抽样质量检验。

To meet one of the following conditions, special or sampling quality inspection shall be carried out according to the analysis results.  
Special or sampling quality inspection shall be conducted based on the analysis results for any of the following conditions.

1. 发现同一处所或部位重复发生磨损、裂纹、腐蚀、烧损等异常现象时。

When abnormal phenomena such as wear, crack, corrosion and burning are found repeatedly in the same place or part.  
When abnormal phenomena such as wear, cracks, corrosion, and burning loss are found to occur repeatedly in the same place or part.

1. 特殊环境（大风、严寒、沿海、潮湿、隧道、周边有严重污染源等）区段检查发现接触网零部件状态劣化，表面腐蚀或磨损明显，需确认其是否能够继续安全使用时。

In special environment (strong wind, severe cold, coastal, humid, tunnel, serious pollution sources around, etc.), it is found that the state of catenary parts is deteriorated, and the surface corrosion or wear is obvious, so it is necessary to confirm whether they can continue to be used safely.  
Inspection of sections in special environments (strong winds, severe cold, coastal areas, humidity, tunnels, surrounding areas with serious pollution sources, etc.) found that the condition of contact line parts is deteriorated and the surface is obviously corroded or worn. It is necessary to confirm whether they can continue to be used safely.

1. 检测发现接触网参数与初始参数对比变化较大，经分析确认其与连接的零部件性能关联性较大时。

It is found that the catenary parameters change greatly compared with the initial parameters, and it is confirmed by analysis that it has a great correlation with the performance of connected parts.  
When the test found that the parameters of the catenary have changed greatly compared with the initial parameters, and analysis confirmed that they have a great correlation with the performance of the connected parts.

1. 区段内接触网零部件脱落、裂损、烧伤等故障多发时。

When faults such as falling off, cracking and burns of catenary parts in the section occur frequently.  
When faults such as falling off, cracking, and burning of catenary parts in the section occur frequently.

1. 需要检验判断确认零部件运行状态或预期残余寿命时。 195．零部件检验应由专业检验机构进行，并出具检验报告。

When it is necessary to check and judge to confirm the running status or expected residual life of parts. 195. The inspection of parts shall be carried out by a professional inspection agency and an inspection report shall be issued.  
When inspection and judgment are needed to confirm the operating status or expected residual life of parts. 195. The inspection of parts and components shall be carried out by a professional inspection institution and an inspection report shall be issued.

1. 零部件检验结果应纳入分析诊断和质量鉴定报告，作为接触网设备维修的依据。

The inspection results of parts should be included in the analysis, diagnosis and quality appraisal report as the basis for the maintenance of catenary equipment.  
The inspection results of parts and components should be included in the analysis, diagnosis and quality appraisal report as the basis for maintenance of catenary equipment.

分析诊断

Analytical diagnosis  
analysis and diagnosis

1. 分析诊断是根据接触网检测结果，判断设备运行状态、判定缺陷等级，为维修提供依据。分析诊断包括即时分析诊断、定期分析诊断。

Analysis and diagnosis is to judge the running state of equipment and the defect grade according to the inspection results of catenary, which provides the basis for maintenance. Analysis and diagnosis include immediate analysis and diagnosis and periodic analysis and diagnosis.  
Analysis and diagnosis are based on the inspection results of the catenary to judge the operating status of the equipment and determine the level of defects, and provide a basis for maintenance. Analytical diagnosis includes immediate analytical diagnosis and regular analytical diagnosis.

1. 检测监测设备报警或发生危及行车信息时，应立即进行即时分析诊断。

When the detection and monitoring equipment gives an alarm or endangers driving information, it should be analyzed and diagnosed immediately.  
When the detection and monitoring equipment alarms or dangerous driving information occurs, immediate analysis and diagnosis should be carried out immediately.

1. 当弓网综合检测装置（1C）、车载接触网运行状态检测装置（3C）、受电弓滑板监测装置（5C）和接触网及供电设备地面监测装置（6C）等设备出现报警、异常信息时，应立即分析原因并安排处理。

When alarm and abnormal information appear in pantograph-catenary comprehensive detection device (1C), vehicle-mounted catenary operation state detection device (3C), pantograph skateboard monitoring device (5C) and catenary and power supply equipment ground monitoring device (6C), the reasons should be analyzed immediately and dealt with.  
When alarm or abnormal information occurs in equipment such as the pantograph and catenary comprehensive detection device (1C), the vehicle-mounted catenary operating status detection device (3C), the pantograph slide monitoring device (5C), and the catenary and power supply equipment ground monitoring device (6C), the cause should be analyzed immediately and treatment should be arranged.

1. 当接触网安全巡检装置（2C）、接触网悬挂状态检测监测装置（4C）及静态检测发现严重缺陷、状态异常时，接触网检测专员应立即分析设备缺陷对接触网运行产生的影响，报相关维修基地安排处理。

When the catenary safety inspection device (2C), catenary suspension state detection and monitoring device (4C) and static inspection find serious defects and abnormal state, the catenary inspector shall immediately analyze the influence of equipment defects on catenary operation and report to the relevant maintenance base for arrangement and treatment.  
When serious defects or abnormal conditions are found in the catenary safety inspection device (2C), catenary suspension status inspection and monitoring device (4C), and static inspection, the catenary inspection specialist shall immediately analyze the impact of equipment defects on the operation of the catenary and report them to relevant maintenance bases to arrange handling.

1. 定期检测工作完成后，接触网运行组应在下表时限内完成定期分析诊断。

After the completion of regular inspection, the OCS operation group shall complete regular analysis and diagnosis within the time limit in the following table.  
After the regular testing work is completed, the catenary operation team shall complete regular analysis and diagnosis within the time limit in the table below.

|  |  |  |
| --- | --- | --- |
| 装置名称  Device name device name | 分析项点  Analysis item point analysis item | 完成时限  Time limit for completion completion time limit |

|  |  |  |
| --- | --- | --- |
| 1C | 缺陷数据  Defect data defect data | 3日  3 days on the 3 rd |
| 全面分析  Comprehensive analysis comprehensive analysis | 10 日  10 days on the 10 th |
| 2C | 季节性、关键性问题  Seasonal, key issues Seasonal, key issues | 1日  1 day from 1 |
| 全面分析  Comprehensive analysis comprehensive analysis | 3日  3 days on the 3 rd |
| 3C | 缺陷数据  Defect data defect data | 3日  3 days on the 3 rd |
| 全面分析  Comprehensive analysis comprehensive analysis | 10 日  10 days on the 10 th |
| 4C | 季节性、关键性问题  Seasonal, key issues Seasonal, key issues | 3日  3 days on the 3 rd |
| 全面分析  Comprehensive analysis comprehensive analysis | 20 日  20 th on the 20 th |
| 5C、6C | 全面分析  Comprehensive analysis comprehensive analysis | 1日  1 day from 1 |

1. 当检查和人工静态检测发现设备缺陷时，由发现作业组分析并纳入维修处理。 当零部件检验发现质量缺陷，基础设施维护公司技术科应立即分析零部件质量缺陷对接

When inspection and manual static inspection find equipment defects, the discovery operation group will analyze them and bring them into maintenance treatment. When the quality defects are found in the inspection of parts, the technical department of the infrastructure maintenance company shall immediately analyze the quality defects of parts  
When equipment defects are discovered in inspection and manual static testing, the discovery operation team will analyze them and incorporate them into maintenance treatment. When quality defects are found in parts inspection, the technical department of the infrastructure maintenance company shall immediately analyze the connection of quality defects of parts.

触网运行产生的影响，并安排修理。

Touch the influence of net operation, and arrange repair.  
Touch the impact of network operation and arrange repairs.

当发生跳闸、中断供电、打碰受电弓等异常情况时，基础设施维护公司技术科应立即组织对该区段检测资料进行分析诊断，查找原因并修理。

In case of tripping, power supply interruption, pantograph collision and other abnormal conditions, the technical department of the infrastructure maintenance company shall immediately organize the analysis and diagnosis of the detection data of this section, find out the reasons and repair them.  
When abnormal circumstances such as tripping, interruption of power supply, and contact with pantographs occur, the technical department of the infrastructure maintenance company shall immediately organize analysis and diagnosis of the inspection data of the section, find out the cause and repair it.

1. 根据检测结果，对设备的运行状态用标准值、警示值和限界值三种量值来界定。标准值为标准状态目标值，一般根据设计值确定。

According to the test results, the running state of the equipment is defined by three values: standard value, warning value and limit value. The standard value is the standard state target value, which is generally determined according to the design value.  
According to the test results, the operating state of the equipment is defined by three types of values: standard value, warning value and limit value. The standard value is the standard state target value and is generally determined based on the design value.

警示值为运行状态提示值，一般根据设备技术条件允许偏差确定。限界值为运行状态安全临界值，一般根据计算或运行实践确定。 标准状态是设备最佳运行状态，一般根据施工允许偏差确定。 202．根据设备运行状态值，设备缺陷分为两级。

The warning value is the operation status prompt value, which is generally determined according to the allowable deviation of equipment technical conditions. The threshold value is the critical value of safety in operation state, which is generally determined according to calculation or operation practice. Standard state is the best running state of equipment, which is generally determined according to the allowable deviation of construction. 202. According to the operating status value of equipment, equipment defects are divided into two levels.  
The warning value is the operating status prompt value and is generally determined according to the allowable deviation of equipment technical conditions. The limit value is the safe critical value for operating conditions and is generally determined based on calculation or operation practice. The standard state is the optimal operating state of the equipment and is generally determined based on the allowable deviation of construction. 202. Equipment defects are divided into two levels based on equipment operating status values.

1. 静态设备缺陷等级划分

Classification of static equipment defect grade  
Classification of static equipment defect levels

一级缺陷：达到或超出限界值。

First-class defect: reaching or exceeding the limit value.  
Level 1 defect: reaching or exceeding the limit value.

二级缺陷：达到或超出警示值且在限界值以内。

Secondary defect: it reaches or exceeds the warning value and is within the limit value.  
Secondary defect: reaches or exceeds the warning value and is within the limit value.

1. 动态检测缺陷等级划分见附件 13。

See Appendix 13 for the classification of dynamic inspection defects.  
See Annex 13 for dynamic inspection defect level classification.

1. 基础设施维护公司要加强分析诊断人员的培养，定期组织培训，以保证分析诊断的质量。

Infrastructure maintenance companies should strengthen the training of analysis and diagnosis personnel and organize regular training to ensure the quality of analysis and diagnosis.  
Infrastructure maintenance companies should strengthen the training of analysis and diagnosis personnel and organize regular training to ensure the quality of analysis and diagnosis.

第五章 修程修制

Chapter V Repair System  
Chapter 5 Repair procedures and systems

1. 一级修（临时修）是为了使设备状态保持在限界值以内，对导致接触网功能障碍的缺陷、故障立即投入、无事先计划的临时性维修。主要包括一级缺陷的临时性修理、危及接触网供电周边环境因素处理、 导致接触网功能障碍的故障修复（必要时采取降弓、限速、封锁等处置措施）。

First-class repair (temporary repair) is to keep the equipment state within the limit value, and immediately put into operation the defects and faults that lead to catenary dysfunction, without pre-planned temporary repair. It mainly includes temporary repair of primary defects, treatment of environmental factors endangering catenary power supply, and fault repair of catenary dysfunction (taking measures such as bow lowering, speed limit and blockade when necessary).  
First-level maintenance (temporary maintenance) is a temporary maintenance that is carried out immediately without prior planning in order to keep the equipment status within the limit value and immediately put into operation defects and failures that cause the catenary dysfunction. It mainly includes temporary repair of first-level defects, treatment of factors that endanger the surrounding environment of the catenary power supply, and fault repair that causes dysfunction of the catenary (taking disposal measures such as lowering bow, speed limiting, and blocking if necessary).

1. 二级修（综合修）是为了使设备状态保持在警示值以内，对定期检测发现缺陷有组织、有计划的维修，以及设备全面维护保养。主要包括二级缺陷集中修理和设备全面维护保养（必要的防腐和注油等）。二级修（综合修）可结合全面检查进行，或根据缺陷情况有计划地安排。

Secondary repair (comprehensive repair) is to keep the equipment status within the warning value, organize and plan the repair of defects found by regular inspection, and comprehensively maintain the equipment. It mainly includes centralized repair of secondary defects and comprehensive maintenance of equipment (necessary anticorrosion and oiling, etc.). Secondary repair (comprehensive repair) can be carried out in combination with comprehensive inspection, or arranged in a planned way according to defects.  
Second-level maintenance (comprehensive maintenance) is to keep the equipment status within warning values, organize and planned maintenance of defects found in regular inspections, and comprehensive maintenance of equipment. It mainly includes centralized repair of secondary defects and comprehensive maintenance of equipment (necessary anti-corrosion and oil filling, etc.). Secondary repair (comprehensive repair) can be carried out in conjunction with a comprehensive inspection or arranged in a planned manner based on the defects.

1. 对运行年限达到寿命周期且评估后不能满足质量要求，或运行状态不能满足要求

The service life reaches the life cycle and cannot meet the quality requirements after evaluation, or the operation status cannot meet the requirements  
If the operating life reaches the life cycle and cannot meet the quality requirements after evaluation, or the operating status cannot meet the requirements

的设备、零部件应进行更换。

The equipment and parts should be replaced.  
Equipment and parts should be replaced.

部分设备寿命周期可参照下表：

The life cycle of some equipment can refer to the following table:  
The life cycle of some equipment can be referred to the following table:

|  |  |  |
| --- | --- | --- |
| 序号  Serial number serial number | 设备名称  Device name device name | 周期  Period cycle |
| 1 | 分相绝缘器  Split-phase insulator neutral section insulator | 5-8 年  5-8 years 5-8 years |
| 2 | 分段绝缘器  Sectional insulator section insulator | 5-8 年  5-8 years 5-8 years |
| 3 | 地面磁感应器  Ground magnetic sensor ground magnetic inductor | 5-8 年  5-8 years 5-8 years |
| 4 | 整体吊弦  Integral hanging string integral hanger | 10-12 年  10-12 years 10-12 years |
| 5 | 常动隔离开关  Normal isolating switch normally-acting isolating switch | 10-12 年  10-12 years 10-12 years |
| 6 | 避雷器  Lightning arrester arrester | 10-12 年  10-12 years 10-12 years |
| 7 | 滑轮补偿装置  Pulley compensation device pulley compensation device | 10-12 年  10-12 years 10-12 years |
| 8 | 复合绝缘子  Composite insulator composite insulator | 10-12 年  10-12 years 10-12 years |

1. 接触网整体设备寿命周期一般为 20-25 年。鉴于各条线、各地区接触网设备性能和运行条件不同，应根据线路运行速度、运行环境等实际情况，组织进行质量状态评估，达到质量要求的，可适当延长接触网设备的寿命周期。

The life cycle of the whole catenary equipment is generally 20-25 years. In view of the different performance and operating conditions of catenary equipment in different lines and regions, the quality status assessment should be organized according to the actual conditions of line operating speed and operating environment. If the quality requirements are met, the life cycle of catenary equipment can be appropriately prolonged.  
The overall equipment life cycle of OCS is generally 20-25 years. In view of the different performance and operating conditions of OCS equipment in each line and region, quality status assessment should be organized based on actual conditions such as line operating speed and operating environment. If the quality requirements are met, the life cycle of OCS equipment can be appropriately extended.

1. 某一区段接触网设备运行年限达到寿命周期且评估后不能满足质量要求，或供电能力、供电质量不能满足运能运量及线路等级要求时，对接触网整体设备进行更换。

When the operating life of catenary equipment in a certain section reaches the life cycle and cannot meet the quality requirements after evaluation, or the power supply capacity and quality cannot meet the requirements of transportation capacity and line grade, the whole catenary equipment shall be replaced.  
When the operating life of the catenary equipment in a certain section reaches its life cycle and cannot meet the quality requirements after evaluation, or the power supply capacity and power supply quality cannot meet the requirements of transportation capacity and line class, the overall catenary equipment shall be replaced.

一般情况下零部件（包括附加导线的金具）应随设备本体同时更新。特殊情况的零部件、支柱、吊柱等，经基础设施维护公司组织鉴定确认残余使用寿命期后可以不更换。

Under normal circumstances, parts (including hardware fittings with additional wires) should be updated at the same time as the equipment body. Parts, pillars, hanging columns, etc. in special circumstances may not be replaced after the residual service life is confirmed by the appraisal organized by the infrastructure maintenance company.  
Under normal circumstances, parts (including fittings for additional wires) should be updated at the same time as the equipment body. Parts, pillars, hanging pillars, etc. under special circumstances may not be replaced after the infrastructure maintenance company organizes identification and confirms the residual service life.

1. 基础设施维护公司每年应对接触网线路周围 2 公里以内的所有污染源进行调查，确定污秽等级，明确绝缘部件监测监控及清扫维护要求。

The infrastructure maintenance company shall investigate all pollution sources within 2 km around the catenary line every year, determine the pollution level, and specify the monitoring, cleaning and maintenance requirements of insulation components.  
The infrastructure maintenance company should investigate all pollution sources within 2 kilometers around the catenary line every year to determine the pollution level and clarify the requirements for monitoring, monitoring and cleaning and maintenance of insulating components.

绝缘部件清扫周期如下：

The cleaning cycle of insulating parts is as follows:  
Cleaning cycles for insulating parts are as follows:

(1)Ⅰ、Ⅱ级污秽等级区段：3 年。 (2)Ⅲ级及以上污秽等级区段：1 年。 (3)分段、分相绝缘器：6 个月。

(1) Grade I and II pollution grade sections: 3 years. (2) Grade III and above pollution level section: 1 year. (3) Segmented and split-phase insulators: 6 months.  
(1)Level I and II pollution level sections: 3 years. (2)Pollution level III and above: 1 year. (3)Segmented and divided phase insulators: 6 months.

特殊处所应缩短周期，适时安排清扫。潮湿隧道的绝缘部件参照Ⅲ级及以上污秽等级管

Special places should shorten the cycle and arrange cleaning in time. Insulation components of wet tunnels refer to pollution level III and above pipes  
Special places should be shortened and cleaning should be arranged in a timely manner. The insulation parts of wet tunnels shall refer to pipes with pollution levels of Class III and above

理。

Rational.  
Reason.

第六章 质量评价与鉴定

Chapter VI Quality Evaluation and Appraisal  
Chapter 6 Quality Evaluation and Appraisal

质量评价

Quality evaluation  
quality evaluation

1. 质量评价是通过对接触网动态几何参数、接触线平顺性参数、弓网受流性能参数等进行综合分析，掌握设备动态运行功能。

Quality evaluation is to master the dynamic operation function of equipment by comprehensively analyzing the dynamic geometric parameters of catenary, the smoothness parameters of contact line and the current collection performance parameters of pantograph-catenary.  
Quality evaluation is to master the dynamic operation functions of the equipment through comprehensive analysis of the dynamic geometric parameters of the catenary, smoothness parameters of the contact line, and current-receiving performance parameters of the pantograph line.

1. 质量评价一般以正线公里为单元，根据每公里接触网扣分数进行评价。质量评价等级分为优良、合格、不合格三种。具体评价标准见附件 13。

Generally, the quality evaluation takes the main line kilometer as the unit, and evaluates according to the deduction score of catenary per kilometer. The quality evaluation grades are divided into three types: excellent, qualified and unqualified. See Annex 13 for specific evaluation criteria.  
The quality evaluation is generally based on the main line kilometer and is evaluated based on the number of points deducted per kilometer of the contact line. The quality evaluation levels are divided into three types: excellent, qualified and unqualified. See Annex 13 for specific evaluation criteria.

总扣分 t＜10 为优良，10≤t＜40 为合格，t≥40 为不合格。

The total deduction points t < 10 are excellent, 10 ≤ t < 40 are qualified, and t ≥ 40 are unqualified.  
The total deduction points of t<10 are excellent, 10≤t<40 is qualified, and t≥40 is unqualified.

1. 区段质量评价根据区段内每公里接触网评价结果确定，优良、合格、不合格公里数为相同质量等级公里数之和。优良率、合格率、不合格率分别按下列公式计算：

Section quality evaluation is determined according to the evaluation results of catenary per kilometer in the section, and the excellent, qualified and unqualified kilometers are the sum of kilometers with the same quality grade. The excellent rate, qualified rate and unqualified rate are calculated according to the following formulas:  
The section quality evaluation is determined based on the evaluation results of the catenary per kilometer in the section. The number of excellent, qualified and unqualified kilometers is the sum of the kilometers of the same quality level. The excellent rate, pass rate and failure rate are calculated according to the following formulas:

优良率=

Excellent rate =  
Excellent rate =

优良设备数量（正线公里） 设备评价总数量（正线公里）

Quantity of excellent equipment (main line km) Total number of equipment evaluation (main line km)  
Number of excellent equipment (main line kilometers) Total number of equipment evaluated (main line kilometers)

×100%

不合格率=

Unqualified rate =  
Failure rate =

不合格设备数量（正线公里）设备评价总数量（正线公里）

Number of unqualified equipment (main line km) Total number of equipment evaluation (main line km)  
Number of unqualified equipment (main line kilometers) Total number of equipment evaluated (main line kilometers)

×100%

合格率=1-不合格率

Qualified rate = 1-unqualified rate  
Pass rate =1-Failure rate

质量鉴定

Quality appraisal  
quality appraisal

1. 质量鉴定主要是通过静态方式对接触网几何参数、设备及零部件状态进行综合统计分析，掌握设备整体技术状态。

Quality appraisal is mainly through the static way of catenary geometric parameters, equipment and parts of the state of comprehensive statistical analysis, master the overall technical status of equipment.  
Quality appraisal mainly conducts comprehensive statistical analysis of the geometric parameters of the catenary, the status of equipment and parts through static methods, and grasps the overall technical status of the equipment.

1. 质量鉴定可采用静态检测、接触网悬挂状态监测检测图像分析、人工检查的方式，按单项设备和整体设备分别进行。

Quality appraisal can be carried out by static inspection, image analysis of catenary suspension monitoring and manual inspection, and according to single equipment and whole equipment respectively.  
Quality appraisal can be carried out separately by means of static inspection, catenary suspension status monitoring and inspection image analysis, and manual inspection.

接触悬挂、附加导线以条公里为单位，隔离（负荷）开关、避雷器等以台为单位，线岔、绝缘器、关节式分相等以组为单位，整体设备以换算条公里为单位。

Contact suspension and additional wires are in kilometres, isolation (load) switches and lightning arresters are in units of stations, wire branches, insulators and joint dividers are in units of groups, and overall equipment is in units of converted kilometres.  
Contact suspension and additional wires are measured in units of kilometers, isolation (load) switches, lightning arresters, etc. are measured in units of units, wire forks, insulators, and joint joints are measured in units of units, and the overall equipment is measured in units of converted kilometers.

质量鉴定以跨距为鉴定单元。若在被鉴定的跨距内有一处不合格，即视为该跨距不合格

The quality appraisal takes span as the appraisal unit. If there is a disqualification within the identified span, it will be regarded as disqualification of the span  
Quality appraisal takes span as the appraisal unit. If there is a failure within the identified span, the span is deemed to be a failure

（在悬挂点及定位点处，跨距长度按相邻跨距的平均值计算）。

(At suspension points and positioning points, the span length is calculated according to the average value of adjacent spans).  
(At the suspension points and positioning points, the span length is calculated based on the average of adjacent spans).

对一个锚段的接触线、承力索、附加导线等，当接头及补强数量达到或超出限界值后，该锚段即视为不合格设备。整根高压电缆有一项不合格的，即视该根电缆为不合格设备。

For the contact wire, bearing cable and additional wire of an anchor section, when the number of joints and reinforcements reaches or exceeds the limit value, the anchor section is regarded as unqualified equipment. If the whole high-voltage cable is unqualified, it will be regarded as unqualified equipment.  
For contact wires, load-bearing cables, additional wires, etc. of an anchor section, when the number of joints and reinforcements reaches or exceeds the limit value, the anchor section will be regarded as unqualified equipment. If the entire high-voltage cable is unqualified, it will be regarded as unqualified equipment.

1. 质量鉴定等级分为三种

There are three grades of quality appraisal  
There are three types of quality appraisal levels

1. 优良：绝缘部件（含空气绝缘间隙）、接触线几何参数和主导电回路的设备状态未超过警示值者。

Excellent: Insulation parts (including air insulation gap), contact wire geometry parameters and equipment status of main electrical circuit do not exceed the warning value.  
Excellent: The geometric parameters of insulating parts (including air insulation gaps), contact wire and equipment status of the main conductive loop do not exceed the warning values.

1. 合格：设备状态未超过限界值者。

Qualified: The equipment status does not exceed the limit value.  
Qualified: Equipment status does not exceed the limit value.

1. 不合格：设备状态达到或超过限界值者。

Unqualified: The equipment status reaches or exceeds the limit value.  
Disqualification: Equipment status reaches or exceeds the limit value.

优良率、合格率、不合格率分别按下列公式计算：

The excellent rate, qualified rate and unqualified rate are calculated according to the following formulas:  
The excellent rate, pass rate and failure rate are calculated according to the following formulas:

优良率=

Excellent rate =  
Excellent rate =

优良设备数量（换算条公里） 设备鉴定总数量（换算条公里）

Quantity of excellent equipment (converted kilometres) Total number of equipment appraisal (converted kilometres)  
Quantity of excellent equipment (converted to carry-kilometers) Total quantity of equipment identified (converted to carry-kilometers)

×100%

不合格率=

Unqualified rate =  
Failure rate =

不合格设备数量（换算条公里）

Quantity of unqualified equipment (converted kilometers)  
Number of unqualified equipment (converted to carry-kilometers)

设备鉴定总数量（换算条公里）

Total quantity of equipment appraisal (converted kilometres)  
Total quantity of equipment identified (converted per kilometer)

×100%

合格率=1-不合格率

Qualified rate = 1-unqualified rate  
Pass rate =1-Failure rate

1. 质量鉴定结果应详细记录，并作为当年设备质量运行状态填入接触网设备履历。基础设施维护公司要针对鉴定存在的问题进行分析总结，提出整改措施并组织实施。对鉴定不合格的设备按照责任进行考核。

The quality appraisal results shall be recorded in detail, and filled in the catenary equipment resume as the equipment quality operation status of the current year. The infrastructure maintenance company should analyze and summarize the problems existing in the appraisal, put forward corrective measures and organize their implementation. The unqualified equipment shall be assessed according to the responsibility.  
The quality appraisal results shall be recorded in detail and filled in the catenary equipment history as the equipment quality operation status of the year. Infrastructure maintenance companies should analyze and summarize the existing problems in the identification, propose rectification measures and organize implementation. Equipment that fails to pass the appraisal shall be assessed according to their responsibilities.

1. 质量鉴定范围应包括所有接触网设备。但下列设备可不作鉴定： (1)已封存的设备。

The scope of quality appraisal shall include all catenary equipment. However, the following equipment may not be identified: (1) Sealed equipment.  
The scope of quality appraisal shall include all contact line equipment. However, the following equipment may not be identified: (1) Equipment that has been sealed.

(2)本年度新（改）建或已列入当年更新改造计划的设备。对本年度新（改）建或更新改造设备的质量状况，可按工程竣工验收质量评定结果统计。

(2) Equipment newly built (modified) or included in the renovation plan of the current year. The quality status of new (modified) or updated equipment in this year can be counted according to the quality evaluation results of project completion acceptance.  
(2)Equipment newly built (modified) in this year or included in the renewal and renovation plan of that year. The quality status of new (modified) or updated equipment this year can be counted based on the quality evaluation results of project completion acceptance.

1. 质量鉴定发现缺陷在鉴定期间已处理的，可按处理后的质量状态进行评定。

If the defects found in the quality appraisal have been treated during the appraisal period, they can be evaluated according to the quality status after treatment.  
If the quality appraisal finds that defects have been dealt with during the appraisal period, they can be evaluated based on the quality status after treatment.

第七章 维修技术标准

Chapter VII Technical Standards for Maintenance  
Chapter 7 Maintenance Technical Standards

1. 接触网系统整体技术标准

Overall technical standard of catenary system  
Overall technical standard for catenary system

(1)接触网系统满足设计的速度目标值。 (2)接触网应满足系统载流量的需要。

(1) The catenary system meets the designed speed target value. (2) The catenary should meet the needs of the current carrying capacity of the system.  
(1)The catenary system meets the designed speed target values. (2)The catenary should meet the current carrying needs of the system.

1. 接触网在自然环境中应满足系统可靠性、安全性要求，有足够的机械、电气强度和安全性能。任何条件下安全系数至少满足附件 14 的规定。

The catenary should meet the requirements of system reliability and safety in natural environment, and have sufficient mechanical and electrical strength and safety performance. Under any conditions, the safety factor shall at least meet the requirements of Annex 14.  
The catenary should meet the system reliability and safety requirements in the natural environment, and have sufficient mechanical and electrical strength and safety performance. The safety factor under any conditions shall at least meet the provisions of Annex 14.

1. 各部位螺栓紧固力矩符合零部件规定要求。

The bolt fastening torque of each part meets the specified requirements of parts.  
The tightening torque of bolts at all parts meets the specified requirements of parts.

1. 接触网与受电弓在接触点载流量、材质、几何参数、动态性能等方面相匹配，接口条件满足相关规定。

Catenary and pantograph are matched in the aspects of current carrying capacity, material, geometric parameters and dynamic performance of contact points, and the interface conditions meet relevant regulations.  
The catenary and pantograph match in terms of current carrying capacity, material, geometric parameters, dynamic performance, etc. of the contact point, and the interface conditions meet relevant regulations.

1. 本办法是基于最大长度为 1950mm 的受电弓弓头制定。受电弓弓头外形轮廓见附件15（1）。

This method is based on the pantograph head with a maximum length of 1950mm. See Appendix 15 (1) for the outline of pantograph head.  
This method is formulated based on the pantograph head with a maximum length of 1950 mm. See Annex 15 (1) for the outline of the pantograph head.

1. 受电弓动态包络线是指运行中的受电弓在最大抬升及摆动时可能达到的最大轮廓线。接触网任何设备不得侵入动态包络线范围内。受电弓动态包络线示意图见附件 15（2）。

The dynamic envelope of pantograph refers to the maximum contour line that can be reached when the pantograph in operation is lifted and swung at the maximum. Any equipment of catenary shall not invade the dynamic envelope. See Annex 15 (2) for the schematic diagram of pantograph dynamic envelope.  
The dynamic envelope of a pantograph refers to the maximum outline that a pantograph may reach during maximum lifting and swinging during operation. No equipment on the catenary shall intrude into the dynamic envelope. See Annex 15 (2) for the schematic diagram of the dynamic envelope of the pantograph.

受电弓动态包络线应符合下列规定：

The dynamic envelope of pantograph shall meet the following requirements:  
The dynamic envelope line of the pantograph shall comply with the following requirements:

160km/h 及以下区段，受电弓动态抬升量 120mm，左右摆动量 250mm；

In the section of 160km/h and below, the dynamic lifting amount of pantograph is 120mm, and the left-right swing amount is 250mm;;  
In the section of 160km/h and below, the dynamic lifting amount of the pantograph is 120mm, and the left and right swinging amount is 250mm;

160km/h 以上区段，受电弓动态抬升量 120mm，左右摆动量直线 250mm，曲线 300mm。

In the section above 160km/h, the dynamic lifting amount of pantograph is 120mm, and the left and right swing amount is 250mm in straight line and 300mm in curve.  
In the section above 160km/h, the dynamic lift of the pantograph is 120mm, the left and right swing is 250mm, and the curve is 300 mm.

接触悬挂

Contact suspension  
contact suspension

1. 接触网一般应采用全补偿链形悬挂。采用简单悬挂时应适当增加接触线的张力，同时明确允许通过的列车速度。采用刚性悬挂时，电力机车（动车组）的运行速度不宜超过 120km/h。

Generally, catenary should be suspended by full compensation chain. When using simple suspension, the tension of contact line should be appropriately increased, and the allowed train speed should be clearly defined. When rigid suspension is adopted, the running speed of electric locomotive (EMU) should not exceed 120km/h.  
Generally, the catenary should adopt fully compensated chain suspension. When using simple suspension, the tension of the contact line should be appropriately increased, and the allowable train speed should be clarified. When rigid suspension is adopted, the operating speed of electric locomotives (EMU) should not exceed 120km/h.

1. 正线接触网的综合张力和正线接触线的张力不应低于下列数值：

The comprehensive tension of the main line catenary and the tension of the main line contact line shall not be lower than the following values:  
The comprehensive tension of the main line contact line and the tension of the main line contact line shall not be lower than the following values:

|  |  |  |
| --- | --- | --- |
| 区段内列车运行速度（km/h）  Train running speed in the section (km/h) Train running speed in the section (km/h) | 接触网综合张力（kN）  Comprehensive tension of catenary (kN) Comprehensive tension of catenary (kN) | 接触线张力（kN）  Contact wire tension (kN) Contact wire tension (kN) |
| v≤120 | 25 | 10 |
| 120＜v≤160 | 28 | 13 |
| 160＜v≤200 | 30 | 15 |

1. 站线接触线、承力索的标称截面、材质、张力宜与正线一致。

The nominal section, material and tension of the contact line and bearing cable of the station line should be consistent with the main line.  
The nominal cross-section, material and tension of the contact line and load-bearing rope of the station line should be consistent with that of the main line.

1. 锚段长度不宜超过 1600m，最大跨距不得超过 65m，对山口、谷口、高路堤和桥梁等风口范围内的跨距，应按设计标准选用值缩小 5～10m，且最大跨距不宜超过 50m。

The length of anchor section should not exceed 1600m, and the maximum span should not exceed 65m. The span within the tuyere range of Yamaguchi, Taniguchi, high embankment and bridge should be reduced by 5 ~ 10m according to the design standard, and the maximum span should not exceed 50m.  
The length of the anchor section should not exceed 1600 m, and the maximum span should not exceed 65 m. For the spans within the range of air vents such as mountain passes, valley entrances, high embankments and bridges, the selected values should be reduced by 5 - 10 m according to the design standards, and the maximum span should not exceed 50 m.

1. 合理布置电分段，对较大的车站应分场、分束供电，对机务折返点、动车所应保证不同径路的接触网能单独停电维修。在车站一端宜设电分段锚段关节，装设隔离开关，纳入远动控制并视频监控。

Reasonable arrangement of electrical sections, for larger stations, power supply should be divided into fields and beams, and for locomotive turn-back points and motor trains, catenary with different paths should be guaranteed to be cut off and maintained separately. At one end of the station, it is advisable to set up electric subsection anchor joint, install isolating switch, bring into telecontrol control and video monitoring.  
Reasonably arrange electrical sections. Power supply should be divided into yards and bundles for larger stations. For maintenance turn-back points and bullet trains, contact networks of different routes should be ensured to be powered off for maintenance separately. At one end of the station, it is advisable to set an electric segmented anchor section joint, install an isolating switch, and incorporate remote control and video monitoring.

承力索与接触线

Load-bearing cable and contact wire  
Bearing cables and contact wires

1. 正线承力索和接触线宜采用恒张力架设。接触线架设张力应根据线材材质、额定张力等因素选取，且不应小于线盘绕线张力，架设张力偏差不得大于 8%。

The main line bearing cable and contact line should be erected with constant tension. The erection tension of contact wire shall be selected according to wire material, rated tension and other factors, and shall not be less than the tension of wire coiling, and the deviation of erection tension shall not be greater than 8%.  
The main line bearing ropes and contact wires should be erected with constant tension. The erection tension of contact wires should be selected based on factors such as wire material, rated tension, etc., and should not be less than the wire winding tension, and the erection tension deviation should not be more than 8%.

1. 承力索和接触线架设后，应采取超拉或其他措施消除新线蠕变引起的初伸长。超拉完毕后方可进行悬挂安装。

After the load-bearing cables and contact wires are erected, overstretching or other measures shall be taken to eliminate the initial elongation caused by creep of new wires. Suspension installation can only be carried out after overpulling is completed.  
After the load-bearing cables and contact wires are erected, overtension or other measures shall be taken to eliminate the initial elongation caused by the creep of the new wire. Suspension installation can be carried out only after overtension is completed.

1. 承力索

Bearing cable  
carrier cable

1. 承力索宜采用铜合金材质，容许载流量符合运能需要。

The load-bearing cable should be made of copper alloy, and the allowable current carrying capacity should meet the needs of transportation capacity.  
The load-bearing rope should be made of copper alloy, and the allowable current carrying capacity should meet the transportation capacity needs.

1. 半补偿链形悬挂承力索的张力和弛度符合安装曲线，允许偏差 15%。

The tension and sag of the half-compensated chain suspension bearing cable conform to the installation curve, and the allowable deviation is 15%.  
The tension and sag of the semi-compensated chain-shaped suspension cable conform to the installation curve, with an allowable deviation of 15%.

1. 承力索位置

Position of bearing cable  
Position of carrier cable

标准值：直线区段，半斜链型悬挂承力索位于线路中心的正上方，直链型悬挂承力索位于接触线正上方。曲线区段，承力索与接触线之间的连线垂直于轨面连线，承力索不得偏向曲线外侧。

Standard value: In straight line section, semi-oblique chain suspension load-bearing cable is located directly above the center of the line, and straight chain suspension load-bearing cable is located directly above the contact line. In the curve section, the connecting line between the bearing cable and the contact line is perpendicular to the connecting line of the rail surface, and the bearing cable shall not deviate to the outside of the curve.  
Standard value: In the straight section, the semi-inclined chain suspension cable is located directly above the center of the line, and the straight chain suspension cable is located directly above the contact line. In the curved section, the line between the bearing cable and the contact line is perpendicular to the line between the rail surface, and the bearing cable shall not deviate to the outside of the curve.

标准状态：标准值±50mm。警示值：标准值±150mm。限界值：标准值±200mm。

Standard state: Standard value ± 50mm. Warning value: standard value ± 150mm. Threshold value: standard value ± 200mm.  
Standard status: Standard value ±50 mm. Warning value: standard value ±150 mm. Limit value: standard value ±200 mm.

1. 承力索磨耗及损伤

Wear and damage of load-bearing cable  
Wear and damage of load-bearing cable

1. 承力索损伤后不能满足该线通过的最大电流时，若系局部损伤，可以加电气补强线，若系普遍损伤则应更换。

When the load-bearing cable cannot meet the maximum current passing through the cable after damage, if it is local damage, it can be added with electrical reinforcement wire, and if it is common damage, it should be replaced.  
When the load bearing rope cannot meet the maximum current passed through the line after damage, if it is partially damaged, an electrical reinforcement wire can be added. If it is generally damaged, it should be replaced.

1. 承力索损伤后不能满足规定的机械强度安全系数时， 若系局部损伤，可以加补强线或切除损坏部分重新接续，若系普遍损伤则应更换。

When the load-bearing cable cannot meet the specified mechanical strength safety factor after damage, if it is local damage, it can be reconnected by adding reinforcement wire or cutting off the damaged part, and if it is common damage, it should be replaced.  
If the load-bearing cable cannot meet the specified mechanical strength safety factor after being damaged, if it is partially damaged, a reinforcing wire can be added or the damaged part can be cut off and reconnected. If it is generally damaged, it should be replaced.

1. 承力索用钢芯铝绞线或铝包钢绞线时，其钢芯若断股，须切断重新接续并用电连接沟通。

When steel-cored aluminum strand or aluminum-clad steel strand is used for load-bearing cable, if the steel core is broken, it must be cut off and re-connected and communicated by electricity.  
When steel core aluminum stranded wire or aluminum clad steel stranded wire is used for the load-bearing rope, if the steel core is broken, it must be cut and reconnected and electrically connected for communication.

1. 承力索在悬吊滑轮处应转动灵活、无卡滞，悬吊滑轮与线索相匹配。

The load-bearing cable should rotate flexibly at the suspension pulley without sticking, and the suspension pulley should match the clue.  
The load-bearing rope should rotate flexibly at the suspension pulley without jamming, and the suspension pulley should match the clue.

1. 承力索在承力索座、悬吊滑轮等处悬吊固定时，应加装与承力索材质匹配的预绞丝护线条。

When the load-bearing cable is suspended and fixed at the load-bearing cable seat and suspension pulley, the pre-twisted wire protection line matching with the material of the load-bearing cable shall be installed.  
When the load-bearing rope is suspended and fixed at the load-bearing rope seat, suspension pulley, etc., pre-twisted wire protection strips matching the material of the load-bearing rope should be installed.

标准值：无损伤。 标准状态：无损伤。

Standard value: No damage. Standard state: No damage.  
Standard value: No damage. Standard status: No damage.

警示值：无散股、损伤 3 股。限界值：断股。

Warning value: No scattered strands, 3 strands damaged. Threshold value: Broken stock.  
Warning value: no loose shares, 3 damaged shares. Limit value: Broken stocks.

(1)一个锚段内，承力索接头和断股补强的总数量应符合以下规定（不包括分段、分相及下锚接头）。

(1) In an anchor section, the total number of load-bearing cable joints and broken strand reinforcement shall meet the following requirements (excluding subsection, phase separation and lower anchor joints).  
(1)The total number of cable joints and broken strand reinforcements in an anchor section shall comply with the following regulations (excluding sectioning, phase separation and anchor joints).

标准值：0 处。标准状态：0 处。警示值：3 处。限界值：4 处。

Standard value: 0. Standard state: 0. Warning value: 3 places. Threshold value: 4 places.  
Standard value: 0. Standard status: 0. Warning value: 3 places. Limit value: 4 places.

承力索的接头距悬挂点应不小于 2m，同一跨距内不允许有两处接头。 231．接触线

The joint distance between the bearing cable and the suspension point should be no less than 2m, and no two joints are allowed within the same span. 231. Contact wires  
The distance between the joints of the load-bearing cable shall be no less than 2m away from the suspension point, and no two joints are allowed within the same span. 231. contact line

1. 接触线应采用铜合金材质，容许载流量符合运能需要。

The contact wire shall be made of copper alloy, and the allowable current carrying capacity shall meet the needs of transportation capacity.  
The contact wire should be made of copper alloy, and the allowable current carrying capacity should meet the transportation capacity requirements.

1. 半补偿链形悬挂和简单悬挂接触线的张力和弛度符合安装曲线，允许偏差为 15%。 (3)接触线拉出值（含最大风偏时跨中偏移值）

The tension and sag of the contact wire for half-compensated chain suspension and simple suspension conform to the installation curve, and the allowable deviation is 15%. (3) Contact line pull-out value (including mid-span offset value during maximum wind deflection)  
The tension and sag of semi-compensated chain suspension and simple suspension contact wires conform to the installation curve, with an allowable deviation of 15%. (3)Contact line pull-out value (including mid-span offset value at the time of maximum wind deflection)

标准值：设计值。

Standard value: Design value.  
Standard value: design value.

标准状态：标准值±30mm。警示值：400mm。

Standard state: Standard value ± 30mm. Warning value: 400mm.  
Standard status: Standard value ±30 mm. Warning value: 400 mm.

限界值：450mm。 (4)接触线高度

Threshold value: 450mm. (4) Height of contact wire  
Limit value: 450 mm. (4)Contact line height

标准值：设计值。

Standard value: Design value.  
Standard value: design value.

标准状态：标准值±30mm。警示值：标准值±100mm。

Standard state: Standard value ± 30mm. Warning value: standard value ± 100mm.  
Standard status: Standard value ±30 mm. Warning value: standard value ±100 mm.

限界值：标准值±200mm；上限 6500mm，下限为任何情况不低于该区段允许的最低值。为保证电力机车（动车组）的良好取流，应尽量减少接触线高度的变化。车站和区间的

Limit value: standard value 200mm;; The upper limit is 6500mm, and the lower limit is not lower than the minimum allowable value of this section in any case. In order to ensure good current extraction of electric locomotives (EMUs), the change of contact line height should be reduced as much as possible. Station and section  
Limit value: standard value ± 200 mm; upper limit is 6500 mm, and lower limit is no lower than the minimum value allowed in this section under any circumstances. In order to ensure good current extraction for electric locomotives (EMUs), changes in the height of contact wires should be minimized. Stations and sections

接触线高度宜取一致。

The height of contact wire should be consistent.  
The height of the contact line should be consistent.

当隧道间距不大于 1000m 时，隧道内、外的接触线可取同一高度。 (5)接触线坡度（工作支）

When the distance between tunnels is not more than 1000m, the contact lines inside and outside the tunnel can be of the same height. (5) Contact line slope (working branch)  
When the tunnel spacing is no more than 1000m, the contact lines inside and outside the tunnel can take the same height. (5)Contact line slope (working branch)

标准值：设计值。

Standard value: Design value.  
Standard value: design value.

标准状态：同标准值。

Standard state: Same as standard value.  
Standard status: same as standard value.

警示值：160km/h 区段 3.3‰；120km/h 区段 4‰。限界值：160km/h 区段 4‰；120km/h 区段 5‰。

Warning value: 3.3 ‰ in 160km/h section; 4 ‰ in 120km/h section. Limit value: 4 ‰ in 160km/h section; 5 ‰ in 120km/h section.  
Warning value: 3.3‰ in 160km/h section; 4‰ in 120km/h section. Limit value: 4‰ in the 160km/h section; 5‰ in the 120km/h section.

在变坡区段的始末跨，接触线坡度变化不宜大于变坡区段最大坡度之半。 (6)接触线偏角（水平面内改变方向）

At the beginning and end span of the variable slope section, the slope change of the contact line should not be greater than half of the maximum slope of the variable slope section. (6) Deflection angle of contact line (changing direction in horizontal plane)  
At the beginning and end spans of the sloping section, the change in the slope of the contact line should not be more than half of the maximum slope of the sloping section. (6)Contact line deflection angle (changes direction in horizontal plane)

标准值：设计值。

Standard value: Design value.  
Standard value: design value.

标准状态：标准值±1°且≤4°。警示值：正线 8°；站线 10°。限界值：同警示值。

Standard state: the standard value is 1 and ≤ 4. Warning value: 8 on the main line; The station line is 10. Threshold value: Same as warning value.  
Standard status: Standard value ±1° and ≤4°. Warning value: 8° for main line; 10° for station line. Limit value: same as warning value.

1. 接触线局部磨耗、变形及损伤

Local wear, deformation and damage of contact wire  
Local wear, deformation and damage of contact wires

1. 接触线磨耗及损伤

Contact wire wear and damage  
Contact wire wear and damage

1. 接触线磨耗和损伤后不能满足该线通过的最大电流时，若系局部磨耗和损伤，可以加电气补强线，若系普遍磨耗和损伤则应更换。

If the contact wire can't meet the maximum current after wear and damage, if it is local wear and damage, electrical reinforcement wire can be added, and if it is general wear and damage, it should be replaced.  
When the contact wire cannot meet the maximum current passed through the wire after being worn and damaged, electrical reinforcement wires can be added if it is partially worn and damaged. If it is generally worn and damaged, it should be replaced.

1. 接触线磨耗和损伤后不能满足规定的机械强度安全系数时，若系局部磨耗和损伤，可以加补强线或切除损坏部分重新接续，若系普遍磨耗和损伤则应更换。

When the contact wire can't meet the specified mechanical strength safety factor after wear and damage, if it is local wear and damage, it can be reconnected by adding reinforcement wire or cutting off the damaged part, and if it is common wear and damage, it should be replaced.  
If the contact wire cannot meet the specified mechanical strength safety factor after being worn and damaged, if it is partially worn and damaged, a reinforcing wire can be added or the damaged part can be cut off and reconnected. If it is generally worn and damaged, it should be replaced.

1. 接触线接头、补强处过渡平滑。该处接触线高度不应低于相邻吊弦点，允许高于相邻

Contact wire joint, smooth transition at reinforcement. The height of contact line should not be lower than the adjacent hanging string point, and it is allowed to be higher than the adjacent one  
The transition of contact wire joints and reinforcements is smooth. The height of the contact line here should not be lower than that of the adjacent hanging string points, and should be higher than that of the adjacent ones.

吊弦点 0～10mm，必要时加装吊弦。标准值：无损伤。

The hanging string point is 0 ~ 10mm, and the hanging string is installed if necessary. Standard value: No damage.  
The hanging string point is 0~10mm, and add hanging strings if necessary. Standard value: No damage.

标准状态：无损伤。

Standard state: No damage.  
Standard status: No damage.

警示值：磨损面积 15%。限界值：磨损面积 20%。

Warning value: 15% wear area. Limit value: Wear area 20%.  
Warning value: 15% of worn area. Limit value: 20% of worn area.

1. 接触线扭面角度标准值：0°。

Standard value of twisted surface angle of contact line: 0.  
Standard value of torsion angle of contact line: 0°.

标准状态：5°。警示值：15°。限界值：20°。

Standard state: 5. Warning value: 15. Threshold value: 20.  
Standard state: 5°. Warning value: 15°. Limit value: 20°.

1. 接触线与平直度检测尺之间的间隙不大于 0.2mm/m。

The gap between the contact line and the flatness measuring ruler shall not be greater than 0.2 mm/m  
The gap between the contact line and the flatness measuring ruler shall not exceed 0.2mm/m.

1. 一个锚段内接触线接头、补强的总数量应符合以下规定（不包括分段、分相及下锚接头），接头距悬挂点应不小于 2m，同一跨距内不允许有两处接头。

The total number of contact wire joints in an anchor section shall meet the following requirements (excluding subsection, phase separation and lower anchor joints), and the distance between joints and suspension points shall not be less than 2m, and no two joints are allowed in the same span.  
The total number of contact line joints and reinforcements in an anchor section shall comply with the following regulations (excluding sectioning, phase separation and anchor joints). The distance between the joints and the suspension point shall be no less than 2m. No two joints are allowed in the same span.

标准值：0 处。

Standard value: 0.  
Standard value: 0.

标准状态：同标准值。警示值：2 处。

Standard state: Same as standard value. Warning value: 2 places.  
Standard status: same as standard value. Warning value: 2 places.

限界值：4 处。

Threshold value: 4 places.  
Limit value: 4 places.

1. 接触线硬点、弓网接触力的技术标准参照附件 13。

Technical standards for hard points of contact lines and contact forces of pantograph and catenary refer to Annex 13.  
Refer to Annex 13 for the technical standards for contact wire hard points and pantograph contact force.

吊弦（索）

Hanging string (cable)  
hanging string (rope)

232．吊弦

232. Hanging strings  
232. dropper

吊弦分环节吊弦和整体吊弦，优先采用整体吊弦。

Hanging strings are divided into link hanging strings and integral hanging strings, and integral hanging strings are preferred.  
Hanging strings are divided into link hanging strings and overall hanging strings, and overall hanging strings are preferred.

1. 吊弦偏移

Hanging string offset  
suspension string offset

标准值：在无偏移温度时处于铅垂状态。当温度变化且承力索、接触线采用不同材质时，吊弦顺线路方向偏移符合安装曲线要求。

Standard value: in vertical state without offset temperature. When the temperature changes and the bearing cable and contact wire are made of different materials, the deviation of the hanging string along the line direction meets the requirements of the installation curve.  
Standard value: In a vertical state when there is no offset temperature. When the temperature changes and the load-bearing cables and contact wires are made of different materials, the deviation of the hanging string along the line meets the requirements of the installation curve.

标准状态：同标准值。

Standard state: Same as standard value.  
Standard status: same as standard value.

警示值：不大于吊弦长度的 1/4。限界值：不大于吊弦长度的 1/3。

Warning value: not more than 1/4 of the length of the hanging string. Limit value: no more than 1/3 of the length of the hanging string.  
Warning value: not more than 1/4 of the length of the hanging string. Limit value: no more than 1/3 of the length of the hanging string.

1. 吊弦状态

Hanging string state  
hanging string state

吊弦的长度要能适应在极限温度范围内接触线的伸缩和弛度的变化，否则应采用滑动吊

The length of hanging string should be able to adapt to the change of expansion and relaxation of contact wire within the limit temperature range, otherwise sliding hanging should be adopted  
The length of the hanging string must be able to adapt to the expansion and relaxation of the contact line within the extreme temperature range, otherwise a sliding crane should be used.

弦。

Strings.  
String.

环节吊弦：至少应由两节组成，每节的长度以不超过 600mm 为宜。吊弦回头应均匀迂回，长度为 150～180mm。吊弦环直径应为其线径的 5～10 倍。吊弦磨耗的面积不得超过原面积的 50%。

Link hanging string: It should be composed of at least two sections, and the length of each section should not exceed 600mm. The hanging string should be evenly circuitous, with a length of 150 ~ 180mm. The diameter of hanging string ring should be 5 ~ 10 times of its wire diameter. The worn area of hanging string shall not exceed 50% of the original area.  
Link hanging string: It should be composed of at least two sections, and the length of each section should not exceed 600 mm. The hanging string should be turned back evenly, with a length of 150~180 mm. The diameter of the hanging string ring should be 5 to 10 times the diameter of the string. The worn area of hanging string shall not exceed 50% of the original area.

整体吊弦：预制长度应与计算长度相等，偏差应不大于±2mm，外观无断股、烧伤或其他不良状态。

Integral hanging string: The prefabricated length should be equal to the calculated length, the deviation should be no more than 2mm, and there is no broken strand, burn or other bad state in appearance.  
Overall hanging string: The prefabricated length should be equal to the calculated length, and the deviation should not be greater than ± 2 mm. The appearance should be free of broken strands, burns or other undesirable conditions.

吊弦线夹在直线处应保持铅垂状态，曲线处应垂直于接触线工作面。曲线处接触线吊弦线夹螺栓应穿向曲线外侧。

The hanging string clamp should be kept vertical at the straight line, and the curve should be perpendicular to the working face of the contact line. At the curve, the contact wire hanging string clamp bolt should penetrate to the outside of the curve.  
The hanging string clamp should be in a vertical state on the straight line, and the curved line should be perpendicular to the working surface of the contact line. Contact line hanging string clamp bolts at the curve should be threaded to the outside of the curve.

1. 吊弦间距

Spacing between hanging strings  
sling spacing

标准值：设计值。

Standard value: Design value.  
Standard value: design value.

标准状态：标准值±100mm。警示值：12m。

Standard state: Standard value ± 100mm. Warning value: 12m.  
Standard status: Standard value ±100 mm. Warning value: 12m.

限界值：15m。

Limit value: 15m.  
Limit value: 15m.

1. 两相邻吊弦点接触线高差标准值：0。

Standard value of contact line height difference between two adjacent hanging string points: 0.  
Standard value of height difference between contact lines of two adjacent hanging chord points: 0.

标准状态：10mm。警示值：30mm。 限界值：50mm。

Standard state: 10mm. Warning value: 30mm. Threshold value: 50mm.  
Standard status: 10 mm. Warning value: 30 mm. Limit value: 50 mm.

1. 整体吊弦损伤标准值：无损伤。 标准状态：无损伤。

Standard value of integral hanging string damage: no damage. Standard state: No damage.  
Standard value of overall hanging string damage: no damage. Standard status: No damage.

警示值：断 3 根单丝。

Warning value: 3 monofilament broken.  
Warning value: 3 monofilaments are broken.

限界值：断 7 根单丝。 233．弹性吊索和简单悬挂吊索

Limit value: 7 monofilament broken. 233. Elastic slings and simple suspension slings  
Limit value: 7 monofilaments were broken. 233. Elastic and simple suspension slings

1. 吊索须用绞线制成并保持一定的张力，不得松弛。

Sling shall be made of stranded wire and keep a certain tension, and shall not relax.  
Slings must be made of stranded wire and maintained at a certain tension and must not be loosened.

1. 在无偏移温度时，吊索在悬挂点两端的长度应相等，允许相差不超过 400mm。

When there is no offset temperature, the lengths of slings at both ends of suspension points should be equal, and the allowable difference should not exceed 400mm.  
In the absence of offset temperatures, the lengths of the slings at both ends of the suspension point shall be equal, with a difference of no more than 400 mm.

1. 吊索不得有散股、断股（丝） 、接头、补强、硬弯。

Sling shall not have scattered strands, broken strands (wires), joints, reinforcements and hard bends.  
Slings shall not have loose strands, broken strands (wires), joints, reinforcements, or hard bends.

1. 弹性吊索两端与承力索的连接符合设计规定。

The connection between the two ends of the elastic sling and the bearing cable meets the design requirements.  
The connection between both ends of the elastic sling and the load-bearing rope complies with the design requirements.

1. 简单悬挂吊索应与悬吊滑轮材质一致，与接触线的连接符合设计规定。

Simple suspension slings should be consistent with the material of suspension pulleys, and the connection with contact lines should conform to the design regulations.  
The material of simple suspension slings should be the same as that of the suspension pulleys, and the connection with the contact wires should comply with the design regulations.

锚段关节及关节式分相

Anchor joint and joint phase separation  
Anchor segment joint and articulated phase separation

1. 绝缘锚段关节及关节式分相

Insulated anchor joint and joint phase separation  
Joint and articulated phase separation of insulation anchor section

* 1. 转换柱处两悬挂垂直距离、水平距离标准值：设计值。

Vertical distance and horizontal distance between two suspensions at transfer column standard value: design value.  
Standard values of vertical distance and horizontal distance between two suspensions at the conversion column: design values.

标准状态：标准值±20mm。警示值：标准值±30mm。 限界值：标准值±50mm。

Standard state: Standard value ± 20mm. Warning value: standard value ± 30mm. Threshold value: Standard value ± 50mm.  
Standard status: standard value ±20 mm. Warning value: standard value ±30 mm. Limit value: standard value ±50 mm.

* 1. 中心柱处两悬挂垂直距离、水平距离

Vertical distance and horizontal distance between two suspensions at the center column  
Vertical distance and horizontal distance between two suspensions at the center column

* + 1. 接触线（承力索）垂直距离标准值：等高（设计值）。

Standard value of vertical distance of contact line (bearing cable): equal height (design value).  
Standard value of vertical distance between contact line (bearing rope): equal height (design value).

标准状态：20mm（标准值±20mm）。警示值：20mm（标准值±30mm）。 限界值：30mm（标准值±50mm）。

Standard state: 20mm (standard value ± 20mm). Warning value: 20mm (standard value ± 30mm). Limit value: 30mm (standard value ± 50mm).  
Standard status: 20mm (standard value ±20mm). Warning value: 20mm (standard value ±30mm). Limit value: 30mm (standard value ±50mm).

* + 1. 接触线（承力索）水平距离：同转换柱。

Horizontal distance of contact line (bearing cable): same as transfer column.  
Horizontal distance of contact line (bearing rope): same as transfer column.

* + 1. 中心柱处接触线等高点接触线高度不应低于相邻工作支吊弦点，允许高于相邻吊弦点 0～10mm。

The height of contact line at the same high point as the contact line at the center column shall not be lower than the hanging chord point of the adjacent working support, and shall be allowed to be higher than the hanging chord point by 0 ~ 10mm.  
The height of the contact line at the center column shall not be lower than the adjacent working support hanging string points, and is allowed to be 0~ 10mm higher than the adjacent hanging string points.

五跨锚段关节中间跨为过渡跨，接触线等高点（屋脊处）宜在过渡跨跨中，高度比相邻定位点工作支接触线抬高 0～40mm。

The middle span of the joint of the five-span anchor section is a transitional span, and the equal high points of the contact line (at the roof ridge) should be in the middle of the transitional span, and the height should be 0 ~ 40mm higher than the contact line of the working branch of the adjacent positioning point.  
The middle span of the joint of the five-span anchor section is a transition span, and the equal high point of the contact line (at the ridge) should be in the middle of the transition span, and the height should be 0 - 40mm higher than the contact line of the working branch of the adjacent positioning point.

* 1. 两接触悬挂接触线工作支过渡处调整符合运行要求。

The adjustment of the transition of the working branch of the two contact suspension contact lines meets the operation requirements.  
The transition between the working branches of the two contact suspension contact wires is adjusted to meet the operating requirements.

* 1. 转换柱处绝缘子串距悬挂点的距离符合设计要求，允许偏差±50mm。承力索、接触线两绝缘子串上下应对齐，允许偏差±100mm。

The distance between the insulator string and the suspension point at the transfer column meets the design requirements, and the allowable deviation is 50mm. The two insulator strings of load-bearing cable and contact line should be aligned up and down, with an allowable deviation of 100mm.  
The distance between the insulator string at the conversion column and the suspension point meets the design requirements, with an allowable deviation of ±50 mm. The two insulator strings of load-bearing cables and contact wires shall be aligned up and down, with an allowable deviation of ±100 mm.

* 1. 任何情况下，两接触悬挂及定位支撑装置带电体各部分应满足空气绝缘间隙要求。锚段关节内的定位支撑、吊弦载流环、斜拉线等不得减小空气绝缘间隙。

In any case, each part of the charged body of the two-contact suspension and positioning support device shall meet the requirements of air insulation gap. Positioning support, current-carrying ring of hanging string and oblique stay wire in anchor joint shall not reduce air insulation gap.  
Under any circumstances, each part of the live body of the two-contact suspension and positioning support device shall meet the air insulation clearance requirements. Positioning supports, hanging string current-carrying rings, diagonal wires, etc. in the anchor section joints shall not reduce the air insulation gap.

* 1. 关节式分相中性区和无电区长度符合设计要求。

The length of articulated phase separation neutral zone and non-electric zone meets the design requirements.  
The lengths of the articulated phase-separated neutral zone and non-charged zone meet the design requirements.

* 1. 绝缘锚段关节处隔离开关宜安装在开口侧。

The isolating switch at the joint of insulating anchor section should be installed on the opening side.  
The isolating switch at the joint of the insulation anchor section should be installed on the opening side.

非绝缘锚段关节

Uninsulated anchor joint  
non-insulated anchor joint

1. 设计极限温度下，两悬挂各部分（包括零部件）之间的距离应保持 50mm 以上。

Under the design limit temperature, the distance between the two suspension parts (including parts) should be kept above 50mm.  
At the design limit temperature, the distance between each part of the two suspension (including parts) should be maintained at least 50 mm.

1. 转换柱处两接触线水平距离标准值：设计值。

Standard value of horizontal distance between two contact lines at conversion column: design value.  
Standard value of horizontal distance between two contact lines at the conversion column: design value.

标准状态：标准值±20mm。警示值：标准值±50mm。 限界值：标准值±100mm。

Standard state: Standard value ± 20mm. Warning value: standard value ± 50mm. Threshold value: Standard value ± 100mm.  
Standard status: standard value ±20 mm. Warning value: standard value ±50 mm. Limit value: standard value ±100 mm.

1. 转换柱处两接触线垂直距离标准值：设计值。

Standard value of vertical distance between two contact lines at transfer column: design value.  
Standard value of vertical distance between two contact lines at the conversion column: design value.

标准状态：标准值±20mm。警示值：标准值±30mm。 限界值：标准值±50mm。

Standard state: Standard value ± 20mm. Warning value: standard value ± 30mm. Threshold value: Standard value ± 50mm.  
Standard status: standard value ±20 mm. Warning value: standard value ±30 mm. Limit value: standard value ±50 mm.

1. 中心柱处两接触线水平距离同转换柱处；中心柱处两接触线距轨面等高，允许偏差±20mm。两接触悬挂接触线工作支过渡处接触线调整符合运行要求。

The horizontal distance between the two contact lines at the center column is the same as that at the conversion column; The two contact lines at the center column are equal to the rail surface, with an allowable deviation of 20mm. The adjustment of contact wire at the transition of two contact suspension contact wire working branches meets the operation requirements.  
The horizontal distance between the two contact lines at the central column is the same as that at the conversion column; the two contact lines at the central column are equal to the rail surface, with an allowable deviation of ±20 mm. The contact wire at the transition between the working branches of the two contact suspension contact wires is adjusted to meet the operating requirements.

1. 锚支接触线在其垂直投影与线路钢轨交叉处，应高于工作支接触线 300mm 以上，并持续抬升至下锚处。下锚角钢安装高度应符合线索延伸下锚抬升的需要。

The anchor support contact line shall be higher than the working support contact line by more than 300mm at the intersection of its vertical projection and the rail of the line, and shall be continuously lifted to the lower anchor. The installation height of anchor angle steel should meet the needs of cable extension and anchor lifting.  
The contact line of the anchor support shall be more than 300mm higher than the contact line of the working support at the intersection of its vertical projection and the line rail, and shall continue to rise to the anchor. The installation height of anchor angle steel shall meet the needs of rope extension and anchor lifting.

中心锚结

Central anchoring  
mid-point anchor

1. 中心锚结按其作用分为防断和防窜两种形式。设置位置满足其两边接触悬挂的补偿条件基本相等。

According to its function, central anchoring can be divided into two forms: anti-breaking and anti-channeling. The compensation conditions for setting positions to meet the contact suspension on both sides are basically equal.  
The central anchorage is divided into two forms according to its function: breaking prevention and channeling prevention. The setting positions meet the compensation conditions for contact suspension on both sides are basically equal.

1. 防断中心锚结

Anti-break center anchoring  
Anti-breaking central anchor

1. 中心锚结安装位置、形式、采用的线材及连接件规格、型号应符合设计要求。

The installation position and form of central anchor, the specifications and models of wires and connectors adopted shall meet the design requirements.  
The installation position and form of the central anchor knot, and the specifications and models of the wires and connectors used shall meet the design requirements.

1. 承力索中心锚结绳

Central anchor rope of load-bearing cable  
central anchor rope

* 1. 中心锚结绳范围内承力索不得有接头和补强。

There shall be no joints and reinforcements for the load-bearing cables within the scope of the central anchor rope.  
There shall be no joints or reinforcements for the load-bearing cables within the scope of the central anchor rope.

* 1. 中心锚结绳、固定线夹应与承力索材质匹配，其设置位置符合设计要求，承力索中心锚结线夹辅助绳外露长度不小于 50mm。

The central anchor rope and fixed clamp shall be matched with the material of the load-bearing cable, and its setting position shall meet the design requirements. The exposed length of the auxiliary rope of the central anchor clamp of the load-bearing cable shall not be less than 50mm.  
The center anchor rope and fixed clip shall match the material of the carrier rope, and their setting positions shall meet the design requirements. The exposed length of the auxiliary rope of the center anchor clip of the carrier rope shall not be less than 50 mm.

* 1. 中心锚结绳弛度应等于或略高于该处承力索弛度，承力索中心锚结绳在其垂直投影与线路钢轨交叉处，应高于接触线 300mm 以上。

The center anchor rope sag should be equal to or slightly higher than the load-bearing cable sag, and the center anchor rope of the load-bearing cable should be higher than the contact line by more than 300mm at the intersection of its vertical projection and line rail.  
The slack of the central anchor rope shall be equal to or slightly higher than the slack of the carrier rope at this point. The central anchor rope of the carrier rope shall be more than 300mm higher than the contact line at the intersection of its vertical projection and the line rail.

* 1. 中心锚结绳的张力符合设计要求。

The tension of the central anchor rope meets the design requirements.  
The tension of the center anchor rope meets the design requirements.

1. 接触线中心锚结绳

Contact wire center anchor rope  
Contact line center anchor rope

1. 中心锚结所在的跨距内接触线不得有接头和补强。

The contact line in the span where the central anchor is located shall not have joints and reinforcements.  
The contact line within the span where the center anchor is located shall not have joints or reinforcements.

1. 中心锚结绳范围内不得安装吊弦和电连接。两端距相邻的吊弦或电连接距离不得小于 500mm。

Hanging strings and electrical connections shall not be installed within the scope of central anchor rope. The distance between two ends and adjacent hanging strings or electrical connection shall not be less than 500mm.  
Hanging strings and electrical connections shall not be installed within the scope of the center anchor rope. The distance between both ends and adjacent hanging strings or electrical connections shall not be less than 500 mm.

1. 中心锚结绳处于受力状态，不得触及弹性吊索，不得改变相邻吊弦受力和接触线

The central anchor rope is in the state of stress, and shall not touch the elastic sling, and shall not change the stress and contact line of adjacent sling strings  
The center anchor rope is under stress and must not touch the elastic slings, and the force and contact lines of adjacent hanging strings must not be changed.

高度。

Height.  
Height.

1. 中心锚结绳两端与承力索固定线夹的设置和间距符合设计要求。接触线侧锚结绳压接后回头外露长度不小于 20mm。

The setting and spacing between the two ends of the central anchor rope and the fixing clamps of the load-bearing cable meet the design requirements. The exposed length of contact wire side anchor rope after crimping shall not be less than 20mm.  
The setting and spacing between the two ends of the center anchor rope and the fixed clamps of the load-bearing rope comply with the design requirements. The exposed length of the anchor rope on the contact line side after crimping shall not be less than 20 mm.

1. 接触线中心锚结线夹

Contact wire center anchor clamp  
Contact wire center anchoring clamp

1. 中心锚结线夹应安装牢固，在直线上保持铅垂状态，在曲线上与接触线的倾斜度一致。

The central anchoring clamp shall be securely installed and maintained in a vertical state in a straight line, consistent with the inclination of the contact line in a curve.  
The central anchoring clamp should be installed firmly, maintaining a vertical state on a straight line, and consistent with the inclination of the contact line on a curve.

1. 中心锚结线夹处接触线高度与相邻吊弦处接触线高度应相等，允许偏差 0～20mm。 238．防窜中心锚结

The height of contact wire at the center anchor clamp and the height of contact wire at the adjacent hanging string shall be equal, with an allowable deviation of 0 ~ 20mm. 238. Anti-channeling center anchoring  
The height of the contact line at the center anchor clamp and the height of the contact line at the adjacent hanging string shall be equal, with an allowable deviation of 0 - 20 mm. 238. Anti-channeling center anchor

* 1. 防窜绳两端固定线夹的设置和间距符合设计要求。

The setting and spacing of fixed clamps at both ends of anti-channeling rope meet the design requirements.  
The setting and spacing of fixed clips at both ends of the anti-running rope comply with the design requirements.

* 1. 接触线中心锚结绳与防断式相同。

The contact wire center anchor rope is the same as the anti-break type.  
The center anchoring rope of the contact line is the same as the anti-breaking type.

线岔

Line bifurcation  
line fork

1. 由正线与侧线组成的交叉线岔，正线接触线位于侧线接触线的下方；由侧线和侧线组成的交叉线岔，距中心锚结较近的接触线位于下方。

A cross line bifurcation composed of a main line and a side line, wherein the main line contact line is located below the side line contact line; A cross bifurcation composed of side lines and side lines, and the contact line closer to the center anchor is located below.  
For a crossing junction consisting of a main line and a side line, the main line contact line is located below the side line contact line; for a crossing junction consisting of a side line and a side line, the contact line closer to the center anchor is located below.

1. 单开、对称（双开）道岔的交叉线岔

Crossing switches of single-opening and symmetrical (double-opening) turnouts  
Crossover crossings of single, symmetrical (double) turnouts

1. 道岔定位支柱位置应符合设计。

The position of turnout positioning pillar shall conform to the design.  
The position of turnout positioning pillars shall comply with the design.

1. 线岔交叉点两侧定位点拉出值满足设计要求，并应保证两接触线交叉点位于规定范围内，任何情况下线岔定位拉出值不大于 450mm。

The pull-out value of positioning points on both sides of the intersection point of the line fork meets the design requirements, and the intersection point of the two contact lines should be ensured to be within the specified range. In any case, the pull-out value of positioning of the line fork is not more than 450mm.  
The pull-out value of the positioning points on both sides of the intersection of the line fork shall meet the design requirements, and the intersection of the two contact wires shall be ensured to be within the specified range. Under any circumstances, the positioning and pull-out value of the line fork shall not exceed 450 mm.

1. 交叉点位置

Intersection position  
Cross Point position

标准值：横向距两线路任一线路中心不大于 350mm，纵向距道岔定位大于 2.5m。

Standard value: the transverse distance from the center of either line of the two lines is not more than 350mm, and the longitudinal distance from the turnout positioning is more than 2.5 m.  
Standard value: The lateral distance from either line center of the two lines shall not be more than 350mm, and the longitudinal distance from the turnout positioning shall be more than 2.5m.

标准状态：交叉点位于道岔导曲线两内轨距 735～1050mm 范围的横向中间位置。允许偏差±50mm。

Standard state: The intersection point is located in the transverse middle position of the two inner gauges of the turnout guide curve in the range of 735 ~ 1050mm. Allowable deviation ± 50mm.  
Standard status: The intersection point is located in the horizontal middle position between the two inner gauges of the turnout guide curve ranging from 735 to 1,050 mm. Allowable deviation ±50 mm.

警示值：同标准状态。

Warning value: Same as standard status.  
Warning value: same as standard state.

限界值：交叉点位于道岔导曲线两内轨距 630～1085mm 范围的横向中间位置。允许偏差±50mm。

Gauge value: The intersection point is located in the transverse middle position of the range of 630 ~ 1085mm between the two inner gauges of the turnout guide curve. Allowable deviation ± 50mm.  
Limit value: The intersection point is located in the horizontal middle position between 630 mm and 1,085 mm inside the turnout guide curve. Allowable deviation ± 50 mm.

1. 两接触线高差

Height difference between two contact lines  
Height difference between two contact lines

标准值：当两支接触线均为工作支时，两线相距 500mm、800mm 处，正线线岔的侧线接触线比正线接触线高 20mm，侧线线岔两接触线等高；当一支为非工作支时，距线路中心 800mm 处，非工作支接触线比工作支接触线抬高 80mm，并向下锚方向均匀抬升。

Standard value: When the two contact lines are working branches, the distance between the two lines is 500mm and 800mm, the side line contact line of the main line bifurcation is 20mm higher than the main line contact line, and the two contact lines of the side line bifurcation are equal in height; When one branch is a non-working branch, the contact line of the non-working branch is 80mm higher than that of the working branch at 800mm away from the center of the line, and it is evenly lifted towards the downward anchor direction.  
Standard value: When both contact wires are working branches, the distance between the two wires is 500mm and 800mm, the side contact wire of the main line fork is 20mm higher than the main line contact wire, and the two contact wires of the side line fork are equal in height; When one is a non-working branch, at 800mm away from the center of the line, the non-working branch contact wire is 80mm higher than the working branch contact wire and is evenly lifted in the direction of anchoring.

标准状态：当两支接触线均为工作支时，两线相距 500mm、800mm 处，正线线岔侧线接

Standard state: When both contact lines are working branches, the distance between the two lines is 500mm and 800mm, and the main line bifurcation and side line are connected  
Standard state: When both contact lines are working branches, the main line will be connected at a distance of 500mm and 800mm between the two lines.

触线比正线接触线高 15～25mm，侧线线岔两接触线高差不大于 20mm；当一支为非工作支时，其距线路中心 800mm 处，非工作支接触线比工作支接触线抬高 60～90mm，并向下锚方向均匀抬升。

The contact line is 15 ~ 25mm higher than the main contact line, and the height difference between the two contact lines of the side line bifurcation is not more than 20mm; When one branch is a non-working branch, the contact line of the non-working branch is 60 ~ 90mm higher than that of the working branch at 800mm away from the center of the line, and it is evenly lifted towards the downward anchor direction.  
The contact line is 15~25mm higher than the contact line on the main line, and the height difference between the contact lines of the side line fork shall not be more than 20mm; when one branch is a non-working branch, at a point 800mm away from the center of the line, the contact line of the non-working branch is raised 60~90mm higher than the contact line of the working branch, and it is evenly lifted in the direction of anchoring.

警示值：同标准状态。

Warning value: Same as standard status.  
Warning value: same as standard state.

限界值：当两支接触线均为工作支时，两线相距 500mm、800mm 处，正线线岔侧线接触线比正线接触线高 10～30mm，侧线线岔两接触线高差不大于 30mm；当一支为非工作支时，其距线路中心 800mm 处，非工作支接触线比工作支接触线抬高 50～100mm，并向下锚方向均匀抬升。

Limit value: When the two contact lines are working branches, the distance between the two lines is 500mm and 800mm, the contact line of the side line of the main line bifurcation is 10 ~ 30mm higher than that of the main line contact line, and the height difference between the two contact lines of the side line bifurcation is not more than 30mm; When one branch is a non-working branch, the contact line of the non-working branch is 50 ~ 100mm higher than that of the working branch at 800mm away from the center of the line, and it is evenly lifted towards the downward anchor direction.  
Limit value: When both contact lines are working branches, at the distance between the two lines 500mm and 800mm, the contact line of the main line branch branch and the side line branch of the main line branch are 10 - 30mm higher than the contact line of the main line branch, and the height difference between the two contact lines of the side line branch shall not be more than 30mm; When one line is a non-working branch, at 800mm away from the center of the line, the contact line of the non-working branch is 50 - 100mm higher than the contact line of the working branch, and it is evenly lifted in the direction of anchoring.

1. 限制管

Limiting pipe  
limiter tube

限制管长度符合设计要求，安装牢固，并使两接触线有一定的活动间隙，保证接触线自由伸缩。

The length of the limiting pipe meets the design requirements, the installation is firm, and the two contact wires have a certain activity gap to ensure the free expansion and contraction of the contact wires.  
The length of the restriction tube meets the design requirements, is firmly installed, and there is a certain movement gap between the two contact wires to ensure that the contact wires can expand and contract freely.

1. 始触区

Initial contact area  
initial contact area

线岔两工作支中，任一工作支的垂直投影距另一股道线路中心 600～1050mm 的范围内，不得安装任何线夹。

No clamp shall be installed within the range of 600 ~ 1050mm from the vertical projection of either working branch to the center of the other track.  
Of the two working branches of the branch, no clamp shall be installed within the range of 600 - 1,050 mm from the vertical projection of either working branch to the center of the other track.

1. 道岔定位器支座、软横跨定位立柱不得侵入本线及邻线受电弓动态包络线。

Turnout positioner support and soft cross positioning column shall not invade the dynamic envelope of pantograph of this line and adjacent lines.  
Turnout positioner supports and soft crossing positioning columns shall not intrude into the dynamic envelope of the pantograph of the line and adjacent lines.

1. 道岔开口方向、道岔定位后的第一个悬挂点设在线间距大于等于 1220mm 处，并应保证两线接触悬挂的任一接触线分别与相邻线路中心的距离不小于 1220mm。

In the direction of turnout opening, the first hanging point after turnout positioning is set at the place where the line spacing is greater than or equal to 1220mm, and the distance between any contact line of two-line contact suspension and the center of adjacent line is not less than 1220mm.  
The first suspension point in the opening direction of the switch and after the switch is positioned shall be set at a line spacing greater than or equal to 1220 mm, and it shall be ensured that the distance between any contact line suspended by the two lines and the center of the adjacent line shall not be less than 1220 mm.

1. 当非工作支下锚偏角大于 10°时，非工作支应延长一跨并适当抬高后下锚。

When the deflection angle of non-working support is greater than 10, the non-working support should be extended by one span and properly raised before anchoring.  
When the anchor deflection angle of the non-working branch is greater than 10 °, the non-working branch should be extended by one span and properly raised before anchoring.

1. 两支承力索交叉处，垂直间距不应小于 60mm。 241．复式交分和交叉渡线道岔的交叉线岔

At the intersection of two supporting cables, the vertical spacing should not be less than 60mm. 241. Crossing turnouts of compound crossing and crossing turnouts  
At the intersection of two supporting force cables, the vertical spacing shall not be less than 60 mm. 241. Crossings of multiple intersections and cross-crossings

1. 复式交分道岔两接触线相交于中轴支距中点；交叉渡线道岔两接触线相交于两渡线中心线交点处。

The two contact lines of the compound intersection turnout intersect at the midpoint of the central axis support distance; Two contact lines of crossover turnout intersect at the intersection point of the center lines of two crossover lines.  
The two contact lines of a compound intersection turnout intersect at the midpoint of the central axis branch; the two contact lines of a crossing crossing turnout intersect at the intersection of the center lines of the two crossings.

标准值：0 mm。

Standard value: 0 mm.  
Standard value: 0 mm.

标准状态：±50mm。警示值：±100mm。限界值：±150mm。

Standard state: ± 50mm. Warning value: 100mm. Limit value: ± 150mm.  
Standard status: ±50 mm. Warning value: ±100 mm. Limit value: ±150 mm.

1. 两接触线高差、限制管和始触区等，同单开道岔的线岔要求。 242．线岔的编号应以其所在的道岔编号命名。

Height difference between two contact lines, limit pipe and initial contact area, etc., are the same as the requirements of single switch. 242. The number of the switch shall be named after the number of the switch where it is located.  
The height difference between the two contact lines, the limiting pipe and the initial contact area are the same as the requirements for line crossings for single turnouts. 242. The number of a line switch shall be named after the number of the switch where it is located.

电连接

Electrical connection  
electrically connected

1. 在锚段关节、线岔、车站电力机车（动车组）经常起动处的股道之间等处所，应装设电连接。

Electrical connections shall be installed at anchor joints, line bifurcations, and between tracks where electric locomotives (EMUs) in stations often start.  
Electrical connections should be installed at anchor section joints, line forks, and between tracks where electric locomotives (EMUs) at stations are often started.

电连接位置和数量符合设计要求，安装位置允许偏差±500mm。

The position and quantity of electrical connection meet the design requirements, and the allowable deviation of installation position is 500mm.  
The position and number of electrical connections meet the design requirements, and the allowable deviation of the installation position is ±500 mm.

交叉跨越线索间距不足 200mm 的处所应加装等位线。等位线及其连接线夹应与被连接线索材质匹配，截面积不小于 10mm2。

Equal potential lines should be installed at places where the distance between crossing clues is less than 200mm. The equipotential line and its connecting clamp shall match the material of the connected thread, and the cross-sectional area shall not be less than 10mm 2 .  
Equipotential lines shall be installed at places where the spacing between crossing clues is less than 200 mm. The equipotential wire and its connecting wire clips shall match the material of the connected wire, and the cross-sectional area shall not be less than 10 mm2.

1. 电连接线及线夹

Electrical connecting wires and clamps  
Electrical connecting wires and clamps

1. 电连接线

Electrical connecting wire  
electrical connection line

* 1. 承力索、接触线间距≤1000mm 时采用“C”型连接方式；间距＞1000mm 时采用“S”型连接。其裕度满足接触线、承力索因温度变化伸缩的要求。

When the distance between load-bearing cables and contact lines is ≤ 1000mm, "C" connection mode shall be adopted; When the spacing is > 1000mm, "S" type connection is adopted. Its margin meets the requirements of expansion and contraction of contact wire and load-bearing cable due to temperature change.  
When the spacing between the load-bearing cables and contact wires is ≤1000mm, the "C" type connection method is adopted; when the spacing is greater than 1000mm, the "S" type connection is adopted. Its margin meets the requirements for the expansion and contraction of contact wires and load-bearing cables due to temperature changes.

* 1. 电连接线均要用多股软铜线做成，其额定载流量不小于被连接的接触悬挂、供电线的额定载流量，且不得有接头。

Electrical connecting wires shall be made of multiple strands of soft copper wires, and their rated current carrying capacity shall not be less than the rated current carrying capacity of connected contact suspension and power supply lines, and there shall be no joints.  
Electrical connecting wires must be made of multiple strands of flexible copper wire, and their rated current carrying capacity shall not be less than the rated current carrying capacity of the connected contact suspension and power supply wires, and there must be no joints.

* 1. 对于压接式电连接，电连接线不应有压伤和断股现象；对于并接式电连接，电连接线端头外露 10～20mm。

For crimping electrical connection, the electrical connecting wire should not be crushed and broken; For parallel electrical connection, the end of the electrical connection wire is exposed by 10 ~ 20mm.  
For crimp type electrical connections, the electrical connection wire should not be crushed or broken; for parallel type electrical connections, the end of the electrical connection wire is exposed by 10 - 20 mm.

1. 电连接线夹

Electrical connecting clamp  
electrically connecting clamp

1. 电连接线夹的材质和规格须与被连接线索相适应，宜采用压接型式。

The material and specification of the electrical connecting clamp must be adapted to the connected thread, and the crimping type should be adopted.  
The material and specifications of the electrical connection clamp must be compatible with the connected cable, and crimping type should be adopted.

1. 电连接线夹与接触线、承力索、供电线之间连接牢固，线夹内无杂物。

The electrical connection clamp is firmly connected with the contact wire, load-bearing cable and power supply line, and there are no sundries in the clamp.  
The electrical connection clamp is firmly connected to the contact wire, load-bearing rope, and power supply wire, and there is no debris in the clamp.

1. 接触线电连接线夹在直线处应处于铅垂状态，在曲线处应与接触线的倾斜度一致。

Contact wire electrical connection wire clamp should be in vertical state at straight line, and should be consistent with the inclination of contact wire at curve.  
The electrical connection wire clamp of the contact wire should be in a vertical state at the straight line, and the inclination of the contact wire should be consistent with the curve.

1. 工作支接触线电连接线夹处接触线高度与最近相邻吊弦点高度相等，允许偏差 0～10mm。

The height of the contact wire at the electrical connection clamp of the working branch contact wire is equal to the height of the nearest adjacent hanging chord point, and the allowable deviation is 0 ~ 10mm.  
The height of the contact wire at the electrical connection clamp of the working branch contact wire is equal to the height of the nearest adjacent hanging string point, with an allowable deviation of 0~10 mm.

1. 压接式接触线电连接线夹与线槽契合的 U 形螺纹卡子应平行压接于线槽内，不得跳出接触线线槽。U 形螺纹卡子应保证卡子插入后，另一端露头 1～3mm。

The U-threaded clip that fits the crimping contact wire electric connecting clamp with the slot shall be crimped in parallel in the slot and shall not jump out of the contact wire slot. U-threaded clip should ensure that the outcrop at the other end is 1 ~ 3mm after the clip is inserted.  
Crimp type contact wire electrical connection clamp The U-shaped threaded clip that matches the wire groove shall be crimped in parallel into the wire groove and shall not jump out of the contact wire groove. The U-threaded clip should ensure that the other end of the clip is exposed by 1~3mm after it is inserted.

1. 电连接线夹与线索接触面均应涂导电脂

Conductive grease shall be coated on the contact surface between the electrical connecting clamp and the thread  
Conductive grease should be applied to the contact surfaces of electrical connection clips and threads

补偿装置

Compensation device  
compensation device

1. 滑轮、棘轮补偿装置

Pulley and ratchet compensation device  
Pulley and ratchet compensation device

（1）a 值、b 值标准值：设计值。

(1) A value, b value Standard value: design value.  
(1) Standard values of a value and b value: design values.

标准状态：标准值±100mm。警示值：标准值±200mm。

Standard state: Standard value ± 100mm. Warning value: standard value 200mm.  
Standard status: Standard value ±100 mm. Warning value: standard value ±200 mm.

限界值：任何情况下不小于 200mm。

Threshold value: not less than 200mm in any case.  
Limit value: not less than 200mm under any circumstances.

1. 坠砣及坠砣限制架

Drop weight and drop weight limiting frame  
Falling weight and falling weight limiting frame

* 1. 坠砣宜采用铁质或高密度复合坠砣。

Iron or high-density composite weight should be used.  
Iron or high-density composite weight should be used as the weight.

* 1. 坠砣块应完整，自上而下编号且叠码整齐，其缺口相互错开 180°。坠砣串的重量（包括坠砣杆的重量）符合规定，整串重量偏差小于 2%。

The weight blocks shall be complete, numbered from top to bottom and stacked neatly, and their gaps shall be staggered by 180. The weight of the weight string (including the weight of the weight rod) meets the requirements, and the weight deviation of the whole string is less than 2%.  
The falling weight blocks should be complete, numbered from top to bottom and neatly stacked, with gaps staggered from each other by 180°. The weight of the weight string (including the weight of the weight rod) complies with the regulations, and the weight deviation of the entire string is less than 2%.

* 1. 限制架的安装位置应满足坠砣升降变化要求。山谷口、高路堤（一般指高出自然地面 5m）、高架桥等“风口”地段，宜采用防风型坠砣限制架。

The installation position of the limiting frame shall meet the requirements of lifting and changing the weight. Wind-proof falling weight limiting frame should be used in "tuyere" sections such as valley mouth, high embankment (generally 5m higher than natural ground) and viaduct.  
The installation position of the restriction frame shall meet the requirements for lifting changes of the weight. Wind-proof weight limiting frames should be used in "tuyere" areas such as valley entrances, high embankments (generally 5 meters higher than the natural ground), and viaducts.

1. 补偿绳

Compensation rope  
compensating rope

1. 补偿绳不得有散股、断股、接头现象，且不得扭绞、与其他部件、线索相摩擦。

The compensation rope shall not have scattered strands, broken strands and joints, and shall not be twisted or rubbed against other parts and clues.  
The compensation rope shall not have loose strands, broken strands, or joints, and shall not be twisted or rubbed against other parts or clues.

1. 棘轮装置大、小轮缠绕补偿绳符合要求。

The winding compensation rope of large and small wheels of ratchet device meets the requirements.  
The large and small wheels of the ratchet device wind the compensation rope in accordance with the requirements.

1. 优先采用柔韧性好、抗疲劳强的补偿绳。

Give priority to compensation ropes with good flexibility and strong fatigue resistance.  
Priority is given to using compensation ropes with good flexibility and strong fatigue resistance.

1. 滑轮补偿装置

Pulley compensation device  
pulley compensation device

1. 滑轮补偿装置安装正确，本体无裂纹、变形，转动灵活无卡滞（人力用手托动坠砣能上下自由移动）。

The pulley compensation device is installed correctly, the body is free of cracks and deformation, and the rotation is flexible without sticking (the falling weight can move up and down freely by hand).  
The pulley compensation device is installed correctly, the body is free of cracks or deformation, and the rotation is flexible and free of jams (the weight can be moved up and down freely by manually supporting it).

1. 对需要加注润滑油的补偿滑轮，应按产品规定的期限加注润滑油，没有规定者至少 3 年一次。

For compensation pulleys that need to be filled with lubricating oil, lubricating oil should be filled according to the time limit specified by the product, and if there is no regulation, it should be filled at least once every 3 years.  
For compensation pulleys that need to be filled with lubricating oil, lubricating oil shall be filled within the time limit specified by the product, and if there is no regulation, at least once every 3 years.

1. 下锚角钢安装水平。定滑轮应保持铅垂状态，动滑轮偏转角度不得大于 45°。

Installation level of anchor angle steel. The fixed pulley shall be kept vertical, and the deflection angle of the moving pulley shall not be greater than 45.  
Install the lower anchor angle horizontally. The fixed pulley should be kept in a vertical state, and the deflection angle of the movable pulley should not exceed 45 °.

1. 同一补偿装置的两补偿滑轮的间距，任何情况下不小于 500mm。

The distance between two compensation pulleys of the same compensation device shall not be less than 500mm under any circumstances.  
The distance between two compensation pulleys of the same compensation device shall not be less than 500mm under any circumstances.

1. 优先采用大直径滑轮补偿装置。

Large diameter pulley compensation device is preferred.  
Large-diameter pulley compensation devices are preferred.

1. 棘轮补偿装置

Ratchet compensation device  
Ratchet compensation device

1. 采用不防断式中心锚结或下锚位于桥梁上时，宜选用棘轮补偿装置。

Ratchet compensation device should be selected when non-breakable central anchor is adopted or the lower anchor is located on the bridge.  
When a non-break-proof center anchor is used or the anchor is located on the bridge, a ratchet compensation device should be used.

1. 棘轮补偿装置安装正确，棘轮本体无裂纹、变形，转动灵活无卡滞（人力用手托动坠砣能上下自由移动）。

Ratchet compensation device is installed correctly, ratchet body without cracks, deformation, flexible rotation without jamming (manual hand-supported weight can move up and down freely).  
The ratchet compensation device is installed correctly, the ratchet body is free of cracks or deformation, and the rotation is flexible and free of jams (the weight can be moved up and down freely by manually supporting the weight).

1. 对需要加注润滑油的棘轮补偿滑轮，应按产品规定的期限加注润滑油，没有规定者至少 3 年一次。

For ratchet compensation pulleys that need to be filled with lubricating oil, lubricating oil should be filled according to the time limit specified by the product, and if there is no regulation, it should be filled at least once every 3 years.  
For ratchet compensation pulleys that need to be filled with lubricating oil, lubricating oil shall be filled within the time limit specified by the product. If there is no regulation, it shall be filled with lubricating oil at least once every 3 years.

1. 制动装置作用良好，制动卡块到大轮轮齿间的距离符合设计要求。

The braking device works well, and the distance between the braking block and the teeth of the big wheel meets the design requirements.  
The braking device works well, and the distance between the brake block and the teeth of the large wheel meets the design requirements.

1. 平衡轮与棘轮的间距不小于 500mm。

The distance between balance wheel and ratchet wheel shall not be less than 500mm.  
The distance between the balance wheel and the ratchet wheel shall not be less than 500 mm.

1. 棘轮大小轮转动灵活，轮槽上下偏斜不得大于 5mm。

The ratchet wheel rotates flexibly, and the deviation of the wheel groove from top to bottom shall not be greater than 5mm.  
The large and small wheels of the ratchet wheel rotate flexibly, and the vertical deviation of the wheel groove shall not exceed 5 mm.

1. 承力索、接触线两下锚绝缘子串应对齐，允许偏差为±100mm。 246．弹簧补偿装置

The two anchor insulator strings of load-bearing cable and contact line shall be aligned, and the allowable deviation shall be 100mm. 246. Spring compensation device  
The anchor insulator strings under the load-bearing cable and contact wire shall be aligned, with an allowable deviation of ±100 mm. 246. spring compensation device

1. 弹簧补偿装置刻度牌与环境温度相对应，补偿绳伸缩长度符合设计要求。

The scale plate of spring compensation device corresponds to the ambient temperature, and the telescopic length of compensation rope meets the design requirements.  
The scale plate of the spring compensation device corresponds to the ambient temperature, and the expansion length of the compensation rope meets the design requirements.

1. 弹簧补偿器本体安装牢固，位置符合设计要求。本体无裂纹、变形，与下锚方向在同一直线上。

The spring compensator body is firmly installed and its position meets the design requirements. The body has no crack and deformation, and is on the same straight line as the anchor direction.  
The spring compensator body is firmly installed and the position meets the design requirements. The body has no cracks or deformation, and is on the same straight line as the anchoring direction.

1. 补偿绳位于渐开线轮槽正中，不得偏磨，不得有松股、断股和接头。

The compensation rope is located in the middle of the involute wheel groove, and shall not be worn eccentrically, and shall not have loose strands, broken strands and joints.  
The compensation rope is located in the center of the involute wheel groove and shall not be worn off, loose strands, broken strands and joints shall not be allowed.

1. 弹簧补偿装置各零部件安装正确。

All parts of spring compensation device are installed correctly.  
All parts of the spring compensation device are installed correctly.

1. 液压等其他结构形式补偿装置，其技术状态符合设计要求。

The technical status of compensation devices with hydraulic and other structural forms meets the design requirements.  
The technical status of compensation devices in other structural forms such as hydraulic pressure meets the design requirements.

1. 同一锚段两端，补偿装置型号应保持一致。

At both ends of the same anchor section, the model of compensation device should be consistent.  
At both ends of the same anchor section, the compensation device type shall be consistent.

定位支撑装置软(硬)横跨

Soft (hard) span of positioning support device  
Positioning support device soft (hard) span

1. 软横跨

Soft span  
head span

1. 横向承力索、上、下部固定绳

Transverse bearing rope, upper and lower fixing rope  
Transverse load-bearing rope, upper and lower fixing rope

* 1. 横向承力索（双横承力索为其中心线）的弛度应符合规定，和上、下部固定绳应布置在同一个铅垂面内。双横承力索两条线的张力应相等。

The sagging degree of transverse bearing cable (double transverse bearing cable is its center line) shall conform to the regulations, and the upper and lower fixed ropes shall be arranged in the same vertical plane. The tension of two lines of double transverse bearing cable should be equal.  
The sag of the transverse bearing rope (double transverse bearing rope is the center line) shall comply with the regulations, and shall be arranged in the same vertical plane as the upper and lower fixing ropes. The tension between the two threads of the double cross-bearing cable should be equal.

* 1. 上、下部固定绳应水平并处于拉紧状态，允许有平缓的负弛度，5 股道及以下不超过 100mm，5 股道以上不超过 200mm。

The upper and lower fixing ropes shall be horizontal and in a tight state, allowing a gentle negative sag, not exceeding 100mm for 5 tracks and below, and not exceeding 200mm for 5 tracks and above.  
The upper and lower fixing ropes should be horizontal and in a tight state, with gentle negative slack allowed, and no more than 100mm for track 5 and below, and no more than 200mm for track 5 and above track 5.

* 1. 上、下部固定绳弹簧补偿器处于固定绳受力小的一侧，张力符合设计规定。

The upper and lower fixed rope spring compensators are located on the side of the fixed rope with small stress, and the tension meets the design requirements.  
The upper and lower fixed rope spring compensators are located on the side of the fixed rope with less stress, and the tension meets the design requirements.

* 1. 横向承力索和上、下部固定绳不得有接头、断股和补强，其机械强度安全系数应符合附件 14 的规定。

Transverse load-bearing cables and upper and lower fixed ropes shall not have joints, broken strands and reinforcements, and their mechanical strength safety factors shall conform to the provisions of Annex 14.  
The transverse load-bearing cables and upper and lower fixed ropes shall not have joints, broken strands or reinforcements, and their mechanical strength safety factors shall comply with the provisions of Annex 14.

1. 吊线

Hanging wire  
suspension wire

1. 软横跨直吊线、斜拉线应采用不锈钢等防腐性能好的材质。

Soft span straight suspension wire and oblique stay wire should be made of stainless steel and other materials with good anticorrosion performance.  
Soft spanning straight suspension wires and diagonal cables should be made of stainless steel and other materials with good corrosion resistance.

1. 软横跨直吊线应保持铅垂，吊线呈拉紧状态，上端永久固定，无松弛，横向承力索与上部固定绳在最短吊线处距离为 400～600mm。

Soft span straight suspension line should be kept vertical, suspension line is in a tight state, the upper end is permanently fixed without relaxation, and the distance between transverse bearing cable and upper fixed rope at the shortest suspension line is 400 ~ 600mm.  
The soft spanning straight suspension wire should be kept vertical. The suspension wire should be in a tight state, the upper end should be permanently fixed without slack. The distance between the transverse bearing rope and the upper fixed rope at the shortest suspension wire should be 400~600 mm.

1. 各吊线应留有不小于 200mm 的余量。

Each hanging wire shall have a margin of not less than 200mm.  
A margin of not less than 200mm shall be reserved for each suspension wire.

1. 各部位几何尺寸

Geometric dimensions of each part  
Geometric size of each part

1. 下部固定绳距工作支接触线的垂直距离不得小于 250mm。

The vertical distance between the lower fixed rope and the working branch contact line shall not be less than 250mm.  
The vertical distance between the lower fixed rope and the contact line of the working branch shall not be less than 250 mm.

1. 横向承力索和上、下部固定绳的电分段绝缘子串应在同一垂直面内。位于站台沿上方绝缘子带电裙边应尽量与站台对齐，股道间横向电分段绝缘子应位于两股道中间。

The transverse load-bearing cable and the electrical subsection insulator string of the upper and lower fixed cables shall be in the same vertical plane. The live skirt of insulators located above the platform edge should be aligned with the platform as far as possible, and the transverse electrical sectional insulators between tracks should be located between the two tracks.  
The electrical segmented insulator strings of transverse load-bearing cables and upper and lower fixing ropes shall be in the same vertical plane. The live skirt of insulators located above the platform edge should be aligned with the platform as much as possible, and the horizontal electrical segmented insulators between tracks should be located between the two tracks.

1. 支柱上角钢底座应水平。各杵头杆螺纹外露长度应为 20～80mm，调整螺栓的螺杆外露长度应为 50mm 至螺纹全长的 1/2。

Angle steel base on strut should be horizontal. The thread exposed length of each pestle head rod shall be 20 ~ 80mm, and the screw exposed length of adjustment bolt shall be 50mm to 1/2 of the total thread length.  
The angle steel base on the pillar should be horizontal. The exposed length of the thread of each pestle head rod shall be 20 - 80mm, and the exposed length of the screw rod of the adjustment bolt shall be 50mm to 1/2 of the total thread length.

1. 非悬挂线索与固定绳间距离符合要求。

The distance between non-hanging thread and fixed rope meets the requirements.  
The distance between non-hanging clues and fixed ropes meets the requirements.

1. 软横跨应垂直于正线，各部螺栓、垫片、弹簧垫圈应齐全，螺栓紧固。

Soft span should be perpendicular to the main line, bolts, gaskets and spring washers should be complete, and bolts should be fastened.  
The soft span should be perpendicular to the main line, and all bolts, washers and spring washers should be complete and the bolts should be fastened.

1. 悬吊滑轮与承力索材质相匹配，满足线索随温度变化伸缩要求。 250．硬横跨

The suspension pulley is matched with the material of the load-bearing cable, which meets the expansion and contraction requirements of the cable with the change of temperature. 250. Hard spanning  
The materials of the suspension pulley and the load-bearing rope are matched to meet the requirements of stretching and retracting the thread with temperature changes. 250. lattice span

1. 硬横梁的安装高度应符合设计要求，允许偏差 0～+100mm。

The installation height of hard beam should meet the design requirements, and the allowable deviation is 0 ~ + 100mm.  
The installation height of the hard beam should meet the design requirements, with an allowable deviation of 0~+100mm.

1. 硬横梁应呈水平状态，允许向上微拱，铰接硬横梁的挠度小于梁长的 1/200，刚接硬横梁的挠度小于梁长的 1/360。

Hard beams should be horizontal, allowing upward micro-arch, the deflection of articulated hard beams is less than 1/200 of beam length, and that of rigid hard beams is less than 1/360 of beam length.  
The hard beams should be horizontal and slightly arched upward. The deflection of the hinged hard beams should be less than 1/200 of the beam length, and the deflection of the rigidly connected hard beams should be less than 1/360 of the beam length.

1. 硬横梁与支柱、硬横梁各梁段之间应结合密贴，连接牢固可靠，螺栓紧固力矩应符合设计要求。

Hard beam and strut, between the beam section of the hard beam should be combined tightly, the connection is firm and reliable, and the bolt fastening moment should meet the design requirements.  
The hard beam, the pillars and each beam section of the hard beam should be closely connected, the connection should be firm and reliable, and the bolt tightening torque should meet the design requirements.

1. 硬横梁（角钢）不得变形和开焊，锈蚀面积不得超过 20%，焊接处不得锈蚀。

Hard beam (angle steel) shall not be deformed and welded, the corroded area shall not exceed 20%, and the welded place shall not be corroded.  
Hard beams (angle steels) shall not be deformed or welded, the corroded area shall not exceed 20%, and the welds shall not be corroded.

1. 固定绳安装方式技术状态应符合第 251 条相关要求。吊柱安装方式技术状态应符

The technical condition of fixing rope installation mode shall comply with the relevant requirements of Article 251. Technical status of davit installation mode shall be in accordance with  
The technical status of the fixing rope installation method shall comply with the relevant requirements of Article 251. The technical status of suspension column installation method shall comply with

合第 258 条相关要求。

Meet the relevant requirements of Article 258.  
Comply with the relevant requirements of Article 258.

支撑装置

Supporting device  
support device

1. 结构高度

Height of structure  
structure height

标准值：设计值。

Standard value: Design value.  
Standard value: design value.

标准状态：标准值±50mm。警示值：标准值±200mm。

Standard state: Standard value ± 50mm. Warning value: standard value 200mm.  
Standard status: Standard value ±50 mm. Warning value: standard value ±200 mm.

限界值：（以跨距中最短吊弦长度为依据界定）最短吊弦长度不小于 300mm。

Limit value: (defined according to the shortest hanging chord length in the span) The shortest hanging chord length shall not be less than 300mm.  
Limit value: (defined based on the shortest hanging string length in the span) The shortest hanging string length shall not be less than 300 mm.

1. 腕臂支撑装置

Wrist arm support device  
Wrist-arm support

1. 腕臂支撑装置底座

Base of wrist arm support device  
Wrist-arm support base

腕臂、拉杆、压管底座应与支柱密贴，呈水平状态，两端高差不大于 10mm。安装高度符合设计要求，允许偏差±50mm。

The wrist arm, pull rod and pipe base should be closely attached to the pillar in a horizontal state, and the height difference between the two ends should not be more than 10mm. The installation height meets the design requirements, and the allowable deviation is 50mm.  
The wrist arm, pull rod, and pressure pipe base should be closely attached to the pillar and be horizontal, with the height difference at both ends not more than 10 mm. The installation height meets the design requirements, and the allowable deviation is ±50 mm.

多线路腕臂底座及连接件安装高度应满足最高轨面至横梁下缘的设计高度，允许偏差± 50mm。

The installation height of multi-line wrist arm base and connectors shall meet the design height from the highest rail surface to the lower edge of the beam, with an allowable deviation of ± 50mm.  
The installation height of the multi-line wrist arm base and connecting pieces shall meet the design height from the highest rail surface to the lower edge of the beam, with an allowable deviation of ± 50 mm.

双腕臂底座间距应满足要求，极限温度时，两支悬挂及零部件间距不得小于 60mm，腕

The distance between the bases of the double wrist arms shall meet the requirements. At the limit temperature, the distance between the two suspensions and parts shall not be less than 60mm, and the wrist  
The spacing between the bases of the two wrist arms should meet the requirements. At extreme temperatures, the spacing between the two suspensions and parts should not be less than 60 mm.

臂底座端头应封堵。

The end of the arm base should be sealed.  
The end of the arm base should be blocked.

1. 腕臂

Carpal arm  
wrist arm

* 1. 腕臂不得明显弯曲且无永久性变形，端部非受力部分长度为 100～200mm，管口封堵良好。

The wrist arm shall not be obviously bent and have no permanent deformation. The length of the non-stressed part at the end is 100 ~ 200mm, and the nozzle is well sealed.  
The wrist and arm shall not be significantly bent and have no permanent deformation. The length of the non-stressed part at the end shall be 100~200mm, and the orifice shall be well blocked.

* 1. 腕臂各部件组装正确，应与腕臂在同一垂直面内，铰接处要转动灵活，各部件间

All parts of the wrist arm are assembled correctly, and should be in the same vertical plane as the wrist arm. The hinge should rotate flexibly, and between the parts  
All parts of the wrist arm are assembled correctly and should be in the same vertical plane as the wrist arm. The hinge should rotate flexibly.

距离符合设计要求。

The distance meets the design requirements.  
The distance meets the design requirements.

* 1. 腕臂的安装位置应满足承力索悬挂点（或支撑点）距轨面的距离（即导线高度加结构高度），悬挂点距线路中心的水平距离符合设计要求。

The installation position of the wrist arm should meet the distance between the suspension point (or support point) of the load-bearing cable and the rail surface (i.e., the conductor height plus the structure height), and the horizontal distance between the suspension point and the center of the line should meet the design requirements.  
The installation position of the wrist arm should meet the distance between the suspension point (or support point) of the carrier cable and the rail surface (i.e., the height of the conductor plus the structure height), and the horizontal distance between the suspension point and the center of the line meets the design requirements.

* 1. 腕臂偏移

Arm offset  
Wrist-arm offset

标准值：符合安装曲线要求。标准状态：标准值±50mm。 警示值：标准值±100mm。

Standard value: Meet the requirements of installation curve. Standard state: Standard value ± 50mm. Warning value: standard value ± 100mm.  
Standard value: Comply with installation curve requirements. Standard status: Standard value ±50 mm. Warning value: standard value ±100 mm.

限界值：任何情况下不得超过腕臂垂直投影长度的 1/3。

Limit value: under no circumstances shall it exceed 1/3 of the vertical projection length of wrist arm.  
Limit value: Under no circumstances shall it exceed 1/3 of the vertical projection length of the wrist arm.

* 1. 双线路腕臂应保持水平状态，其允许仰高不超过 100mm，无永久性变形。定位立柱应保持铅垂状态。

The double-line wrist arm shall be kept horizontal, and its allowable elevation shall not exceed 100mm without permanent deformation. Positioning columns should be kept vertical.  
The dual-line wrist arm should be kept horizontal, its allowable height should not exceed 100mm, and there should be no permanent deformation. The positioning column shall be kept in a vertical state.

* 1. 棒式绝缘子排水孔朝下。 承力索座内的承力索置于受力方向指向轴心的槽内。

The drain hole of rod insulator faces down. The bearing cable in the bearing cable seat is arranged in the groove where the bearing direction points to the axis.  
The drain hole of the rod insulator faces downward. The load-bearing cable in the load-bearing cable seat is placed in a groove whose force direction points to the axis.

1. 拉杆（压管）

Pull rod (pressure pipe)  
Pull rod (pressure pipe)

1. 拉杆（压管）的安装位置要满足承力索的悬挂需要，安装偏差与腕臂相同。

The installation position of pull rod (pressure pipe) should meet the suspension needs of load-bearing cable, and the installation deviation is the same as that of wrist arm.  
The installation position of the tie rod (pressure pipe) must meet the suspension needs of the load-bearing cable, and the installation deviation is the same as that of the wrist arm.

1. 拉杆（压管）应呈水平状态，允许悬挂点侧仰高不超过 100mm。

The pull rod (pressure pipe) shall be in a horizontal state, and the lateral height of the suspension point shall not exceed 100mm.  
The tie rod (pressure pipe) should be horizontal, and the allowable suspension point height should not exceed 100 mm.

1. 拉杆（压管）须处于受拉（受压）状态。 253．隧道悬挂装置

The pull rod (pressure pipe) must be in tension (pressure) state. 253. Tunnel suspension  
The tie rod (pressure pipe) must be in tension (compression) state. 253. Tunnel suspension device

* 1. 隧道悬挂装置应满足隧道及线路所规定的限界要求，任何情况下不得短接绝缘部件的有效绝缘距离，绝缘间隙符合要求。

The tunnel suspension device shall meet the limit requirements specified by tunnels and lines. Under no circumstances shall the effective insulation distance and insulation gap of insulation components be shorted to meet the requirements.  
The tunnel suspension device shall meet the clearance requirements specified by the tunnel and the line. Under no circumstances shall the effective insulation distance of the insulating parts be shorted, and the insulation gap shall meet the requirements.

* 1. 各零部件连接可靠，运转灵活，防腐性能满足要求。

All parts are connected reliably, operated flexibly, and the anticorrosion performance meets the requirements.  
All parts are connected reliably, operate flexibly, and their anti-corrosion performance meets requirements.

* 1. 承力索固定零部件与其材质相匹配，满足承力索随温度变化伸缩要求。

The fixed parts of the load-bearing cable are matched with their materials, which meets the expansion and contraction requirements of the load-bearing cable with temperature changes.  
The fixing parts of the load-bearing cable match their materials to meet the requirements for expansion and contraction of the load-bearing cable with temperature changes.

* 1. 隧道水平悬挂安装后其整体弛度不应超过 30mm。

The overall sag of the tunnel after horizontal suspension installation shall not exceed 30mm.  
The overall sag of the tunnel after horizontal suspension installation shall not exceed 30 mm.

定位装置

Positioning device  
positioning device

1. 定位装置结构及安装状态应保证接触线工作面平行于轨面连线，定位点处接触线的弹性符合规定。当电力机车（动车组）受电弓通过和温度变化时，接触线能上下、左右自由移动。

The structure and installation state of the positioning device shall ensure that the working face of the contact line is parallel to the connecting line of the rail surface, and the elasticity of the contact line at the positioning point meets the requirements. When the pantograph of electric locomotive (EMU) passes and the temperature changes, the contact wire can move up and down, left and right freely.  
The structure and installation status of the positioning device shall ensure that the working surface of the contact line is parallel to the rail surface line, and the elasticity of the contact line at the positioning point shall comply with the regulations. When the pantograph of an electric locomotive (EMU) passes through and the temperature changes, the contact wire can move freely up and down, left and right.

1. 定位器

Locator  
locator

* 1. 定位器应处于受拉状态（拉力≥80N），定位器静态角度（定位器与轨面连线之间的夹角）标准如下：

The positioner shall be in a tension state (tension ≥ 80 N), and the static angle of the positioner (the included angle between the positioner and the rail surface) is as follows:  
The positioner should be in tension (tensile force ≥ 80N), and the static angle of the positioner (the angle between the positioner and the rail surface line) standard is as follows:

标准值：9°。

Standard value: 9.  
Standard value: 9°.

标准状态：8～11°。警示值：7～14°。 限界值：6～17°。

Standard state: 8 ~ 11. Warning value: 7 ~ 14. Limit value: 6 ~ 17.  
Standard state: 8~11°. Warning value: 7~14°. Limit value: 6~17°.

对于非限位、弓形等定位器，安装应符合设计要求。

For non-limit, bow and other positioners, the installation shall meet the design requirements.  
For non-limiting, bow and other positioners, the installation shall comply with the design requirements.

* 1. 定位器偏移

Locator offset  
positioner offset

定位器应与腕臂顺线路偏移的方向、角度相一致。

The locator should be consistent with the direction and angle of wrist arm offset along the line.  
The positioner should be consistent with the direction and angle of the wrist arm offset along the line.

标准值：平均温度时垂直于线路中心线，温度变化时沿接触线纵向偏移与接触线在该点的伸缩量相一致。

Standard value: The average temperature is perpendicular to the centerline of the line, and the longitudinal deviation along the contact line when the temperature changes is consistent with the expansion and contraction of the contact line at this point.  
Standard value: When the average temperature is perpendicular to the centerline of the line, and when the temperature changes, the longitudinal offset along the contact line is consistent with the expansion and contraction of the contact line at that point.

标准状态：标准值±偏移量的 10%。警示值：标准值±偏移量的 20%。

Standard state: Standard value ± 10% of offset. Warning value: 20% of the standard value ± offset.  
Standard status: Standard value ± 10% of offset. Warning value: standard value ± 20% of offset.

限界值：极限温度时，偏移值不得大于定位器（管）长度的 1/3。

Limit value: At the limit temperature, the offset value shall not be greater than 1/3 of the length of the positioner (tube).  
Limit value: At extreme temperature, the offset value shall not exceed 1/3 of the length of the positioner (tube).

* 1. 定位器限位间隙应符合设计要求，允许偏差±lmm。且应满足受电弓最大动态抬升量的限位要求，在 1.5 倍最大动态抬升量时限位间隙为 0。非限位定位器根部与接触线高差符合设计要求，允许偏差±l0mm。

Positioner limit clearance shall meet the design requirements, with allowable deviation of ± lmm. And should meet the limit requirements of the maximum dynamic lifting of pantograph, and the position gap is 0 when the maximum dynamic lifting is 1.5 times. The height difference between the root of the non-limit positioner and the contact line meets the design requirements, and the allowable deviation is ± l0mm.  
The limit clearance of the positioner shall comply with the design requirements, with an allowable deviation of ±lmm. The limit requirement for the maximum dynamic lifting amount of the pantograph should be met, and the limit gap should be 0 when the maximum dynamic lifting amount is 1.5 times. The height difference between the root of the non-limit positioner and the contact line meets the design requirements, and the allowable deviation is ± 10 mm.

* 1. 转换支柱处两定位器能分别随温度变化自由转动，不得卡滞；非工作支和工作支定位器、管之间的间隙不小于 50mm。

The two positioners at the conversion pillar can rotate freely with the change of temperature respectively without sticking; The gap between non-working branch and working branch positioner and pipe shall not be less than 50mm.  
The two positioners at the conversion pillar can rotate freely with temperature changes and must not be stuck; the gap between the positioners and pipes of non-working and working branches shall not be less than 50 mm.

1. 定位管

Locating tube  
positioning tube

1. 正、反定位管状态均应符合设计要求，应与腕臂在同一垂面内。

Positive and reverse positioning tubes shall meet the design requirements and be in the same vertical plane as the wrist arm.  
The status of the forward and reverse positioning pipes shall meet the design requirements and shall be in the same vertical plane as the wrist arm.

1. 定位管端部余长为 50～150mm，定位管管口封堵良好。

The excess length of the end of the positioning pipe is 50 ~ 150mm, and the orifice of the positioning pipe is well sealed.  
The remaining length of the end of the positioning pipe is 50 - 150mm, and the nozzle of the positioning pipe is well blocked.

1. 定位管吊线应顺直受力，与弹性吊索间隙大于 50mm。

The sling wire of positioning pipe should be directly stressed, and the gap between it and elastic sling should be greater than 50mm.  
The suspension wire of the positioning pipe shall be stressed straight, and the gap between it and the elastic sling shall be greater than 50 mm.

1. 采用“V”型吊线时，两侧吊线的长度张力应相等。固定吊线的定位环、支撑管卡子、吊线固定钩距定位器定位环应保持 100～150mm 的距离。吊线固定钩开口方向符合规定。

When "V" type suspension wire is used, the length tension of suspension wire on both sides should be equal. Fixed hanging wire positioning ring, supporting pipe clip, hanging wire fixing hook should keep a distance of 100 ~ 150mm from positioner positioning ring. The opening direction of the hanging wire fixing hook meets the requirements.  
When using "V" shaped suspension wires, the length tension of suspension wires on both sides should be equal. The positioning ring, support pipe clip, and suspension wire fixing hook for fixing the suspension wire shall keep a distance of 100 - 150mm from the positioning ring of the positioner. The opening direction of the suspension wire fixing hook shall comply with the requirements.

1. 定位管支撑及两端支撑管卡子与腕臂在同一垂面内，定位管支撑与定位管之间夹角为 30～60°。

The positioning pipe support and the supporting pipe clips at both ends are in the same vertical plane as the wrist arm, and the included angle between the positioning pipe support and the positioning pipe is 30-60.  
The positioning pipe support and the support pipe clips at both ends are in the same vertical plane as the wrist arm, and the included angle between the positioning pipe support and the positioning pipe is 30 - 60°.

1. 其他

Others  
other

1. 防风拉线固定环面向下锚侧安装，距定位器端头水平距离为 600mm，允许误差

Install the windproof cable fixing ring facing the lower anchor side, and the horizontal distance from the positioner end is 600mm, with allowable error  
Install the windproof cable fixing ring facing the lower anchor side, and the horizontal distance from the end of the positioner is 600mm, allowable error

+50～-l00mm。

1. 防风拉线长环在定位管端，短环在定位器端。长环端回头 250mm，短环端回头 100mm，防风拉线固定环应位于长环中间位置。  
   +50~-l00mm。

The long ring of windproof stay wire is at the positioning pipe end, and the short ring is at the positioner end. The long ring end turns back 250mm and the short ring end turns back 100mm. The windproof stay wire fixing ring should be located in the middle of the long ring.

1. 定位环应垂直线路方向安装。定位管上定位环的安装位置距定位管根部不小于 40mm。

The locating ring shall be installed perpendicular to the line direction. The installation position of the positioning ring on the positioning pipe is not less than 40mm away from the root of the positioning pipe.  
Positioning rings should be installed perpendicular to the line. The installation position of the positioning ring on the positioning pipe shall not be less than 40mm from the root of the positioning pipe.

1. 定位装置各部件之间应连接可靠，定位钩与定位环的铰接状态良好。

The parts of the positioning device should be connected reliably, and the hinge state between the positioning hook and the positioning ring should be in good condition.  
Each component of the positioning device shall be connected reliably, and the articulation state of the positioning hook and the positioning ring shall be good.

1. 定位器支座处电气连接线安装符合设计要求，且不应与定位支座限位止钉相互摩擦，铜铝双面垫片安装正确。

The installation of electrical connecting wires at the positioner support meets the design requirements, and should not rub against the limit nails of the positioning support. The copper-aluminum double-sided gasket is installed correctly.  
The installation of the electrical connecting wire at the positioner support meets the design requirements and should not rub against the positioning support limit nail. The copper and aluminum double-sided gasket is installed correctly.

1. 定位线夹或锚支定位卡子受力面符合要求，有环夹板远离定位钩和定位支座侧，U形销向上弯折 60°。

The stress surface of positioning clamp or anchor positioning clip meets the requirements, with ring splint far away from positioning hook and positioning support side, and U-shaped pin bent upward by 60.  
The stress surface of the positioning clip or anchor positioning clip meets the requirements, the ring-shaped clamp plate is away from the positioning hook and positioning support side, and the U-shaped pin is bent upward by 60°.

1. 软定位器的定位拉线调整端在定位器侧，固定端在腕臂侧。

The adjusting end of the positioning cable of the soft positioner is on the positioner side, and the fixed end is on the wrist arm side.  
The adjustment end of the positioning cable of the soft positioner is on the positioner side, and the fixed end is on the wrist side.

支柱、拉线和基础支柱及吊柱

Struts, stay wires and foundation struts and hanging columns  
Struts, stay wires and foundation struts and hanging columns

1. 支柱

pillar  
pillar

1. 支柱位置

Position of strut  
strut position

* 1. 支柱侧面限界应符合设计规定，允许偏差＋100mm、－60mm，但最小不得小于《ERCL技术管理规则》规定的建筑限界值。跨距允许偏差+1m、－2m。接触网整体更新改造时，接触网支柱侧面限界根据需要预留大机养护和调车作业条件。

The side clearance of the strut shall comply with the design regulations, with allowable deviations of + 100mm and-60mm, but the minimum shall not be less than the building clearance value specified in ERCL Technical Management Rules. Allowable deviation of span is + 1m,-2m. When the catenary is renovated as a whole, the side clearance of the catenary strut shall reserve the maintenance and shunting operation conditions of the large machine as required.  
The side gauge of the pillar shall comply with the design regulations, with an allowable deviation of +100mm and-60mm, but the minimum shall not be less than the building gauge value specified in the ERCL Technical Management Rules. Allowable span deviation +1m,-2m. During the overall renewal and transformation of the catenary, the side gauge of the catenary pillar will reserve conditions for maintenance and shunting operation of large machines as needed.

* 1. 每组软横跨两支柱中心连线应垂直于正线，偏角不大于 3°；每组硬横跨两支柱中心连线应垂直于正线，偏角不大于 2°。

The connecting line of each group of soft struts across the center of the two pillars should be perpendicular to the main line, and the deflection angle should not be more than 3; The connecting line across the center of the two struts of each group shall be perpendicular to the main line, and the deflection angle shall not be more than 2.  
The center line connecting the two pillars of each group of soft spans shall be perpendicular to the main line with an angle of not more than 3°; the center line connecting the two pillars of each group of hard spans shall be perpendicular to the main line with an angle of not more than 2°.

* 1. 支柱应尽量设在侧沟限界以外。若客观条件限制必须设在侧沟中，应留有排水通道，排水通道与排水沟应统一设计，避免对路基防排水系统的影响。支柱根部应用砂浆砌石加固。

Props should be located outside the side ditch clearance as far as possible. If objective conditions must be set in the side ditch, drainage channels should be reserved, and drainage channels and drainage ditches should be designed in a unified way to avoid the influence on subgrade waterproof and drainage system. The root of the pillar shall be reinforced with mortar masonry.  
Pillars should be located outside the side ditch limits as much as possible. If objective conditions must be located in side ditches, drainage channels should be reserved, and drainage channels and drainage ditches should be designed in a unified manner to avoid impact on the subgrade waterproof and drainage system. The root of the pillar shall be reinforced with mortar and stone masonry.

* 1. 支柱埋设深度应符合设计要求，允许偏差±100mm。

The buried depth of struts shall meet the design requirements, with an allowable deviation of 100mm.  
The embedding depth of pillars shall comply with the design requirements, with an allowable deviation of ±100 mm.

1. 支柱本体

Pillar body  
post body

1. 横腹杆式钢筋混凝土支柱表面应光洁、平整。横腹板破损应及时修补，翼缘破损和露筋不超过两根且长度不超过 400mm 应及时修补；露筋达两根以上但不超过 4 根且长度不超过 400mm 可以修补后降级使用；露筋超过 4 根或者露筋长度超过 400mm 应及时更换。支柱翼缘不得有横向、斜向和纵向裂纹。支柱翼缘与横腹板结合处裂纹及横腹板裂纹宽

The surface of transverse web member reinforced concrete pillar should be smooth and flat. Transverse web damage should be repaired in time, flange damage and exposed ribs should not exceed two and the length should not exceed 400mm should be repaired in time; More than two exposed ribs but no more than four with a length of no more than 400mm can be repaired and degraded for use; If there are more than 4 exposed tendons or the length of exposed tendons exceeds 400mm, they should be replaced in time. The strut flange shall not have transverse, oblique and longitudinal cracks. Crack at the joint between strut flange and transverse web and crack width of transverse web  
The surface of transverse web bar reinforced concrete pillars should be smooth and smooth. Damage to the transverse web should be repaired in time. Flange damage and exposed ribs should not exceed two and the length should not exceed 400mm should be repaired in time; more than two exposed ribs but no more than 4 and the length should not exceed 400mm can be repaired and downgraded; More than 4 exposed ribs or the length of exposed ribs exceeding 400mm should be replaced in time. Pillar flanges shall not have transverse, oblique and longitudinal cracks. Crack width at the junction of pillar flange and transverse web and crack width in transverse web

度不超过 0.3mm 时，要及时修补，大于 0.3mm 时应更换。 混凝土支柱破损不露筋者，可以用水泥砂浆修补后使用。

When the degree does not exceed 0.3 mm, it should be repaired in time, and when it is greater than 0.3 mm, it should be replaced. If the concrete pillar is damaged and does not expose reinforcement, it can be repaired with cement mortar and used.  
If the diameter does not exceed 0.3mm, it must be repaired in time, and if it is larger than 0.3mm, it should be replaced. If the concrete pillars are damaged and do not expose the ribs, they can be repaired with cement mortar and then used.

1. 环形等径预应力混凝土支柱表面应光洁平整。 合缝处不得漏浆，不应有混凝土剥

The surface of annular equal diameter prestressed concrete pillar should be smooth and smooth. No slurry leakage and no concrete stripping shall be allowed at the joint  
The surface of annular equal-diameter prestressed concrete pillars shall be smooth and smooth. No slurry leakage shall be allowed at the joints, and no concrete peeling shall be allowed

落、露筋等缺陷。支柱弯曲度不大于 2‰，杆顶封堵良好。支柱应具有防止安装设备扭转及滑动措施。

Defects such as falling and revealing tendons. The bending degree of the strut is not more than 2 ‰, and the top of the strut is well sealed. Struts shall have measures to prevent torsion and sliding of installation equipment.  
Defects such as falling and exposed tendons. The bending degree of the strut shall not exceed 2‰, and the top of the strut shall be well blocked. The pillars shall have measures to prevent twisting and sliding of the installed equipment.

横向裂纹宽度不超过 0.2mm 且长度不超过 1/3 圆周长的支柱要及时修补，否则应更换； 纵向裂纹宽度大于 0.2mm 但不超过 1mm 的支柱要及时修补，纵向裂纹宽度大于 1mm 的支柱应更换。修补支柱破损部位的混凝土等级比支柱本身混凝土高一级。

Pillars with transverse crack width not exceeding 0.2 mm and length not exceeding 1/3 circumference should be repaired in time, otherwise they should be replaced; Props with longitudinal crack width greater than 0.2 mm but not more than 1mm should be repaired in time, and columns with longitudinal crack width greater than 1mm should be replaced. The concrete grade of repairing the damaged part of the pillar is one grade higher than the concrete of the pillar itself.  
Struts with a transverse crack width not exceeding 0.2mm and a length not exceeding 1/3 of the circumference must be repaired in time, otherwise they should be replaced; struts with a longitudinal crack width greater than 0.2mm but no more than 1mm must be repaired in time, and struts with a longitudinal crack width greater than 1mm should be replaced. The level of concrete used to repair the damaged parts of the pillar is one level higher than the concrete of the pillar itself.

1. 金属支柱及硬横梁支柱本体不得弯曲、扭转、变形，各焊接部分不得有裂纹、开焊，主角钢不应有扭转现象，弯曲不得超过 5‰，副角钢弯曲不得超过 2 根；表面防腐层剥落面积不得超过 10%。

Metal struts and hard beam struts shall not be bent, twisted or deformed, and each welded part shall not have cracks or open welding. The leading steel shall not be twisted, and the bending shall not exceed 5 ‰, and the bending of auxiliary angle steel shall not exceed 2; The stripping area of surface anticorrosive coating shall not exceed 10%.  
The body of metal pillars and hard beam pillars shall not be bent, twisted or deformed, and each welded part shall not have cracks or open welding. The main angle steel shall not have torsion, and the bend shall not exceed 5‰, and the bend of auxiliary angle steel shall not exceed 2 pieces; The peeling area of the surface anticorrosive layer shall not exceed 10%.

1. 整正支柱使用的垫片不得超过 3 块。 每块垫片的面积不小于 50mm×100mm，厚度不大于 10mm。

No more than 3 gaskets shall be used for straightening struts. The area of each gasket is not less than 50mm × 100mm and the thickness is not more than 10mm.  
No more than 3 shims should be used to align the pillars. The area of each spacer shall not be less than 50mm×100mm, and the thickness shall not be more than 10 mm.

1. 支柱倾斜率

Inclination rate of strut  
pillar tilt rate

1. 支柱在顺线路方向应保持铅垂状态，其倾斜率不超过 0.5%。锚柱应向拉线方向倾斜，其倾斜率不超过 1%。

The strut shall be kept vertical along the line, and its inclination rate shall not exceed 0.5%. Anchor column should be inclined to the direction of stay wire, and its inclination rate should not exceed 1%.  
The pillars should remain vertical in the direction along the line, and their inclination rate should not exceed 0.5%. The anchor column shall be tilted in the direction of the pulling wire, and its tilt rate shall not exceed 1%.

1. 支柱在垂直线路方向均应直立，允许向受力的反向倾斜，腕臂柱、隔离开关支柱、硬横跨支柱倾斜率不超过 0.5%；软横跨支柱高度 13m 的倾斜率为 0.5%～1%，高度 15m 及以上的倾斜率为 1%～2%。

The struts shall be upright in the vertical direction of the line, and are allowed to tilt in the opposite direction of the stress. The tilt rate of the wrist arm struts, isolating switch struts and hard span struts shall not exceed 0.5%; The inclination ratio of soft span struts with a height of 13m is 0.5% ~ 1%, and that with a height of 15m and above is 1% ~ 2%.  
The pillars should be upright in the direction perpendicular to the line and allowed to tilt in the opposite direction of the force. The tilt rate of wrist pillars, isolating switch pillars and hard cross pillars should not exceed 0.5%; the tilt rate of soft cross pillars with a height of 13m is 0.5%~1%, and the tilt rate of 15m and above is 1%~2%.

1. 接触网各种支柱，均不得向受力方向倾斜。 向线路侧倾斜时，任何情况下不得侵入基本建筑限界。

All kinds of struts of catenary shall not be inclined to the stress direction. When inclined to the line side, it is not allowed to invade the basic building clearance under any circumstances.  
All types of pillars of the catenary shall not tilt in the direction of force. When tilting to the line side, it is not allowed to intrude into the basic building clearance under any circumstances.

1. 支柱防撞

Pillar collision avoidance  
Pillar collision avoidance

1. 经常有机动车辆运行的场所以及装卸货物站台上等易被碰撞的支柱，均应设置强度较高的防护桩，防护高度原则上不小于 1.5m。

Protective piles with high strength shall be set up in places where motor vehicles often run and pillars that are easy to be collided on cargo loading and unloading platforms, and the protective height shall not be less than 1.5 m in principle.  
In places where motor vehicles are often running and pillars that are prone to collision such as cargo loading and unloading platforms, protective piles with higher strength should be installed, with a protective height of not less than 1.5m in principle.

1. 支柱防护宜采用混凝土防护墩或钢结构防护，不应采用外围砖砌、内填石渣或砂土的封闭式防护方式。

Pillar protection should adopt concrete protection pier or steel structure protection, and should not adopt closed protection mode of peripheral brick, internal stone slag or sand.  
Concrete protective piers or steel structures should be used for pillar protection, and closed protection methods of surrounding bricks, filling with gravel or sand should not be used.

采用混凝土防护墩防护时，厚度不小于 0.4m 并采用混凝土灌注基础，基础满足稳固要求，混凝土标号不小于 C20 并植入钢筋网；采用钢结构防护时，埋设深度应满足稳固要求并采用混凝土灌注基础。

When concrete protective pier is used for protection, the thickness is not less than 0.4 m and concrete pouring foundation is adopted. The foundation meets the stability requirements, and the concrete grade is not less than C20 and is implanted with steel mesh; When steel structure is used for protection, the embedding depth should meet the stability requirements and concrete pouring foundation should be adopted.  
When using concrete protective piers for protection, the thickness shall not be less than 0.4m and the foundation shall be poured with concrete. The foundation shall meet the stability requirements. The concrete grade shall not be less than C20 and steel mesh shall be implanted; when using steel structure protection, the embedding depth shall meet the stability requirements and the foundation shall be poured with concrete.

1. 防护桩内壁与支柱保持 0.5m 的距离，且不得侵入铁路建筑限界。

The inner wall of the protective pile shall keep a distance of 0.5 m from the pillar, and shall not invade the railway building clearance.  
Keep a distance of 0.5m between the inner wall of the protective pile and the pillar, and shall not intrude into the railway building clearance.

1. 防护桩外表面应有黄黑相间的警示标识。

The outer surface of the protective pile shall have yellow and black warning signs.  
The outer surface of the protective pile shall have yellow and black warning signs.

1. 需防护支柱装有开关操作机构时，需同时将开关操作支架纳入防护保护范围。

When the protective strut is equipped with the switch operating mechanism, the switch operating bracket should be included in the protection scope at the same time.  
When the protective pillar needs to be equipped with the switch operating mechanism, the switch operating bracket needs to be included in the protection scope at the same time.

1. 支柱护坡

Pillar slope protection  
pillar slope protection

1. 填方地段的支柱外缘距路基边坡的距离不小于 500mm，否则应培土或砌石，其坡度应与原路基相同。高填方地段培土困难、流失严重或土质强度不够者，应采用砂浆砌石护坡加固，片石应挤压紧密、堆砌整齐，砂浆应饱满、标号符合规定。

The distance between the outer edge of the pillar of the fill section and the subgrade slope is not less than 500mm, otherwise, it should be ridged or masonry, and its slope should be the same as the original subgrade. If it is difficult to cultivate soil in high fill section, serious loss or insufficient soil strength, mortar masonry slope protection shall be used for reinforcement, flaky stones shall be squeezed tightly and piled neatly, mortar shall be full, and the label shall meet the requirements.  
The distance between the outer edge of the pillars in the filled section and the slope of the subgrade shall not be less than 500mm, otherwise soil or stone masonry shall be built, and the slope shall be the same as that of the original subgrade. If the soil is difficult to cultivate, is seriously lost, or the soil strength is insufficient, mortar stone slope protection should be used for reinforcement. The rubble should be tightly squeezed and piled neatly. The mortar should be full and the markings should comply with regulations.

1. 支柱护坡应延伸至地面，并做深度不小于 0.6m 护坡基础。上部宽度为支柱中心两侧各不小于 1m，下部宽度为支柱中心两侧各不小于 2m，厚度不小于 300mm。距边坡坡底 1m 处应设置 100mm×100mm 的泄水孔。

Pillar slope protection shall extend to the ground, and make slope protection foundation with depth not less than 0.6 m. The width of the upper part is not less than 1m on both sides of the center of the pillar, the width of the lower part is not less than 2m on both sides of the center of the pillar, and the thickness is not less than 300mm. 100 mm × 100 mm drain holes should be set at 1m away from the bottom of the slope.  
Pillar slope protection shall be extended to the ground and the slope protection foundation shall be made with a depth of not less than 0.6m. The width of the upper part is not less than 1m on both sides of the center of the pillar, the width of the lower part is not less than 2m on both sides of the center of the pillar, and the thickness is not less than 300 mm. A drainage hole of 100mm×100mm shall be provided 1m away from the bottom of the slope.

1. 路堑地段的基础外侧与水沟外侧的间距不小于 300mm。

The distance between the outer side of the foundation and the outer side of the ditch in the cutting section shall not be less than 300mm.  
The distance between the outside of the foundation in the cutting section and the outside of the ditch shall not be less than 300 mm.

1. 支柱容量满足受力要求，需要更新时宜采用热浸镀锌钢支柱，更新的混凝土支柱容量不应低于 60kN．m。

The capacity of the pillar meets the stress requirements, and the hot-dip galvanized steel pillar should be used when it needs to be updated, and the capacity of the updated concrete pillar should not be less than 60kN. m.  
The column capacity meets the stress requirements. Hot-dipped galvanized steel columns should be used when updating them. The capacity of the updated concrete columns should not be less than 60kN.m.

1. 吊柱

Davit post  
davit

1. 吊柱型号、规格、防腐措施符合设计要求，锈蚀面积不超过 20%。当采用圆吊柱时，腕臂底座处应采取防扭转及滑动措施。

The model, specification and anticorrosion measures of the hanging column meet the design requirements, and the corroded area shall not exceed 20%. When using round hanging column, anti-torsion and sliding measures should be taken at the base of wrist arm.  
The model, specification and anti-corrosion measures of the hanging column meet the design requirements, and the corrosion area shall not exceed 20%. When circular hanging columns are used, anti-torsion and sliding measures should be taken at the base of the wrist arm.

1. 吊柱法兰盘与隧道壁应结合密贴。吊柱固定螺栓应采用双螺母，拧紧螺帽后螺栓外露长度不得小于 30mm；吊柱调整使用的镀锌闭环垫片不超过 2 片，垫片的面积不小于 50mm×100mm，厚度不大于 10mm。

Davit flange and tunnel wall should be combined and tightly attached. Double nuts shall be used for fixing bolts of hanging posts, and the exposed length of bolts shall not be less than 30mm after tightening nuts; No more than 2 galvanized closed-loop gaskets shall be used for davit adjustment, with an area of not less than 50mm × 100mm and a thickness of not more than 10mm.  
The suspension column flange and tunnel wall should be tightly combined. Double nuts shall be used for fixing the hanging column, and the exposed length of the bolt after tightening the nuts shall not be less than 30mm; no more than 2 galvanized closed-loop gaskets shall be used for adjusting the hanging column. The area of the gaskets shall not be less than 50mm×100mm, and the thickness shall not be greater than 10 mm.

1. 吊柱不得扭曲，宜向受力反方向倾斜不大于 1°。限界符合设计要求，允许偏差 0～ 20mm，但不得侵入邻线基本建筑限界。

The hanging column shall not be twisted, and should be inclined not more than 1 in the opposite direction of stress. The clearance meets the design requirements, with allowable deviation of 0 ~ 20mm, but it shall not invade the basic building clearance of adjacent lines.  
The hanging column shall not be twisted, and should be tilted not more than 1° in the opposite direction of force. The gauge meets the design requirements, with a deviation of 0 - 20mm allowed, but it shall not intrude into the gauge of basic buildings adjacent lines.

基础及拉线

Foundation and stay wire  
Foundation and cable

1. 支柱基础

Pillar foundation  
pillars

1. 金属支柱基础面应高出地面（或站台面）100～200mm。基础外露 400mm 以上者应培土，每边培土宽度为 500mm，培土边坡与水平面呈 45°。金属支柱有基础帽时，基础帽应完整无破损、无裂纹。

The foundation surface of metal pillar should be 100 ~ 200mm higher than the ground (or platform surface). If the foundation is exposed more than 400mm, the width of each side should be 500mm, and the slope should be 45 degrees with the horizontal plane. When the metal pillar has a foundation cap, the foundation cap should be complete without damage and crack.  
The foundation surface of the metal pillar should be 100~200mm higher than the ground (or station table). If the foundation is exposed more than 400mm, soil should be cultivated. The width of soil on each side is 500mm, and the soil slope is 45° from the horizontal plane. When the metal pillar has a foundation cap, the foundation cap shall be intact without damage or crack.

1. 支柱根部周围 5m 范围内不得取土，1m 范围内应保持清洁，不得有积水和杂物。 258．桥梁、隧道内埋入杆件

Soil shall not be taken within 5m around the root of the pillar, and shall be kept clean within 1m, without accumulated water and sundries. 258. Embedded members in bridges and tunnels  
No soil shall be taken within 5m around the root of the pillar, and no water or debris shall be allowed within 1m. 258. Embedded rods in bridges and tunnels

1. 桥梁、隧道内的埋入杆件（包括立柱）应安装牢固，无断裂、变形，其填充物不得剥落和裂纹，杆件要做好防腐处理。埋入杆件受力后，其周围灌注部分不得有裂纹、破损及脱落现象，螺栓本体不得松动和变形。

Embedded bars (including columns) in bridges and tunnels shall be installed firmly without fracture or deformation, and their fillers shall not peel off and crack, and the bars shall be treated with anticorrosion. After the embedded bar is stressed, the pouring part around it shall not have cracks, damages and shedding, and the bolt body shall not be loose and deformed.  
Embedded rods (including columns) in bridges and tunnels should be installed firmly without fracture or deformation. The fillers should not peel off or crack. The rods should be treated with anti-corrosion treatment. After the embedded rod is subjected to stress, the poured parts around it shall not have cracks, damage or falling off, and the bolt body shall not be loose or deformed.

1. 后植锚栓或后植滑槽应避免设置在隧道伸缩缝、不同断面接缝、石缝或明显渗水、

Post-planting anchor bolts or post-planting chutes should be avoided from being set at tunnel expansion joints, joints of different sections, stone joints or obvious water seepage.  
Post-implanted anchor bolts or post-implanted chutes should be avoided in tunnel expansion joints, joints with different sections, stone joints or obvious water seepage,

漏水处所。后植锚栓各埋入杆件的埋深、外露、距离符合设计要求，杆件之间距离允许偏差

Leaking place. The buried depth, exposure and distance of each embedded bar of post-planting anchor bolt meet the design requirements, and the distance between bars is allowed to deviate  
Where the water leaks. The burial depth, exposure and distance of each embedded rod of the post-implanted anchor bolt comply with the design requirements, and the distance between rods is allowed to deviate.

±20mm。滑槽 T 型螺栓距槽道端部不小于 25mm。

± 20mm. The distance between chute T-bolt and channel end is not less than 25mm.  
±20mm。The distance from the T-bolt of the sliding groove shall not be less than 25mm from the end of the channel.

1. 使用后植化学黏结锚栓时，其黏结材料（剂）的养护（固化）时间应达到相关要求。锚固拉拔力不应小于设计值。

When using post-implant chemical bonding anchor bolt, the curing (curing) time of its bonding material (agent) should meet relevant requirements. Anchorage drawing force should not be less than the design value.  
When planting chemical bonding anchors after use, the curing (curing) time of the bonding material (agent) shall meet relevant requirements. The anchorage pull-out force shall not be less than the design value.

1. 拉线和拉线基础

Cable and Cable Foundation  
Pull wires and pull wires foundation

1. 接触悬挂、附加导线下锚拉线基础宜采用钢筋混凝土浇筑基础，外形尺寸和位置应符合设计要求。拉线应位于下锚支导线的延长线上，在任何情况下不得侵入限界；与地面夹角一般为 45°，最大不得超过 60°。

Reinforced concrete pouring foundation should be used for contact suspension and anchor cable foundation with additional wires, and its external dimensions and positions should meet the design requirements. The stay wire shall be located on the extension wire of the lower anchor branch conductor, and shall not invade the clearance under any circumstances; The included angle with the ground is generally 45, and the maximum shall not exceed 60.  
The foundation of contact suspension and anchor stay under additional conductors should be reinforced concrete poured foundation, and the shape size and position should meet the design requirements. The pull wire shall be located on the extension line of the lower anchor support wire and shall not intrude into the clearance under any circumstances; the angle with the ground is generally 45°, and the maximum shall not exceed 60°.

1. 拉线应绷紧，在同一支柱上的各拉线应受力均衡；锚板拉杆与拉线应成一条直线。

Stay wires should be tightened, and each stay wire on the same pillar should be stressed evenly; Anchor plate tie rod and tie wire should be in a straight line.  
The stay wires should be tight, and the force on each stay wire on the same pillar should be balanced; the anchor plate pull rod and the stay wire should be in a straight line.

1. 拉线应采取防腐措施且不得有断股、松股、接头及严重锈蚀。

Anticorrosion measures shall be taken for stay wires, and there shall be no broken strands, loose strands, joints and serious corrosion.  
Anti-corrosion measures shall be taken for pulling wires and there shall be no broken strands, loose strands, joints or serious corrosion.

1. UT 型楔形线夹螺纹外露长度不小于 20mm 且不大于螺纹全长的 1/2。

The thread exposed length of UT wedge clamp shall not be less than 20mm and not more than 1/2 of the total thread length.  
The exposed length of the thread of type UT wedge clamp shall not be less than 20mm and shall not be more than 1/2 of the total length of the thread.

1. 拉线及下锚零部件不得与回流线、保护线、地线间形成环流通路。

The pull wire and anchor parts shall not form a circulation path with the return line, protection line and ground line.  
Pull wires and anchor parts shall not form a circulation path with return wires, protection wires and ground wires.

1. 基础周围 5m 范围内不得取土，1m 范围内应保持清洁，不得有积水和杂物。

Soil shall not be taken within 5m around the foundation, and shall be kept clean within 1m, without accumulated water and sundries.  
No soil shall be taken within 5m around the foundation, and no water or debris shall be allowed within 1m.

1. 对经常有机动车辆运行的场所以及装卸货物站台上等易被碰撞的拉线，应采取防护措施，参照第 257 条支柱防撞标准执行。

For places where motor vehicles often run and stay wires that are easy to be collided on cargo loading and unloading platforms, protective measures should be taken with reference to Article 257 pillar anti-collision standard.  
Protective measures should be taken for pull wires that are prone to collision, such as places where motor vehicles are often running and cargo loading and unloading platforms, and the pillar collision avoidance standard shall be implemented in accordance with Article 257.

附加悬挂

Additional suspension  
additional suspension

1. 附加导线系指接触悬挂以外的架空导线。包括供电线、回流线、架空避雷线等。

Additional conductors refer to overhead conductors other than contact suspension. Including power supply line, return line, overhead lightning protection line, etc.  
Additional conductors refer to overhead conductors other than contact suspension. Including power supply lines, return lines, overhead lightning protection lines, etc.

1. 附加导线的材质和截面积应满足通过的最大电流和附件 14 规定的机械强度安全系

The material and cross-sectional area of additional conductors shall meet the maximum current passing through and the mechanical strength safety system specified in Annex 14  
The material and cross-sectional area of the additional conductor shall meet the maximum current passed and the mechanical strength safety system specified in Annex 14

数。

Count.  
Number.

1. 张力和弛度

Tension and relaxation  
Tension and sag

标准值：符合安装曲线的要求。标准状态：标准值±6%。

Standard value: Meet the requirements of installation curve. Standard state: standard value 6%.  
Standard value: Comply with the requirements of installation curve. Standard status: Standard value ±6%.

警示值：标准值±8%。限界值：标准值±10%。

Warning value: standard value 8%. Threshold value: 10% of standard value.  
Warning value: Standard value ±8%. Limit value: standard value ±10%.

支柱同一侧悬挂为不同线径及材质的导线时，导线的弛度应以其中弛度较大的导线为

When wires with different diameters and materials are suspended on the same side of the strut, the sag degree of the wires shall be the one with larger sag degree  
When wires of different wire diameters and materials are suspended on the same side of the pillar, the sag of the wire shall be as follows:

准。

Accurate.  
accurate.

1. 接头及损伤

Joint and damage  
Joint and damage

* 1. 跨越铁路，一、二级公路，重要通航河流时，附加导线不得有接头。不同金属、不同规格、不同绞制方向的导线严禁直接进行接头。

When crossing railways, first-class and second-class highways and important navigable rivers, there shall be no joints for additional conductors. It is strictly forbidden to connect wires of different metals, specifications and twisting directions directly.  
When crossing railways, primary and secondary highways, and important navigable rivers, additional conductors shall not have joints. It is strictly prohibited to directly connect wires of different metals, different specifications, and different stranded directions.

* 1. 一个跨距内一根导线的接头不得超过 1 处。一个耐张段内附加导线接头、断股和补强线段的总数量不得超过下列规定，且接头距悬挂点的距离应大于 500mm：

There shall be no more than one joint of a wire in a span. The total number of additional wire joints, broken strands and reinforced wire segments in a tensile section shall not exceed the following provisions, and the distance between joints and suspension points shall be greater than 500mm:  
No more than 1 joint for a wire within a span. The total number of additional conductor joints, broken strands and reinforced segments in a tensile section shall not exceed the following provisions, and the distance between the joints and the suspension point shall be greater than 500 mm:

1. 耐张段长度在 800m 及以下者标准值：0 处。

Standard value for tensile segment length of 800m or less: 0.  
Standard value for tensile section length of 800m or less: 0.

标准状态：0 处。警示值：2 处。限界值：4 处。

Standard state: 0. Warning value: 2 places. Threshold value: 4 places.  
Standard status: 0. Warning value: 2 places. Limit value: 4 places.

1. 耐张段长度超过 800m 者标准值：0。

Standard value for tensile segment length exceeding 800m: 0.  
Standard value for tensile section length exceeding 800m: 0.

标准状态：0 处。警示值：4 处。限界值：8 处。

Standard state: 0. Warning value: 4 places. Threshold value: 8 places.  
Standard status: 0. Warning value: 4 places. Limit value: 8 places.

* 1. 附加导线不得散股，损伤断股标准如下。标准值：无损伤。

The additional wires shall not be scattered, and the criteria for damaged and broken strands are as follows. Standard value: No damage.  
Additional wires shall not be loose, and the standards for damage and breakage are as follows. Standard value: No damage.

标准状态：无损伤。警示值：无断股。 限界值：断股。

Standard state: No damage. Warning value: No broken stocks. Threshold value: Broken stock.  
Standard status: No damage. Warning value: No broken shares. Limit value: Broken stocks.

铝绞线和钢芯铝绞线的铝线断股、损伤 3 股及以下时，可用预绞丝接续条或铝绑线绑扎补强，缠绕方向与被接续导线外层绞向一致，绑扎长度超出缺陷部分 30～50mm；当断股、损伤 3 股以上、7 股以下时，应采用同材质导线进行补强；当断股、损伤 7 股及以上时，应重新制作接头或更换。

When the aluminum strand of aluminum stranded wire and steel-core aluminum stranded wire is broken and damaged for 3 strands or less, it can be bound and reinforced by pre-stranded wire connecting strip or aluminum binding wire. The winding direction is consistent with the outer twisting direction of the connected wire, and the binding length exceeds the defective part by 30 ~ 50mm;; When broken strands and damaged more than 3 strands and less than 7 strands, wires of the same material should be used for reinforcement; When broken strands and damaged 7 strands or more, the joints should be re-made or replaced.  
When the aluminum wire of aluminum stranded wire and steel-core aluminum stranded wire is broken and 3 strands or less are damaged, pre-twisted wire splicing strips or aluminum binding wires can be used to bind and strengthen. The winding direction is consistent with the outer layer of the connected wire, and the binding length exceeds the defective part. 30~50mm; When the strands are broken and more than 3 strands or less than 7 strands are damaged, wires of the same material should be used for reinforcement; when the strands are broken and more than 7 strands are damaged, the joints should be re-made or replaced.

钢芯铝绞线的钢芯断股或损伤时应重新制作接头或更换。

When the steel core of steel-cored aluminum stranded wire is broken or damaged, the joint should be re-made or replaced.  
When the steel core of aluminum steel stranded wire is broken or damaged, the joint shall be re-made or replaced.

钢芯铝绞线与绝缘子或金具的固定处缠绕铝包带时，应密贴缠绕，不得重叠，绕向与导线绕向一致，绑扎长度为 200mm。

When winding aluminum wrapping tape at the fixed place of steel-cored aluminum stranded wire and insulator or hardware fittings, it should be tightly wound without overlapping, and the winding direction is consistent with the winding direction of conductor, and the binding length is 200mm.  
When winding the aluminum clad tape at the fixing place of the steel core aluminum strand and the insulator or hardware, it should be tightly wound and not overlapped. The winding direction is consistent with the winding direction of the wire, and the binding length is 200 mm.

* 1. 附加导线在接头、下锚和补强处所采用预绞丝护线条时，预绞丝护线条的型号、规格应与附加导线材质相匹配，缠绕方向与附加导线绞向一致。接续时，其缠绕长度、机械性能符合设计要求，接续点处导电性能不低于被接续导线。

When pre-twisted wire protection lines are used for additional wires at joints, anchors and reinforcing places, the model and specification of pre-twisted wire protection lines shall match the material of additional wires, and the winding direction shall be consistent with the twisting direction of additional wires. During connection, the winding length and mechanical properties meet the design requirements, and the conductivity at the connection point is not lower than that of the connected wire.  
When pre-twisted wire protective strips are used for additional conductors at joints, anchors and reinforcements, the model and specification of the pre-twisted wire protective strips shall match the material of the additional conductor, and the winding direction shall be consistent with the twist direction of the additional conductor. During connection, its winding length and mechanical properties meet the design requirements, and the electrical conductivity at the connection point is not lower than that of the wire to be connected.

1. 附加导线不得跨越屋顶为易燃材料的建筑物；对耐火屋顶的建筑物也要尽量避免跨越，若必须跨越时，其距建筑物的距离要符合第 262 条第（5）项的规定，且跨越的跨距

Additional wires shall not cross buildings whose roofs are flammable materials; For buildings with refractory roofs, crossing should also be avoided as much as possible. If it is necessary to cross, the distance from the building should comply with the provisions of Article 262 (5), and the span should be crossed  
Additional wires shall not span buildings with flammable roofs; buildings with fire-resistant roofs shall also be avoided as much as possible. If crossing is necessary, the distance from the building must comply with the provisions of Article 262 (5), and the span spanned

内不得有接头、断股和补强。

There shall be no joints, broken strands and reinforcements inside.  
There must be no joints, broken strands or reinforcements inside.

1. 附加导线对地面及相互距离在任何情况下不应小于下表的数值。附加导线对地面及相互距离的最小值（mm）

The distance between additional conductors to the ground and each other shall not be less than the values in the following table under any circumstances. Minimum distance of additional conductors to the ground and each other (mm)  
The distance between the additional conductors and the ground and each other shall under no circumstances be less than the values in the following table. Minimum distance of additional wires to the ground and each other (mm)

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 序号 serial number  Serial number | 有关情况 relevant situation  Relevant information | | 供电线 power supply line  Power supply line | 回流线、架空  Return line, overhead Return line, overhead  避雷线  Lightning conductor lightning conductor |
| 1 | 导线在最大弛度时距地面的高度 Height of the conductor from the ground at maximum sag  Height of conductor from ground at maximum sag | 居民区及车站站台处  Residential area and station platform Residential areas and station platforms | 7000 | 6000 |
| 非居民区  Non-residential area non-residential area | 6000 | 5000 |
| 车辆、农业机械不能到达的山坡、  Hillsides that cannot be reached by vehicles and agricultural machinery, Hillsides that cannot be reached by vehicles and agricultural machinery,  峭壁和岩石  Cliffs and Rocks Cliffs and rocks | 5000 | 4000 |
| 2 | 导线距离峭壁、挡土  Distance between conductor and cliff and retaining soil Distance between wire and cliff, retaining soil Distance between wire and cliff, retaining soil  墙和岩石  Walls and rocks Walls and rocks Walls and rocks | 无风时  When there is no wind no wind | 1000 | 500 |
| 计算最大风偏时  Calculate the maximum wind deviation time Calculate the maximum wind deviation | 300 | 75 |
| 3 | 导线跨越铁路时 When the wire crosses the railway  When the conductor crosses the railway, | 跨越非电化股道（对轨面）  Crossing non-electrified track (opposite track surface) Crossing the non-electrified track (facing the rail surface) | 7500 | 7500 |
| 跨越不同回路电气化股道（对承  Electrified tracks across different loops (opposite bearings Electrified tracks across different circuits (double bearing  力索或无承力索时对接触线）  Force cable or contact wire without load cable) Contact line when force cord or no force cord is present) | 3000 | 2000 |
| 4 | 不同相或不同供电  Different phase or different power supply Different phases or different power supplies | 两线水平排列  Two-line horizontal arrangement Two lines are arranged horizontally | 2400 | —— |
| 分段两导线悬挂点  Segmented two-conductor suspension point Sectional two-conductor suspension point  间距离  Distance between distance between | 导线垂直排列，上方为供电线，  The wires are arranged vertically, and the power supply line is above them. The wires are arranged vertically, with the power supply wires above,  下方为供电线或回流线  Below is the power supply line or the return line Below is the power supply line or return line | 2000 | —— |
| 5 | 与建筑物间的最小  Minimum between building and building minimum between buildings minimum between buildings  距离  distance distance distance | 最大弛度时最小垂直距离  Minimum vertical distance at maximum sag Minimum vertical distance at maximum sag | 4000 | 2500 |
| 边导线最大风速时最小水平距离  Minimum horizontal distance of side traverse at maximum wind speed Minimum horizontal distance at maximum wind speed of side conductor | 3000 | 1000 |

1. 附加导线与接触网同杆合架时，供电线带电部分与支柱边沿的距离应不小于 1m。附加导线与接触网分杆架设时，应符合电力部门架空输电线路有关规定。

When the additional conductors and catenary are combined on the same pole, the distance between the live part of the power supply line and the edge of the strut shall not be less than 1m. The erection of additional conductors and catenary poles shall comply with the relevant provisions of the power department on overhead transmission lines.  
When the additional wires are combined with the contact network on the same pole, the distance between the live part of the power supply line and the edge of the pillar shall not be less than 1m. When erecting additional wires and contact network poles, they shall comply with the relevant regulations of the power department on overhead transmission lines.

1. 附加导线肩架

Additional lead shoulder  
Additional wire shoulder frame

1. 肩架安装位置正确，允许偏差＋50mm。

The shoulder frame is installed in the correct position, with an allowable deviation of + 50mm.  
The installation position of the shoulder frame is correct, with an allowable deviation of +50mm.

1. 肩架安装牢固、呈水平状态。

The shoulder frame is firmly installed and in a horizontal state.  
The shoulder frame is installed firmly and horizontally.

1. 肩架采用方（槽）钢方式时，端头应封堵。

When the shoulder frame is made of square (grooved) steel, the end should be blocked.  
When the shoulder frame is made of square (slot) steel, the end should be blocked.

单项设备

Single equipment  
individual equipment

隔离（负荷）开关

Isolation (load) switch  
Isolation (load) switch

1. 隔离（负荷）开关

Isolation (load) switch  
Isolation (load) switch

1. 隔离（负荷）开关应动作可靠、转动灵活，转动部分应注以适合当地气候的润滑油。分闸角度及合闸状态应符合产品技术要求，止钉间隙符合规定。

Isolation (load) switch should operate reliably and rotate flexibly, and the rotating part should be injected with lubricating oil suitable for local climate. The opening angle and closing state shall meet the technical requirements of the product, and the nail clearance shall meet the requirements.  
The isolation (load) switch should operate reliably and rotate flexibly, and the rotating part should be filled with lubricating oil suitable for the local climate. The opening angle and closing state shall comply with product technical requirements, and the nail stop gap shall comply with regulations.

1. 隔离（负荷）开关触头接触面应平整、光洁无损伤，并涂以导电脂。触头间接触紧密，接触压力均匀，用 0.05mm×10mm 的塞尺检查，线接触为 0mm，面接触不大于 4mm。

The contact surface of isolation (load) switch contact shall be smooth, smooth and undamaged, and coated with conductive grease. The contact between contacts is tight and the contact pressure is uniform. Check with a gauge of 0.05 mm × 10mm. The line contact is 0mm and the surface contact is not more than 4mm.  
The contact surface of the isolation (load) switch contact shall be flat, smooth and free from damage, and shall be coated with conductive grease. The contact between the contacts is tight and the contact pressure is uniform. Use a feeler gauge of 0.05mm× 10mm to inspect, the line contact is 0mm, and the surface contact is no more than 4mm.

1. 引线和连接线的截面与开关额定电流及所连接接触网当量截面相适应，引线连接

The cross section of the lead and connecting wire is suitable for the rated current of the switch and the equivalent cross section of the connected catenary, and the lead is connected  
The cross-sections of the leads and connecting wires are compatible with the rated current of the switch and the equivalent cross-section of the connected contact network. The leads are connected.

良好且不得有接头。引线及连接线应连接牢固接触良好，无破损和烧伤。当接触悬挂受温度

Good and without joints. Leads and connecting wires should be firmly connected and in good contact without damage and burn. When the contact suspension is affected by temperature,  
Good and free of joints. Lead wires and connecting wires should be connected firmly and in good contact without damage or burns. When the contact suspension is subject to temperature

变化偏移时，引线的长度应保证有一定的活动余量并不得侵入限界，引线摆动到极限位置对接地体的距离不小于 350mm。

When changing the offset, the length of the lead should ensure a certain margin of activity and should not invade the gauge, and the distance between the lead and the ground body should not be less than 350mm when it swings to the limit position.  
When changing the offset, the length of the lead should ensure a certain amount of mobility and should not intrude into the limit. The distance between the lead and the grounding body when swinging to the limit position shall not be less than 350 mm.

1. 支持绝缘子应清洁无破损和放电痕迹，瓷釉剥落面积不超过 300mm2。

Support insulators shall be clean without damage and discharge traces, and the enamel peeling area shall not exceed 300mm 2 .  
Support insulators shall be clean and free from damage and discharge traces, and the enamel peeling area shall not exceed 300 mm2.

1. 新安装的隔离（负荷）开关在投入运行前应按附件 16 进行交接试验，试验合格后方可投入运行。

The newly installed isolation (load) switch shall be put into operation according to Appendix 16 before handover test, and can be put into operation only after passing the test.  
The newly installed isolation (load) switch shall be subjected to handover test in accordance with Annex 16 before being put into operation, and can be put into operation only after passing the test.

1. 负荷开关的技术状态应符合产品技术要求。 263．隔离开关操作机构

The technical status of load switch shall meet the technical requirements of products. 263. Disconnector operating mechanism  
The technical status of the load switch shall comply with the product technical requirements. 263. isolating switch operating mechanism

1. 隔离开关操作机构应完好无损并加锁。操作时平稳正确无卡阻和冲击，联锁、限位器作用良好可靠。操作机构箱应密封良好，箱体及托架等无锈蚀并可靠接地。

The disconnector operating mechanism shall be intact and locked. Smooth and correct operation without jamming and impact, interlocking and limiter function well and reliably. The operating mechanism box shall be well sealed, and the box body and bracket shall be corrosion-free and reliably grounded.  
The operating mechanism of the isolating switch should be intact and locked. Operation is smooth and correct without jamming and impact, and the interlock and limiter function well and reliably. The operating mechanism box should be well sealed, and the box and bracket should be free of rust and be reliably grounded.

1. 具有远动操作功能的隔离开关，应能保证当地位及远动位的正常操作。

The isolating switch with telecontrol operation function should be able to ensure the normal operation of local position and telecontrol position.  
An isolating switch with remote operation function shall be able to ensure normal operation in the current position and remote operation position.

1. 电动隔离开关操作机构的分合闸电机、接触器等部件状态良好，接线紧固，限位开关位置正确，操作灵活可靠。

The opening and closing motors and contactors of the operating mechanism of the electric isolating switch are in good condition, the wiring is tightened, the position of the limit switch is correct, and the operation is flexible and reliable.  
The opening and closing motors, contactors and other components of the electric isolating switch operating mechanism are in good condition, the wiring is tight, the limit switch is in correct position, and the operation is flexible and reliable.

1. 驱动装置的电机转向正确，机械系统润滑良好，分、合闸指示器与开关实际位置相符合。驱动装置的电机和传动器的滑动离合器应符合技术要求。

The motor steering of the driving device is correct, the mechanical system is well lubricated, and the opening and closing indicators are consistent with the actual position of the switch. The motor of the driving device and the sliding clutch of the actuator shall meet the technical requirements.  
The motor of the driving device turns correctly, the mechanical system is well lubricated, and the opening and closing indicators are consistent with the actual position of the switch. The motor of the drive unit and the sliding clutch of the transmission shall meet the technical requirements.

分段、分相绝缘器

Sectional and phase-separated insulator  
Sectional and split-phase insulators

264．分段绝缘器

264. Sectional insulators  
264. Sectional insulators

1. 分段绝缘器通过速度不得超过 120km/h。空气绝缘间隙不小于 300mm。

The passing speed of segmented insulator shall not exceed 120km/h. The air insulation gap shall not be less than 300mm.  
The passing speed of section insulators shall not exceed 120km/h. The air insulation gap shall not be less than 300 mm.

1. 分段绝缘器主绝缘应完好，其表面放电痕迹应不超过有效绝缘长度的 20%。主绝缘严重磨损应及时更换。

The main insulation of the sectional insulator shall be in good condition, and the surface discharge trace shall not exceed 20% of the effective insulation length. The main insulation should be replaced in time if it is seriously worn.  
The main insulation of segmented insulators shall be intact, and the discharge traces on its surface shall not exceed 20% of the effective insulation length. The main insulation is severely worn and should be replaced in time.

1. 分段绝缘器应位于受电弓中心，一般情况下偏差不超过 100mm。相对于两侧吊弦点有 5～15mm 的负弛度。滑道底面应平行于轨面，最大偏差不超过 10mm。

Sectional insulators shall be located in the center of pantograph, and the deviation shall not exceed 100mm under normal circumstances. There is a negative sag of 5 ~ 15mm relative to the hanging chord points on both sides. The bottom surface of slideway shall be parallel to the rail surface, and the maximum deviation shall not exceed 10mm.  
The segmented insulator shall be located in the center of the pantograph, with a deviation of no more than 100 mm. There is a negative sag of 5 to 15mm relative to the hanging string points on both sides. The bottom surface of the slide should be parallel to the rail surface with a maximum deviation of no more than 10 mm.

1. 分段绝缘器导线接头、导流滑道端头处过渡平滑。承力索分段绝缘子应采用重量较轻的有机复合绝缘子。

The transition at the end of conductor joint and guide slideway of segmented insulator is smooth. Organic composite insulators with light weight should be used for subsection insulators of load-bearing cables.  
The transition is smooth at the conductor joints of segmented insulators and the ends of diversion slides. Lightweight organic composite insulators shall be used for section insulators of load-bearing cables.

1. 分段绝缘器不应长时间处于对地耐压状态。雨、雾、霾等恶劣天气下，起电分段作用的隔离开关严禁处于分闸状态。隔离开关应在作业开始前 30 分钟内断开，在作业间歇 时间大于 30 分钟时应闭合，继续作业时再断开，作业结束后应及时闭合。

Sectional insulators should not be in a withstand voltage state to ground for a long time. Under bad weather such as rain, fog and haze, it is strictly forbidden to open the isolating switch with the function of electricity segmentation. The isolating switch shall be disconnected within 30 minutes before the start of operation, closed when the intermittent time of operation is more than 30 minutes, disconnected again when continuing operation, and closed in time after operation.  
Sectional insulators should not be in withstand voltage to ground for a long time. In severe weather such as rain, fog, and haze, the isolating switch that serves as a power segment is strictly prohibited from being in an open state. The isolating switch should be disconnected within 30 minutes before the start of the operation, closed when the operation interval is more than 30 minutes, and then disconnected when the operation continues, and closed in time after the operation is completed.

1. 分段绝缘器安装位置符合规定，距离定位点不得小于 2m。 265．分相绝缘器

The installation position of sectional insulator shall conform to the regulations, and the distance from the positioning point shall not be less than 2m. 265. Phase separation insulator  
The installation position of segmented insulators shall comply with the regulations, and the distance from the positioning point shall not be less than 2m. 265. Split phase insulator

1. 分相绝缘器通过速度不得超过 120km/h。

The passing speed of phase separation insulator shall not exceed 120km/h.  
The passing speed of split phase insulators shall not exceed 120km/h.

1. 分相绝缘器主绝缘应完好，其表面放电痕迹应不超过有效绝缘长度的 20%。主绝缘严重磨损应及时更换。

The main insulation of the split-phase insulator shall be in good condition, and the surface discharge trace shall not exceed 20% of the effective insulation length. The main insulation should be replaced in time if it is seriously worn.  
The main insulation of the divided phase insulator shall be intact, and the discharge traces on its surface shall not exceed 20% of the effective insulation length. The main insulation is severely worn and should be replaced in time.

1. 分相绝缘器应位于受电弓中心，一般情况下偏差不超过 100mm。双线区段，在列车运行方向为 1‰的上升坡度；单线区段，为 50mm±10mm 的负弛度；滑道底面应平行于轨面连线。

The phase separation insulator shall be located in the center of pantograph, and the deviation shall not exceed 100mm under normal circumstances. Double-track section, with an upward slope of 1 ‰ in the train running direction; Single line section, with a negative sag of 50mm ± 10mm; The bottom surface of the slideway shall be parallel to the connecting line of the rail surface.  
The split phase insulator should be located in the center of the pantograph, with a deviation of no more than 100 mm. For double-track sections, there is a rising slope of 1‰ in the direction of train running; for single-track sections, there is a negative sag of 50mm±10mm; the bottom surface of the slideway should be parallel to the rail surface line.

1. 分相绝缘器导线接头处过渡平滑。承力索分段绝缘子应采用重量较轻的有机复合绝缘子。

Smooth transition at wire joint of split-phase insulator. Organic composite insulators with light weight should be used for subsection insulators of load-bearing cables.  
The transition at the wire joints of the divided phase insulator is smooth. Lightweight organic composite insulators shall be used for section insulators of load-bearing cables.

1. 中性区长度符合《ERCL 技术管理规则》规定。

The length of neutral zone conforms to ERCL technical management rules.  
The length of the neutral zone complies with the provisions of the ERCL Technical Management Rules.

1. 优先采用过渡平滑、耐弧性能好的分段、分相绝缘器。

Segmented and phase-separated insulators with smooth transition and good arc resistance are preferred.  
Priority is given to segmented and divided phase insulators with smooth transition and good arc resistance.

避雷器

Lightning arrester  
arrester

1. 避雷器

Lightning arrester  
arrester

1. 避雷器托架安装水平，无锈蚀，各部螺栓连接紧固。

The lightning arrester bracket is installed horizontally without corrosion, and all parts are bolted and fastened.  
The lightning arrester bracket is installed horizontally and free from rust, and each part is connected tightly by bolts.

1. 避雷器及支持绝缘子应呈竖直状态，倾斜角度不超过 2°。表面清洁，安装牢固，无裂纹、破损及放电痕迹。

Lightning arresters and supporting insulators shall be in a vertical state with an inclination angle not exceeding 2. The surface is clean, the installation is firm, and there are no cracks, damages and discharge traces.  
Lightning arresters and supporting insulators shall be vertical with an inclination angle of no more than 2°. The surface is clean, the installation is firm, and there are no cracks, damage or discharge traces.

1. 避雷器引线无烧伤、断股。至高压侧引线的张力应适宜，不应使连接端子受到超出允许的外加应力。极限条件下，高压侧引线对接地体之间的距离大于 350mm。

Lightning arrester lead no burn, broken strand. The tension of the lead to the high voltage side should be appropriate, and the connecting terminal should not be subjected to additional stress beyond the allowable limit. Under the limit condition, the distance between the high voltage side leads and the ground body is more than 350mm.  
There are no burns or broken strands on the lightning arrester leads. The tension of the lead wire to the high-voltage side shall be appropriate, and the connecting terminal shall not be subjected to additional stress exceeding the allowable limit. Under extreme conditions, the distance between the high-voltage side lead and the grounded body is greater than 350 mm.

1. 脱离器状态良好，无破损、裂纹。安装位置应满足动作后，引线不侵入限界并与带电体保持足够的绝缘间距。

The detacher is in good condition without damage or crack. Installation position should meet the action, the lead does not invade the limit and keep enough insulation distance with the charged body.  
The disconnector is in good condition without damage or crack. The installation position shall be such that after action, the lead wire will not intrude into the limit and maintain sufficient insulation spacing from the charged body.

1. 动作计数器完好，一般安装在距离地面 2m 为宜，具备在线泄漏电流监测功能。

The action counter is in good condition, generally installed 2m away from the ground, and has the function of online leakage current monitoring.  
The action counter is in good condition and is generally installed 2 meters away from the ground. It has online leakage current monitoring function.

1. 避雷器的试验按照行业有关标准执行。

The test of lightning arrester shall be carried out according to relevant industry standards.  
The test of lightning arrestors shall be carried out in accordance with relevant industry standards.

27.5kV 电缆

27.5 kV cable  
27.5kV cable

1. 电缆

cable  
cable

1. 电缆本体各部分无机械损伤，无过热变色、变形、开裂、放电现象。

All parts of the cable body are free from mechanical damage, overheating discoloration, deformation, cracking and discharge.  
There is no mechanical damage to all parts of the cable body, no overheating, discoloration, deformation, cracking, or discharge.

1. 电缆及电缆终端的固定处必须采用专用的铝制或非磁性材料抱箍，并加装保护垫。 (3)电缆固定支架无松动、严重锈蚀或变形，电缆悬挂钢索和挂钩无严重锈蚀或脱落。 (4)电缆铠装层、屏蔽层及电缆导体之间均应可靠绝缘。测量电缆铠装层、屏蔽层及电

The fixing place of cable and cable terminal must adopt special aluminum or non-magnetic material hoop, and install protective pad. (3) The cable fixing bracket is free from looseness, serious corrosion or deformation, and the cable suspension cable and hook are free from serious corrosion or falling off. (4) Reliable insulation shall be provided between cable armor layer, shielding layer and cable conductor. Measure cable armor layer, shielding layer and electricity  
Special aluminum or non-magnetic material hoop must be used for fixing cables and cable terminals, and protective mats must be installed. (3)The cable fixing bracket shall not be loose, seriously corroded or deformed, and the cable suspension cables and hooks shall not be seriously corroded or peeled off. (4)Cable armor, shielding layer and cable conductors should be reliably insulated. Measuring cable armor layer, shielding layer and electricity

缆主绝缘之间的绝缘电阻值与历次数据比较，不应有显著变化。 (5)电缆上网点宜设置隔离开关并纳入远动控制。

Compared with previous data, the insulation resistance value between main insulation of cable should not change significantly. (5) Isolating switches should be set at the network points on the cable and included in telecontrol control.  
The insulation resistance value between the main insulation of the cable shall not change significantly compared with previous data. (5)Isolation switches should be provided at cable connection points and remote control should be included.

1. 电缆终端

Cable terminal  
cable termination

1. 电缆终端表面干燥、清洁、密封良好，无渗漏水、裂纹、老化、破损等。

The surface of cable terminal is dry, clean and well sealed, without water leakage, crack, aging and damage.  
The surface of the cable terminal is dry, clean and well sealed, without water leakage, cracks, aging, damage, etc.

1. 电缆终端应保证竖直向上，不得出现偏转、扭曲变形，伞裙不得挤压变形，最大偏移角度不得大于 30°。

The cable terminal shall be vertical and upward, without deflection or distortion, and the umbrella skirt shall not be extruded and deformed, and the maximum offset angle shall not be greater than 30.  
The cable terminal should be kept upright and upright without deflection or distortion. The umbrella skirt should not be squeezed and deformed, and the maximum offset angle should not exceed 30°.

1. 电缆终端母排及零部件应与大地、接地钢构、固定抱箍等保持足够的绝缘距离。顶部端子对地空气绝缘距离不小于 450mm，电缆终端应力锥对地空气绝缘距离不小于 35mm，多个电缆终端并联时，其间空气绝缘距离不小于 35mm。

Cable terminal bus and parts should keep enough insulation distance from the ground, grounding steel structure, fixed hoop, etc. The air insulation distance from the top terminal to the ground shall not be less than 450mm, and the air insulation distance from the stress cone of the cable terminal to the ground shall not be less than 35mm. When multiple cable terminals are connected in parallel, the air insulation distance between them shall not be less than 35mm.  
Cable terminal busbars and parts should maintain sufficient insulation distance from the earth, grounding steel structures, fixed hoop rings, etc. The air insulation distance between the top terminal and the ground shall not be less than 450mm, and the air insulation distance between the stress cone of the cable terminal shall not be less than 35 mm. When multiple cable terminals are connected in parallel, the air insulation distance between them shall not be less than 35 mm.

1. 电缆终端应固定牢固，金属端子不得承受拉力，应力锥无受力变形。电缆终端固定夹持部位距离冷缩地线管下端大于 100mm，不得夹持在电缆终端椎体表面，并与接地线保证 50mm 以上的距离。

Cable terminal shall be fixed firmly, metal terminal shall not bear tension, and stress cone shall not be deformed by force. The fixed clamping position of cable terminal is more than 100mm away from the lower end of cold shrinkage ground wire pipe, and shall not be clamped on the surface of cable terminal vertebral body, and the distance from ground wire is more than 50mm.  
Cable terminals should be fixed firmly, metal terminals should not bear tensile force, and stress cones should not be deformed under force. The fixed clamping part of the cable terminal is more than 100mm away from the lower end of the cold shrink ground pipe. It shall not be clamped on the surface of the cable terminal cone, and the distance between it and the ground wire shall be more than 50 mm.

1. 电缆接地

Cable grounding  
cable grounding

1. 电缆长度小于 100m 时，电缆终端应一端直接接地，另一端可不接地。

When the cable length is less than 100m, one end of the cable terminal should be directly grounded, and the other end may not be grounded.  
When the cable length is less than 100m, one end of the cable terminal should be directly grounded, and the other end may not be grounded.

长度 100m 及以上时，宜每隔 400m（直供方式）划分区段且在每个区段应实施接地绝缘分隔。电缆终端应一端铠装层、屏蔽层直接接地，另一端铠装层、屏蔽层通过护层保护器分开接地。

When the length is 100m or more, sections should be divided every 400m (direct supply mode), and grounding insulation separation should be implemented in each section. One end of the cable terminal shall be grounded with armor layer and shielding layer directly, and the other end shall be grounded separately through sheath protector.  
When the length is 100m and above, sections should be divided every 400m (direct supply method) and grounding insulation separation should be implemented in each section. The armor layer and shielding layer at one end of the cable terminal shall be directly grounded, and the armor layer and shielding layer at the other end shall be separately grounded through a sheath protector.

1. 电缆终端接地线及端子应采取绝缘包扎并固定在电缆上，不得与金属构架直接接触。 (3)电缆终端接地线无破损现象，受损股数不得超过总数的 20%。

The grounding wire and terminal of cable terminal shall be insulated and fixed on the cable, and shall not be in direct contact with the metal frame. (3) There is no damage to the grounding wire of cable terminal, and the number of damaged shares shall not exceed 20% of the total.  
The grounding wires and terminals of cable terminals shall be insulated wrapped and fixed on the cable, and shall not be in direct contact with the metal frame. (3)There is no damage to the ground wire of the cable terminal, and the number of damaged strands shall not exceed 20% of the total.

1. 电缆敷设

Cable laying  
cable laying

1. 电缆采用地面敷设时须单独设置电缆沟槽，按规定设置地面电缆标识桩。同沟（槽）敷设 2 根以上电缆时，每隔 30m 分别标识。

When cables are laid on the ground, cable trenches shall be set separately, and ground cable identification piles shall be set according to regulations. When laying more than 2 cables in the same trench (groove), they shall be marked every 30m.  
When cables are laid on the ground, separate cable grooves must be set up, and ground cable identification piles must be set up as required. When laying more than 2 cables in the same ditch (trough), mark them every 30 meters.

1. 电缆应作波浪形敷设，在敷设过程中，不应出现铠装压扁、电缆绞拧、护套折裂破损等现象，电缆弯曲半径不小于电缆外径的 20 倍。电缆终端（上支柱、上桥等）处，电缆应预留不小于 5m。

Cables should be laid in waves. During laying, armored flattening, cable twisting, sheath cracking and damage should not occur. The bending radius of cables should not be less than 20 times of the outer diameter of cables. At the cable terminal (upper pillar, upper bridge, etc.), the cable should be reserved not less than 5m.  
The cable shall be laid in waves. During the laying process, there shall be no phenomena such as flattening of armor, twisting of cables, cracking of sheaths, etc., and the bending radius of cables shall not be less than 20 times the outer diameter of cables. At the cable terminal (upper pillar, upper bridge, etc.), no less than 5m of cable should be reserved.

1. 电缆上、下行间敷设应无交叉，供电线、正馈线电缆间无交叉（特殊区段用绝缘板做隔离），并按规定采取隔热及阻燃防护措施。

There shall be no crossover between the upper and lower cables, and there shall be no crossover between the power supply lines and positive feeder cables (insulation plates shall be used for isolation in special sections), and heat insulation and flame retardant protection measures shall be taken according to regulations.  
There shall be no intersection between the upper and lower cables, and no intersection between the power supply line and the positive feeder cables (special sections shall be isolated with insulating plates), and heat insulation and flame retardant protection measures shall be taken as required.

1. 当电缆穿管敷设时，保护管长度、内径应符合要求；当采用磁性保护管防护时，应顺向切割开缝，防止构成闭合磁路。

When the cable is laid through the pipe, the length and inner diameter of the protection pipe shall meet the requirements; When magnetic protective tube is used for protection, the slit should be cut in the forward direction to prevent the formation of closed magnetic circuit.  
When cables are laid through pipes, the length and inner diameter of the protective pipe should meet the requirements; when magnetic protective pipes are used for protection, slits should be cut in the forward direction to prevent the formation of a closed magnetic circuit.

1. 当电缆直埋敷设时，电缆表面距地面不应小于 0.7m，穿越农田时不应小于 1m；其径路应避开使电缆受到机械损伤、化学或地下电流腐蚀、振动、热影响、虫鼠等危害地段。困难情况下应设置电缆槽、沟，并采取必要的防护措施。电缆过轨时应加装防护套管，埋深

When the cable is laid directly, the cable surface should not be less than 0.7 m from the ground and should not be less than 1m when crossing farmland; Its path should avoid the damage areas such as mechanical damage, chemical or underground current corrosion, vibration, heat influence, insects and rats. Cable trenches and trenches should be set up in difficult situations, and necessary protective measures should be taken. Protective sleeve shall be installed when the cable passes through the rail, and the buried depth shall be  
When the cable is directly buried, the distance between the cable surface and the ground should not be less than 0.7m, and when crossing farmland, it should not be less than 1m; the path should avoid causing the cable to suffer mechanical damage, chemical or underground current corrosion, vibration, thermal effects, insects and other hazardous areas. Cable troughs and trenches should be set up in difficult circumstances, and necessary protective measures should be taken. Anti-sheath pipes should be installed when cables pass through rails, and buried deeply

低于轨面不少于 1m。

Not less than 1m below the rail surface.  
Not less than 1m below the rail surface.

1. 直埋或以直埋电缆槽方式敷设的电缆，敷设后应及时填埋电缆沟，并采取减振、阻燃、阻断鼠道措施。同路径并排展放的多根电缆，相邻两根之间应有隔离措施。

For cables directly buried or laid in the form of directly buried cable trench, the cable trench shall be buried in time after laying, and measures such as vibration reduction, flame retardant and rat trench blocking shall be taken. For multiple cables spread side by side in the same path, isolation measures should be taken between two adjacent cables.  
For cables directly buried or laid in direct buried cable troughs, the cable trenches should be buried in time after laying, and measures to reduce vibration, flame retardant, and block rat channels should be taken. For multiple cables laid side by side on the same path, isolation measures should be taken between adjacent two cables.

1. 电缆标桩埋设应清晰显示出路径状态，直线地段每 35～50m 设置一根电缆标桩，在出所位置、电缆转弯处以及和其他管、线、路交叉处，可增加标桩数量。电缆标桩上字样由各基础设施维护公司制定。

The buried cable stakes should clearly show the path state, and a cable stakes should be set every 35 ~ 50m in the straight line section. The number of stakes can be increased at the exit position, cable bends and intersections with other pipes, lines and roads. The words on cable stakes shall be formulated by each infrastructure maintenance company.  
The path status should be clearly displayed when the cable stake is buried. A cable stake should be set every 35 - 50m in the straight section. The number of stakes can be increased at the exit position, cable turns, and intersections with other pipes, lines, and roads. The words on the cable stakes are formulated by each infrastructure maintenance company.

1. 电缆上网处应自地面下 0.8m 至地面以上 2m，砌钢筋混凝土电缆槽或砖砌防护墙进行防护。

The cable connection shall be from 0.8 m below the ground to 2m above the ground, and be protected by reinforced concrete cable trough or brick protective wall.  
The cable connection point should be protected by reinforced concrete cable troughs or brick protective walls from 0.8m below the ground to 2m above the ground.

其他

Others  
other

吸上线

Suction wire  
suction line

1. 吸上线

Suction wire  
suction line

1. 吸上线型号及安装位置应符合设计并满足牵引回流需要，外露部分电缆护管应无损伤且封堵良好。

The type and installation position of suction line shall conform to the design and meet the needs of traction backflow, and the exposed cable guard pipe shall be undamaged and well sealed.  
The model and installation position of the suction line shall comply with the design and meet the traction reflux needs. The exposed part of the cable protection pipe shall be free from damage and well blocked.

1. 在有轨道电路区段，采用截面满足要求的电缆接至扼流变压器中性点连接钣（端子）。吸上线须与支柱密贴连接牢固。无轨道电路区段按设计进行安装。

In the section with track circuit, the cable with cross section meeting the requirements is connected to the neutral point connecting sheet (terminal) of choke transformer. The suction line must be closely attached and firmly connected with the strut. The non-track circuit section shall be installed as designed.  
In the section with track circuits, use cables with cross-sections that meet the requirements to be connected to the neutral point connection plate (terminal) of the choke transformer. The upper suction line must be tightly connected to the pillar and firmly connected. The trackless circuit section is installed as designed.

1. 吸上线与回流线（保护线）连接时，与悬挂点的距离应符合设计要求；与回流线（保护线）、扼流变压器（或空心线圈）连接处应连接牢固，接触良好，并涂导电脂。

When the suction line is connected with the return line (protection line), the distance from the suspension point shall meet the design requirements; The connection with return line (protection line) and choke transformer (or air-core coil) should be firmly connected and well contacted, and coated with conductive grease.  
When the suction line is connected to the return line (protective line), the distance from the suspension point should meet the design requirements; the connection with the return line (protective line) and choke transformer (or air-core coil) should be firmly connected, in good contact, and coated with conductive grease.

1. 对吸上线进行固定、防护时，其抱箍、套管不得形成闭合磁路。

When fixing and protecting the suction line, its hoop and sleeve shall not form a closed magnetic circuit.  
When fixing and protecting the upper suction line, its hoop and sleeve shall not form a closed magnetic circuit.

1. 吸上线电缆沿地面、支柱的敷设必须密贴、牢固。埋入地下时，埋深不少于 300mm。穿过钢轨、桥台时应采取防护措施。

The laying of suction cable along the ground and pillars must be closely attached and firm. When buried underground, the buried depth shall not be less than 300mm. Protective measures should be taken when passing through rails and abutments.  
The laying of the suction line cables along the ground and pillars must be close and firm. When buried underground, the burial depth shall not be less than 300 mm. Protective measures should be taken when crossing rails and abutments.

保安装置及标识

Security devices and signs  
Security devices and logos

1. 在站台及未封闭线路的接触网支柱上距轨面 2.5m 高的处所，以及安全挡板、细孔网栅和跨线桥防护网栅均应设置白底、黑字、红色闪电符号的“高压危险”警示标识。

Warning signs of "high voltage danger" with white background, black characters and red lightning symbols shall be set on the platform and the place 2.5 m high from the rail surface on the catenary pillar of the unclosed line, as well as the safety baffle, fine hole grid and overpass bridge protective grid.  
"High-voltage Danger" warning signs with white background, black letters and red lightning symbols should be installed on platforms and contact net pillars on unenclosed lines at a height of 2.5m from the rail surface, as well as safety baffles, fine hole grids and overpass bridge protective grids.

1. 上跨构筑物（桥、隧道、明洞、站房等）下方的承力索、供电线，应在防断点处至少 5m 采取防护措施。

The load-bearing cables and power supply lines under the upper span structures (bridges, tunnels, open tunnels, station buildings, etc.) shall take protective measures at least 5m at the breakpoint.  
Protective measures shall be taken at least 5 meters at the breaking point for the load-bearing cables and power supply lines below the upper span structures (bridges, tunnels, open-cut holes, station buildings, etc.).

隧道、桥梁内漏水点距离接触网带电线索小于 2m 处所，下方承力索、供电线等在漏水点垂直投影向两侧延伸至少 1m 采取防护措施。

Where the water leakage point in tunnels and bridges is less than 2m away from the live clues of catenary, the lower load-bearing cables and power supply lines extend at least 1m to both sides in the vertical projection of the water leakage point to take protective measures.  
Where the water leakage point in tunnels and bridges is less than 2m away from the live clues of the catenary, the load-bearing cables, power supply lines, etc. below are projected vertically at the water leakage point and extend at least 1m to both sides to take protective measures.

重点处所上跨电线路下方的承力索、供电线，可在上跨电线路垂直投影两侧延伸至少 5m采取防护措施。

The load-bearing cables and power supply lines under the upper span power lines in key places can extend at least 5m on both sides of the vertical projection of the upper span power lines to take protective measures.  
The load-bearing cables and power supply lines below the upper span power lines in key places can extend at least 5 meters on both sides of the vertical projection of the upper span power lines to take protective measures.

1. 轨面标准线

Rail surface standard line  
rail surface standard line

接触网支柱上、隧道每个定位点下方隧道边墙上，均要涂刷红色“轨面标准线”。轨面标准线标画依据为正线股道靠近隧道边墙、站台或支柱侧的钢轨顶面的设计高程。

Red "rail surface standard line" shall be painted on the catenary pillar and the tunnel side wall below each positioning point of the tunnel. The standard line of the rail surface is plotted according to the design elevation of the top surface of the rail near the side wall, platform or pillar side of the main track.  
Red "rail surface standard lines" must be painted on the overhead contact network pillars and the tunnel side walls below each positioning point of the tunnel. The standard line marking of the rail surface is based on the design elevation of the rail top surface of the main track near the tunnel side wall, platform or pillar side.

1. 标识

Identification  
identification

1. 号码牌

Number plate  
number plate

每根接触网支柱上均应安装反光号码牌。每个区间、车站、隧道均应分别单独编号，上行双号、下行单号，编号方向与线路公里标方向一致。

Reflective number plates shall be installed on each catenary pillar. Each section, station and tunnel shall be numbered separately, with upward double number and downward single number, and the numbering direction shall be consistent with the direction of the line kilometer mark.  
Reflective number plates should be installed on each contact line pillar. Each section, station, and tunnel should be numbered separately, with double uplink numbers and single downlink numbers, and the numbering direction is consistent with the direction of the kilometer mark of the line.

1. 电力机车禁停标

No stopping standard for electric locomotives  
Ban on stopping of electric locomotives

绝缘锚段关节作为接触网电分段处宜装设“电力机车禁停标”，必要时还应根据反向行车需要设置。

As the electrical section of catenary, the joint of insulation anchor section should be equipped with "No Stop Standard for Electric Locomotive", and if necessary, it should be set according to the needs of reverse driving.  
"Electric locomotive stop prohibition sign" should be installed at the joint of the insulation anchor section as the electrical section of the catenary, and if necessary, it should also be set according to the needs of reverse driving.

1. 分相断合标

Separated phase breaking mark  
Phase separation and standard closing

在接触网分相处应装设“禁止双弓”、“断（T 断）”、“合”、等标志。并根据反向行车需要设置断电标、合电标。在有动车组上线的线路，还应装设“动车合”标志。

Signs such as "No Double Bow", "Break (T Break)", "Close" and so on should be installed in the catenary. According to the needs of reverse driving, the power-off mark and the power-on mark are set. On the line with EMU on-line, the sign of "EMU closing" should also be installed.  
Signs such as "No Double Bow","Break (T Break)","Close", etc. should be installed on the contact line separation interface. And set power-off signs and power-on signs according to the needs of reverse driving. On lines where EMU units are on line, the "EMU closed" sign should also be installed.

1. 接触网终点标

Catenary terminal mark  
Contact line endpoint

在接触网终端应设置接触网终点标，“接触网终点”标应装设于接触网锚支距受电弓中心线不大于 400mm 处接触线的上方或线路列车运行方向的左侧地面上。

The catenary end point mark shall be set at the catenary terminal, and the "catenary end point" mark shall be installed above the contact line where the catenary anchor support is not more than 400mm away from the pantograph center line or on the left ground in the running direction of the line train.  
The catenary terminal mark shall be set at the terminal of the catenary. The "catenary terminal" mark shall be installed above the contact line at a position where the catenary anchor supports are no more than 400mm from the center line of the pantograph or on the left side of the ground in the running direction of the line train.

上述标识均为白底黑框，黑字黑体。标志装设位置及规格符合《ERCL 技术管理规》等有关规定。

The above logos are all in black box on white background, with black characters and bold body. The installation position and specifications of the signs comply with the relevant provisions of ERCL Technical Management Regulations.  
The above logos are all black frames on a white background, with black characters in bold. The installation position and specifications of the signs comply with the "ERCL Technical Management Regulations" and other relevant regulations.

1. 接触网运行组均应备有临时“准备降弓、“降”（T 降）、“升”弓标。当突然发现接触网故障或故障抢修先行送电开通时，按《ERCL 技术管理规则》规定在故障地点两端设置临时升、降弓标。临时“降（T 降）”、“升”弓标的规格可比照“断、“合”电标， “准备降弓”的规格可比照“禁止双弓”标。

The catenary operation group shall be equipped with temporary "ready bow lowering," T lowering "and" lifting "bow marks. When catenary failure is suddenly found or power transmission is started in advance for fault emergency repair, temporary bow lifting and lowering marks shall be set at both ends of the fault site according to ERCL Technical Management Rules. The specifications of temporary" T lowering "and" lifting "bow marks can be compared with" off "and" close "electric marks, and the specifications of" ready bow lowering "can be compared with" no double bow ".  
The overhead contact line operation group shall be equipped with temporary "ready to lower bow," lower "(T-lower), and" raise "bow. When an overhead contact network fault is suddenly discovered or power is switched on first for fault repair, temporary raising and lowering bows are set at both ends of the fault site in accordance with the provisions of the "ERCL Technical Management Rules". The specifications of temporary "lowering (T lowering)" and "raising" bows can be compared to the "breaking and" closing "electric bows, and the specifications of" preparing to lower bow "can be compared to the" double bow prohibited "sign.

1. 各种标识和揭示牌应完整无损、安装牢固、字迹清晰、便于瞭望，不得侵入限界，与行车有关的标识一般应设于列车运行方向的左侧。

All kinds of signs and signs shall be intact, firmly installed, clearly written, convenient for observation, and shall not invade the clearance. Signs related to driving shall generally be located on the left side of the train running direction.  
Various signs and announcements should be intact, firmly installed, clear in writing, easy to look at, and must not intrude into the clearance. Signs related to traffic should generally be located on the left side of the train's running direction.

1. 各级维护机构的设备分界应以文件或协议明确，一般不在接触网设备上悬挂分界标识。

The equipment boundary of maintenance institutions at all levels shall be clearly defined by documents or agreements, and boundary marks shall not be hung on catenary equipment in general.  
The equipment boundaries of maintenance agencies at all levels should be clearly defined in documents or agreements, and generally no demarcation signs should be hung on the overhead contact network equipment.

自动过分相地面磁感应器

Automatic over-phase ground magnetic sensor  
Automatic phase passing ground magnetic sensor

1. 自动过分相地面磁感应器

Automatic over-phase ground magnetic sensor  
Automatic phase passing ground magnetic sensor

1. 地面磁感应器设置符合设计要求，允许偏差±2m。

The setting of ground magnetic sensor meets the design requirements, and the allowable deviation is 2m.  
The setting of ground magnetic sensors meets the design requirements, with an allowable deviation of ±2m.

1. 地面磁感应器应安装牢固，完整无损，表面清洁。

Ground magnetic sensors should be installed firmly, intact and clean.  
Ground magnetic sensors should be installed firmly, intact and without damage, and the surface should be clean.

（3）地面磁感应器的磁感应强度应大于 36GS。

(3) The magnetic induction intensity of ground magnetic sensor should be greater than 36GS.  
(3) The magnetic induction strength of the ground magnetic sensor should be greater than 36GS.

零部件及其他

Parts and others  
parts and components and others

1. 接触网零件（包括附加导线的金具，下同）应符合有关标准。

Catenary parts (including fittings for additional wires, the same below) shall meet relevant standards.  
Contact line parts (including fittings for additional wires, the same below) shall comply with relevant standards.

接触网零部件应优先采用耐腐蚀、强度高的零部件，悬挂零件轻型化。主要的受力件（如接头、下锚件等）不得使用可锻铸铁。

Corrosion-resistant and high-strength parts should be preferred for catenary parts, and light suspension parts should be made. Malleable cast iron shall not be used for main stress parts (such as joints and lower anchors, etc.).  
OCS parts should be preferred to use corrosion-resistant and high-strength parts, and suspension parts should be lighter. Malleable cast iron shall not be used for main load-bearing parts (such as joints, lower anchors, etc.).

1. 接触网零件表面应光洁、无裂纹、疤痕和剥离以及其他质量缺陷，其材质、制造质量及公差、机械性能等均应满足技术标准要求，并按规定采用镀锌、防腐漆及其他技术进行防腐处理。

The surface of catenary parts should be smooth, free of cracks, scars, peeling and other quality defects. Its material, manufacturing quality, tolerance and mechanical properties should meet the requirements of technical standards, and galvanizing, anticorrosive paint and other technologies should be used for anticorrosive treatment according to regulations.  
The surface of contact line parts should be smooth and smooth, free from cracks, scars, peeling and other quality defects. Its materials, manufacturing quality and tolerances, mechanical properties, etc. should meet the requirements of technical standards, and galvanized, anti-corrosion paint and other technologies should be used for anti-corrosion treatment as required.

承载负荷的不锈钢螺栓等零部件，一旦锈蚀应立即更换。

Parts such as stainless steel bolts bearing load should be replaced immediately once corroded.  
Parts such as stainless steel bolts that bear load should be replaced immediately once they are corroded.

1. 接触网和附加导线中用于电气连接的零件，其允许载流量不应小于被连接的导线。线索接续处两测点之间电阻应不大于同等长度被连接线索的电阻。各种材质的电连接线夹最高允许使用温度不得超过以下规定：铜质为 95℃，铝青铜合金为 125℃，铜镍硅合金为 150℃，铝质为 80℃，铝镁硅合金为 125℃、其余铝合金为 90℃，钢质为 125℃。

The permissible current carrying capacity of the parts of the catenary and additional wires used for electrical connection shall not be less than that of the wires to be connected. The resistance between the two measuring points at the connection of the thread shall not be greater than the resistance of the connected thread of the same length. The maximum allowable service temperature of electrical connecting clamps made of various materials shall not exceed the following provisions: 95 ℃ for copper, 125 ℃ for aluminum bronze alloy, 150 ℃ for copper nickel silicon alloy, 80 ℃ for aluminum, 125 ℃ for aluminum magnesium silicon alloy, 90 ℃ for other aluminum alloys and 125 ℃ for steel.  
The allowable current carrying capacity of parts used for electrical connection in the contact network and additional wires shall not be less than the wire being connected. The resistance between two measuring points at the connection point of the thread shall not be greater than the resistance of the connected thread of the same length. The maximum allowable temperature for electrical connection clamps of various materials shall not exceed the following regulations: 95℃ for copper, 125℃ for aluminum bronze alloy, 150℃ for copper-nickel silicon alloy, 80℃ for aluminum, and 125℃ for aluminum-magnesium-silicon alloy., 90℃ for other aluminum alloys, and 125℃ for steel.

1. 被测零部件与相连接导体间的温度差应符合下列规定：标准值：0℃。

The temperature difference between the tested part and the connected conductor shall meet the following requirements: standard value: 0 ℃.  
The temperature difference between the tested part and the connected conductor shall comply with the following requirements: Standard value: 0℃.

标准状态：10℃。警示值：20℃。 限界值：25℃。

Standard state: 10 ℃. Warning value: 20 ℃. Limit value: 25 ℃.  
Standard state: 10℃. Warning value: 20℃. Limit value: 25℃.

1. 采用红外热成像监测时，参照附件 17 执行。

When infrared thermal imaging monitoring is used, refer to Annex 17.  
When using infrared thermal imaging monitoring, refer to Annex 17.

1. 接触网零件要安装牢固，紧固件在螺栓、螺母、螺纹连接或其他型式连接时应有防松措施。零件上的各个螺栓均应受力均匀，其紧固力矩符合规定。各种调整螺栓的丝扣外露部分一般不得小于 50mm。

Catenary parts should be installed firmly, and fasteners should have anti-loosening measures when bolts, nuts, threaded connections or other types of connections. All bolts on the parts shall be stressed evenly, and their fastening torque shall conform to the regulations. The thread exposed part of various adjustment bolts shall not be less than 50mm in general.  
Contact line parts must be installed firmly, and fasteners should have anti-loosening measures when connecting bolts, nuts, threads or other types of connections. Each bolt on the part should be uniformly stressed, and its tightening torque should comply with regulations. The exposed part of the threads of various adjustment bolts shall generally not be less than 50 mm.

1. 接触网零件应按规定检验合格后方可使用。所有接触网零件均应有明确的、永久性生产厂家标识，否则视为不合格零件严禁使用。

Catenary parts shall be inspected according to regulations before use. All catenary parts should have clear and permanent manufacturer identification, otherwise they are regarded as unqualified parts and are strictly prohibited from use.  
Contact line parts must be inspected and passed according to regulations before being used. All catenary parts should have clear and permanent manufacturer logos, otherwise they are deemed to be unqualified parts and strictly prohibited.

1. 当用楔形线夹连接或固定各种线索时，线索回头长度应为 300～500mm，并用与线索材质相匹配的绑线扎紧。一处绑扎时绑扎长度为 80～120mm，两处绑扎时每处绑扎长度不得小于 20mm。

When connecting or fixing various clues with wedge-shaped clamps, the turning length of clues should be 300 ~ 500mm, and the binding thread matched with the material of clues should be tied tightly. The length of one ligation is 80 ~ 120mm, and the length of each ligation should not be less than 20mm when two ligations are made.  
When connecting or fixing various clues with wedge wire clips, the length of the clues back should be 300 to 500mm, and tightened with a binding wire that matches the material of the clues. The binding length is 80 - 120mm when binding at one place, and the binding length of each place shall not be less than 20mm when binding at two places.

当用钢线卡子连接钢绞线时，不得少于 4 个卡子，其间距为 100-150mm，每边最外方钢线卡子距绞线端头 100mm，并用绑线扎紧。

When connecting steel strands with steel wire clips, there shall be no less than 4 clips with a distance of 100-150mm, and the outermost steel wire clips on each side shall be 100mm away from the end of strands, and tied tightly with binding wires.  
When steel wire clips are used to connect steel strands, there must be no less than 4 clips with a spacing of 100-150 mm. The outermost steel wire clip on each side is 100mm away from the end of the strand, and tighten it with binding wires.

1. 零部件连接销钉与开口销穿向正确，双向夹角不小于 120°，开口销不得二次使用。β型开口销的圆弧要锁在销钉的圆柱面上。

The connecting pin and cotter pin of parts pass in the correct direction, the bidirectional included angle is not less than 120, and the cotter pin shall not be used twice. The arc of beta cotter pin should be locked on the cylindrical surface of pin.  
The connecting pin and the cotter pin of the parts are threaded in the correct direction, and the two-way angle is not less than 120°. The cotter pin shall not be used twice. The arc of the beta cotter pin should be locked to the cylindrical surface of the pin.

绝缘、防雷、接地

Insulation, lightning protection and grounding  
Insulation, lightning protection, grounding

1. 绝缘部件

Insulating component  
insulating member

1. 绝缘部件的泄漏距离

Leakage distance of insulating parts  
Leakage distance of insulating parts

0、Ⅰ、Ⅱ级污秽等级区域，接触网绝缘泄漏距离不小于 1400mm；Ⅲ、Ⅳ级污秽等级区域，接触网绝缘泄漏距离不小于 1600mm。

0, I, II pollution level area, catenary insulation leakage distance is not less than 1400mm;; III, IV pollution level area, catenary insulation leakage distance is not less than 1600mm.  
In areas with level 0, I and II pollution levels, the insulation leakage distance of the contact line shall not be less than 1400mm; in areas with level III and IV pollution levels, the insulation leakage distance of the contact line shall not be less than 1600 mm.

供电线、电缆终端、接触悬挂下锚、软横跨接地侧、隔离开关绝缘子及分束供电的分段处绝缘子泄漏距离不小于 1600mm。

The leakage distance of insulators at power supply line, cable terminal, contact suspension anchor, soft span grounding side, isolating switch insulator and split beam power supply section shall not be less than 1600mm.  
The leakage distance of insulators at power supply lines, cable terminals, contact suspension anchors, soft crossing ground sides, isolator switches and segments for split power supply shall not be less than 1600 mm.

在海拔超过 1000m 的地区，上述泄漏距离应按规定增大。

In areas over 1000m above sea level, the above leakage distance should be increased according to regulations.  
In areas above 1000m above sea level, the above leakage distance should be increased as required.

1. Ⅲ、Ⅳ级污秽等级区域以及高路堑、跨线桥两侧、接触网下锚、分段、分相处宜采用复合绝缘子。

Composite insulators should be used in pollution grade III and IV areas, high cutting, both sides of overpass bridge, anchoring of catenary, subsection and subsection.  
Composite insulators should be used in pollution level III and IV areas, as well as high cutting, both sides of overpass bridges, contact network anchorage, segmentation, and separation.

1. 绝缘部件不得有裂纹和破损。瓷绝缘子的瓷釉剥落面积不大于 300mm2，连接件不松动。

Insulating parts shall not be cracked or damaged. The enamel peeling area of porcelain insulators is not more than 300mm 2 , and the connectors are not loose.  
Insulating parts must be free of cracks and damage. The enamel peeling area of porcelain insulators shall not exceed 300 mm2, and the connection parts shall not be loose.

1. 在运输装卸和安装绝缘子时应避免发生冲撞，不得锤击与瓷体连接的铁帽和金属件，同时也不得对其进行机械加工和热处理，铁帽和金具无锈蚀。

During transportation, loading, unloading and installation of insulators, collision should be avoided, iron caps and metal parts connected with porcelain bodies should not be hammered, and mechanical processing and heat treatment should not be carried out, and iron caps and hardware fittings should not be corroded.  
Collision should be avoided during transportation, loading, unloading and installation of insulators. The iron caps and metal parts connected to the porcelain body should not be hammered. At the same time, they should not be machined or heat treated. The iron caps and fittings should be free of corrosion.

1. 接触网空气绝缘间隙符合下表要求。

The air insulation gap of catenary meets the requirements of the following table.  
The air insulation clearance of the contact network shall comply with the requirements of the following table.

接触网空气绝缘间隙表

Air insulation gap table of catenary  
Contact net air insulation clearance table

|  |  |  |
| --- | --- | --- |
| 序号 serial number  Serial number | 项目 project  Project | 正常情况下  Under normal circumstances under normal circumstances  最小值 mm  Minimum value mm Minimum mm |
| 1 | 接触线、承力索、供电线等带电部分至固定接地体间隙  Gap between live parts such as contact wire, load-bearing cable and power supply line and fixed grounding body Clearance between contact wires, load-bearing cables, power supply wires and other live parts to fixed grounding bodies | 300 |
| 2 | 接触网带电部分至机车车辆或装载货物的间隙  Gap between live part of catenary and rolling stock or loaded goods The gap between the live part of the catenary and the rolling stock or the loaded cargo | 350 |
| 3 | 接触线、承力索、供电线等带电部分至跨线建筑物间隙  Gap between live parts such as contact lines, load-bearing cables and power supply lines and cross-line buildings Clearance between contact wires, load-bearing cables, power supply wires and other live parts to over-line buildings | 500 |
| 4 | 受电弓振动至极限位置和导线被抬高的最高位置距接地体的瞬间间隙  Instantaneous gap between the pantograph vibration to the limit position and the highest position where the conductor is raised and the grounding body The instantaneous gap between the pantograph vibrates to the extreme position and the highest position where the wire is raised and the grounded body | 200 |
| 5 | 25kV 带电绝缘子接地侧裙边距接地体间隙  Gap between skirt and grounding body of grounding side of 25kV live insulator Clearance between grounding side skirt of 25kV live insulator and grounding body | 100 |
| 6 | 43.3kV 绝缘间隙（关节式分相）  43.3 kV Insulation Gap (Articulated Phase Separation) 43.3kV insulation gap (articulated phase separation) | 400 |

注：1.当海拔高度超过 1000m 时，上述距离应按海拔修正系数进行修正。

Note: 1. When the altitude exceeds 1000m, the above distance should be corrected according to the altitude correction coefficient.  
Note: 1. When the altitude exceeds 1000m, the above distance shall be corrected according to the altitude correction factor.

2.回流线、保护线、架空地线、架空避雷线距固定接地体或桥梁及隧道壁的正常情况下最小距离 150mm。

2. The minimum distance between return line, protection line, overhead ground wire and overhead lightning protection line and fixed grounding body or bridge and tunnel wall under normal conditions is 150mm.  
2. The minimum distance between return wires, protection wires, overhead ground wires, and overhead lightning protection wires and fixed grounding objects or bridges and tunnel walls under normal circumstances is 150 mm.

290．防雷

290. Lightning protection  
290. lightning protection

1. 接触网防雷装置通常由避雷线或避雷器、引下线和接地装置组成。

The lightning protection device of catenary is usually composed of lightning conductor or arrester, down lead and grounding device.  
Contact line lightning protection devices are usually composed of lightning conductors or lightning arresters, down conductors and grounding devices.

避雷器引下线应直接从避雷线（避雷器）连续、完整、最短距离的引下并可靠接地。引下线的材质、结构和最小截面应满足雷电流强度检算并不小于避雷线的铜当量载流截面。

Lightning arrester down lead should be directly from the lightning arrester (lightning arrester) continuous, complete, the shortest distance down and reliable grounding. The material, structure and minimum cross-section of the down lead should meet the lightning current strength check and not less than the copper equivalent current-carrying cross-section of the lightning conductor.  
The lightning arrester downlead should be directly led from the lightning conductor (lightning arrester) continuously, completely and in the shortest distance and reliably grounded. The material, structure and minimum cross-section of the down conductor shall meet the requirements of lightning current intensity and be no less than the copper equivalent current-carrying cross-section of the lightning conductor.

接地装置应状态良好，接地极、接地线的敷设和焊接应满足设计要求。

The grounding device shall be in good condition, and the laying and welding of grounding electrode and grounding wire shall meet the design requirements.  
The grounding device shall be in good condition, and the laying and welding of the grounding electrode and grounding wire shall meet the design requirements.

1. 防雷装置接地电阻超标时，应分析原因并采取措施，必要时进行开挖检查。雷电活动强烈的地区，应增加防雷装置的检查次数。

When the grounding resistance of lightning protection device exceeds the standard, the reasons should be analyzed and measures should be taken, and excavation inspection should be carried out when necessary. In areas with strong lightning activity, the inspection times of lightning protection devices should be increased.  
When the grounding resistance of lightning protection devices exceeds the standard, the cause should be analyzed and measures should be taken, and excavation inspection should be carried out if necessary. In areas with strong lightning activity, the number of inspections of lightning protection devices should be increased.

1. 雷害发生后，应及时调查雷害具体原因和后果损失，总结分析，提出改进措施。 (4)接触网单独设置的防雷接地体（极）在贯通地线上的接入点与其他设备在贯通地线

After the occurrence of lightning damage, the specific causes and consequences of lightning damage should be investigated in time, summarized and analyzed, and improvement measures should be put forward. (4) The access point of the lightning protection grounding body (pole) set separately in the catenary on the through ground wire is connected with other equipment on the through ground wire  
After a lightning disaster occurs, the specific causes and consequential losses of the lightning disaster should be promptly investigated, summarized and analyzed, and improvement measures should be proposed. (4)The access point of the lightning protection grounding body (pole) separately set on the contact line on the through ground wire is connected to other equipment on the through ground wire.

上的接入点间距不应小于 15m。 291．接地

The distance between access points on should not be less than 15m. 291. Grounding  
The spacing between access points on the should not be less than 15m. 291. ground

27.5kV 电缆、开关、避雷器、架空地线接地电阻值不应大于 10Ω，零散的接触网支柱接地电阻值不应大于 30Ω。

The grounding resistance value of 27.5 kV cables, switches, lightning arresters and overhead ground wires shall not be greater than 10 Ω, and the grounding resistance value of scattered catenary struts shall not be greater than 30 Ω.  
The grounding resistance value of 27.5kV cables, switches, lightning arresters, and overhead ground wires should not be greater than 10Ω, and the grounding resistance value of scattered catenary pillars should not be greater than 30Ω.

第四部分 附则

Part IV Supplementary Provisions  
Part 4 Supplementary Provisions

附件 1 作业命令记录

Attachment 1 Job Command Record  
Attachment 1 Operation Order Record

作业命令记录

Job command record  
job command record

年

Year  
years

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 日期 date  Date | 命令内容 command content  Command content | 发令人 initiator  Make a person | 受令人 person under order  Recipient | 要求完成时  When the request is completed When requirements are completed  间  between between | 命令号 command number  Command number | 批准  Approve approved  时间  Time time | 消令  Cancellation order cancellation order  时间  Time time | 消令人 eliminate people  Dissipating people | 工电供  Power supply Industrial and Electrical Supply  调度员  Dispatcher dispatcher |
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说明：本表应装订成册。

Note: This form should be bound into a book.  
Note: This form should be bound into a book.

101

附件 2 无人所设备巡视记录

Attachment 2 Patrol Record of Unmanned Equipment  
Attachment 2 Equipment Inspection Records of Unmanned Places

无人所设备巡视记录

Patrol record of unmanned equipment  
Unmanned equipment inspection records

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 巡视时间  Patrol time inspection time |  | 巡视人员  Patrol personnel patrol personnel |  | | 温度  Temperature temperature |  |
| 巡视项目及结果  Inspection items and results Inspection items and results Inspection items and results Inspection items and results Inspection items and results Inspection items and results Inspection items and results Inspection items and results | | | | | | |
| integrated automation system  综自系统  Integrated self-system | 运行电压 operating voltage  Operating voltage | \*\*方向上行 \*\* Up direction  \*\* Upward in the direction | \*\*方向下行 \*\* Direction down  \*\* Downward direction | 运行电流 running current  Operating current | \*\*方向上行 \*\* Up direction  \*\* Upward in the direction | \*\*方向下行 \*\* Direction down  \*\* Downward direction |
| (kV) | (kV) | (A) | (A) |
| 装置电源 device power supply  Device power supply |  | | 各指示灯、按钮  All indicator lights and buttons Each indicator light, button |  | |
| 连片、开关 位  Contiguous, switch bit Connecting, switching position  置  Set set |  | | | | |
| 故障报告  Failure report fault report |  | | | | |
| 交流系统 AC system  AC system | 二次电压  Secondary voltage  **（V）** | 27.5kV 自用变 10kV 自用变 27.5kV self-use transformer 10kV self-use transformer  27.5 kV self-use transformer 10kV self-use transformer | | | |  |
| 直流系统 DC system  DC system | 浮充电压  Floating charge voltage  **（V）** |  | 浮充电流  Floating charge current  （A） |  | 绝缘监察 insulation monitoring  Insulation monitoring |  |
| 测温监控系统  Temperature measurement monitoring system Temperature measurement monitoring system |  | | | | | |
| 灭火器  Fire extinguisher fire extinguisher |  | | | | | |
| 空调  Air conditioning air conditioning |  | | | | | |
| 自耦变压器  Autotransformer the autotransformer |  | | | | | |
| 自用变压器 self-use transformer  Self-use transformer | 27.5kV 自用变 27.5kV self-use transformer  27.5 kV self-use transformer |  | | 10kV 自用变 10kV self-use transformer  10kV self-use transformer |  | |
| 断路器  Circuit breaker circuit breaker |  | | | | | |
| 隔离开关及机构  Disconnector and mechanism Isolation switch and mechanism |  | | | | | |
| 互感器  Transformer transformer |  | | | | | |
| 支柱、场坪、基础及  Pillars, yards, foundations and Pillar, site, foundation and  接地  Earthing ground |  | | | | | |
| 绝缘子、母线  Insulator, bus Insulator, bus bar |  | | | | | |
| 照明  illumination lighting |  | | | | | |

附件 3 避雷器动作记录

Appendix 3 Lightning Arrester Action Record  
Attachment 3 Lightning arrester action record

所（亭）

Institute (kiosk)  
Office (Pavilion)

避雷器动作记录

Arrester action record  
Lightning arrester action record

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 避雷器型号  Lightning arrester model Lightning arrester model Lightning arrester model | |  | | | 设备编号  Equipment number equipment number equipment number | |  | | |
| 制造厂  Manufacturing plant manufacturing plant manufacturing plant | |  | | | 运行编号  Running number run number run number | |  | | |
| 读数 readings  readings | 差数 difference  Difference | 动作次数 action times  Number of movements | 泄露电流 leakage current  Leakage current | 记录时间 recording time  Record time | 读数 readings  readings | 差数 difference  Difference | 动作次数 action times  Number of movements | 泄露电流 leakage current  Leakage current | 记录时间 recording time  Record time |
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附件 4 保护装置整定记录

Appendix 4 Setting record of protection device  
Attachment 4 Protection Device Setting Record

所（亭）

Institute (kiosk)  
Office (Pavilion)

保护装置整定记录

Setting record of protection device  
Protection device setting record

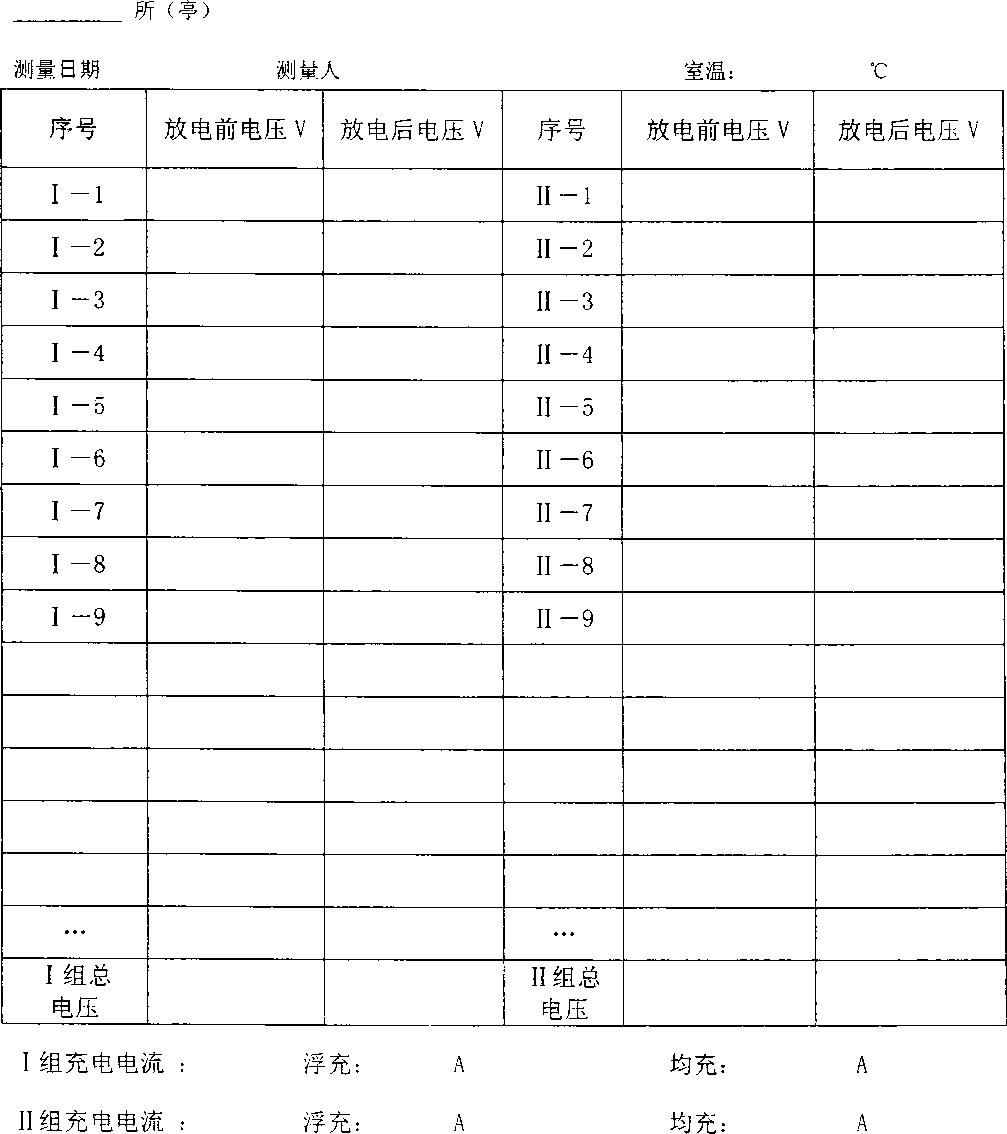
|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 保护装置 protection device  Protective device |  | | 变流比 variable current ratio  Converter ratio |  | | remarks  备注  Remarks |  |
| 被保护的设备名称和运行编 Protected device name and operating code  Protected device name and running code  号 no.  No. |  | | transformer ratio  变压比  Transformer ratio |  | |
| original setting value  原始整定值  Original setting value |  | | | | | | |
| 变更时间 change time  Change time | 变更项目 change project  Change item | 变更原因 reason for change  Reason for change | | | 变更后的整定值 Changed setting value  Changed setting value | 变更整定值负责人 Person in charge of changing setting value  Person in charge of changing setting value | |
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附件 5 蓄电池开路电压测量记录

Appendix 5 Battery open circuit voltage measurement record  
Attachment 5 Battery open-circuit voltage measurement record

蓄电池开路电压测量记录

Battery open circuit voltage measurement record  
Battery open-circuit voltage measurement record



附件 6 设备检修记录

Appendix 6 Equipment Maintenance Record  
Attachment 6 Equipment Maintenance Records

设备检修记录

Equipment maintenance record  
Equipment maintenance records

日期

Date  
date

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 设备名称及编号 Equipment name and number  Equipment name and number |  | 承修班组 maintenance team  Repair team |  | 检修人 maintenance person  Repairman | signature  签字  Signature |
| 安装地点及运行编号 Installation location and operation number  Installation location and operation number |  | 修程 repair classification  Repair |  | 互检人 mutual checker  Mutual inspector | 签字 signature  Signature |
| 修前状态  Pre-repair state pre-repair status pre-repair status | | 修中措施  Middle repair measures Measures for revision Measures for revision | | 修后结语  Revised conclusion Conclusion after revision Conclusion after revision | |
|  | |  | |  | |

注：修前状态和修后结语内均应记录有关的技术数据；修后结语栏内还应记录设备的质量评定（即“合格”或“不合格”）

Note: Relevant technical data should be recorded in the pre-revision status and post-revision conclusion; The quality assessment of the equipment (i.e. "qualified" or "unqualified") shall also be recorded in the conclusion column after repair  
Note: Relevant technical data should be recorded in the pre-repair status and post-repair conclusion; the quality assessment of the equipment (i.e."qualified" or "unqualified") should also be recorded in the post-repair conclusion column

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附件 7 设备缺陷记录

Appendix 7 Equipment Defect Record  
Attachment 7 Equipment Defect Records

所（亭）

Institute (kiosk)  
Office (Pavilion)

设备缺陷记录

Equipment defect record  
Equipment defect record

|  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 发现缺陷的日期 Date defect discovered  Date of defect discovery | 发现缺陷的人员 Persons who discovered defects  People who find defects | 有缺陷的设备名称及运行编号 Name and running number of defective equipment  Defective equipment name and operation number | Defect content  缺陷内容  Defect content | Confirming by (signature)  确认人（签字）  Confirmer (signature) | treatment measures  处理措施  Treatment measures | Person in charge of handling defects  处理缺陷负责人  Defect Handling Person in Charge | the acceptance personnel  验收人  Acceptant | 消除缺陷日期 Defect elimination date  Defect elimination date |
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附件 8 保护装置动作和断路器自动跳闸记录

Appendix 8 Record of Protective Device Action and Circuit Breaker Automatic Trip  
Attachment 8 Records of protective device action and automatic tripping of circuit breaker

保护装置动作和断路器自动跳闸记录

Record of protection device action and automatic trip of circuit breaker  
Protection device action and circuit breaker automatic tripping records

所（亭）

Institute (kiosk)  
Office (Pavilion)

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| trip time  跳闸时间  Trip time |  | 保护动作 protection action  Protective action | | | | trip time  跳闸时间  Trip time | reply time  复送时间  Repeat time |
| 保护名称 protected name  Protection name | 重合和强送情况 Coincidence and forced delivery  Overlap and forced delivery | 信号显示情况 Signal display status  Signal display situation | 故障点 fault point  Fault point |
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注：故障点标定装置指示栏内填写：跳闸时电流、电压，阻抗角、电抗和实际公里数。

Note: Fill in the indication column of the fault point calibration device: current, voltage, impedance angle, reactance and actual kilometers during trip.  
Note: Fill in the indicator column of the fault point calibration device: current, voltage at tripping, impedance angle, reactance and actual kilometers.

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附件 9 设备大修申请表

Appendix 9 Application Form for Equipment Overhaul  
Attachment 9 Equipment Overhaul Application Form

设备大修申请表

Application form for equipment overhaul  
Equipment overhaul application form

申请单位： （章）编号:

Applicant: (Chapter) No.:  
Application unit: (Chapter) No.:

|  |  |  |  |
| --- | --- | --- | --- |
| 设备名称  Device name device name |  | 运行时间  Running time running time |  |
| 设备编号  Equipment number equipment number |  | 承修单位  Repair undertaking unit Maintenance unit |  |
| 安装地点及运行编号  Installation location and operation number Installation location and operation number |  | 要求大修时间  Required overhaul time Required overhaul time |  |
| 规格  Specification specifications |  | 所需费用  Cost requirements requirements for |  |
| Equipment status (i.e. reason for overhaul)  设备状态（即大修原因）  Equipment status (i.e. overhaul reason) |  | | |
| Overhaul scope (including projects built in conjunction with major modifications)  大修范围（包括结合大修改 造的项目）  Overhaul scope (including projects combined with overhaul renovation) |  | | |
| 基础设施维护公司意见 Opinion of infrastructure maintenance company  Infrastructure maintenance company opinion |  | | |
| Associate Company Opinion  联营公司意见  Comments of associates |  | | |

年月

Year and month  
Nian Yue

附件 10 铁路供电安全检测监测装置表

Appendix 10 List of Railway Power Supply Safety Detection and Monitoring Devices  
Annex 10 Railway Power Supply Safety Inspection and Monitoring Device Table

|  |  |  |  |
| --- | --- | --- | --- |
| 序号  Serial number serial number | 名称  Name name | 单位  Unit units | 数量  Quantity number |
| 1 | 弓网综合检测装置（1C）  Pantograph-catenary integrated detection device (1C) Comprehensive inspection device for pantograph and catenary (1C) | 台  Taiwan Taiwan | 1台  1 unit 1 set |
| 2 | 接触网安全巡检装置（2C）  Catenary safety inspection device (2C) Contact line safety inspection device (2C) | 台  Taiwan Taiwan | 每个基地 1 台  1 per base 1 per base |
| 3 | 车载接触网运行状态检测装置（3C）  Vehicle-mounted catenary running state detection device (3C) On-board catenary operating status detection device (3C) | 台  Taiwan Taiwan | 覆盖全线  Covering the whole line Covering the entire line |
| 4 | 接触网悬挂状态检测监测装置（4C）  Catenary suspension state detection and monitoring device (4C) Contact line suspension status detection and monitoring device (4C) | 台  Taiwan Taiwan | 1台  1 unit 1 set |
| 5 | 受电弓滑板监测装置（5C）  Pantograph slide plate monitoring device (5C) Pantograph slide monitoring device (5C) | 台  Taiwan Taiwan | 基地界口、动车出入库线等  Base boundary, motor train inbound and outbound lines, etc. Base boundary entrance, bullet train entry and exit line, etc. |
| 6 | 接触网及供电设备地面监测装置（6C）  Ground monitoring device for catenary and power supply equipment (6C) Ground monitoring device for catenary and power supply equipment (6C) | 处  Department at | 根据需要配备  Equipped as required be equipped when necessary |
| 7 | 6C 综合数据处理系统  6C Integrated Data Processing System 6C Comprehensive Data Processing System | 套  sleeve set | 各1套  1 set each 1 set each |

附件 11 接触网作业需要的主要工机具配置表

Appendix 11 Configuration table of main tools and tools required for catenary operation  
Appendix 11 Configuration Table of Main Tools and Machines Required for OCS Operation

主要工机具配置表

Configuration table of main tools and tools  
Configuration list of main tools and tools

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 序号  Serial number serial number | 名称  Name name | 规格  Specification specifications | 单位  Unit units | 数量  Quantity number | 备注  Remarks remarks |
| 一、车辆及交通工具  I. Vehicles and Vehicles 1. Vehicles and transportation 1. Vehicles and transportation 1. Vehicles and transportation 1. Vehicles and transportation 1. Vehicles and transportation 1. Vehicles and transportation | | | | | |
| 1 | 接触网作业车 OCS operating vehicle  Catenary operation vehicle |  | 辆 vehicles  vehicles | 1 | 优先配置多平台接触  Priority configuration of multi-platform contact Priority configuration of multi-platform engagement  网作业车  Net operation vehicle net operation vehicle |
| 2 | 电力工程车  Electric engineering vehicle Electric power engineering vehicle |  | 辆  vehicles vehicles | 1 |  |
| 二、工机具  Second, tools and tools 2. Tools 2. Tools 2. Tools 2. Tools 2. Tools 2. Tools | | | | | |
| 1 | 牵引供电维护管理信息  Maintenance and management information of traction power supply Traction power supply maintenance and management information  化系统及检测数据存储、分析客户端  Chemical system and test data storage and analysis client Chemical system and inspection data storage and analysis client |  | 套 set  sleeve | 1 |  |
| 2 | 接触线正弯器  Contact wire positive bender Contact wire positive bender |  | 个  a a | 1 |  |
| 3 | 充电液压绞线切割工具  Charging hydraulic twisted wire cutting tool Rechargeable hydraulic strand cutting tool |  | 套  sleeve set | 各1  Each 1 1 each |  |
| 4 | 充电液压接触线切割工  Charging hydraulic contact wire cutter Charging hydraulic contact wire cutter  具  With with |  | 套 set  sleeve | 各1 1 each  Each 1 |  |
| 5 | 充电液压电缆切割工具  Cutting tool for charging hydraulic cable Charging hydraulic cable cutting tool |  | 套  sleeve set | 各1  Each 1 1 each |  |
| 6 | 充电液压压接工具 Charging hydraulic crimping tool  Charging hydraulic crimping tool |  | 套 set  sleeve | 各1 1 each  Each 1 | 吊弦、斜拉线、附加导  Hanging string, oblique stay wire, additional guide Hanging string, diagonal wire, additional guide  线等线索  Line and other clues Lines and other clues |
| 7 | 电连接液压工具  Electrically connected hydraulic tools Electrical connection hydraulic tools |  | 套  sleeve set | 各1  Each 1 1 each | 含压接、破除功能  Including crimping and breaking functions Including crimping and breaking functions |
| 8 | 磁力钻  Magnetic drill magnetic drill |  | 套  sleeve set | 1 |  |
| 9 | 紧线器  Tightener thread tensioner |  | 个  a a | 各6  Each 6 each 6 | 各型号  Each model each model |
| 10 | 手扳（链条）葫芦  Hand pull (chain) gourd Hand lever (chain) hoist |  | 个  a a | 各2  Each 2 each 2 | 各型号  Each model each model |
| 11 | 滑轮组  Pulley block pulley block |  | 套  sleeve set | 2 |  |
| 12 | 弹性吊索安装工具  Elastic sling installation tool Elastic sling installation tool |  | 套  sleeve set | 各1  Each 1 1 each | 根据需要配备  Equipped as required be equipped when necessary |
| 13 | 充电式螺帽粉碎器  Rechargeable nut crusher Rechargeable nut crusher |  | 套  sleeve set | 1 |  |
| 14 | 力矩扳手  Torque wrench torque wrench | 各规格套筒  Sleeves of various specifications Sleeves of various specifications | 套  sleeve set | 4 |  |
| 15 | 游标卡尺  Vernier caliper vernier caliper |  | 个  a a | 2 |  |
| 16 | 水平尺  Horizontal ruler level ruler |  | 个  a a | 2 |  |
| 17 | 道尺  Road ruler track ruler |  | 把  Put put | 2 |  |
| 18 | 定位器角度测量仪  Positioner angle measuring instrument Positioner angle measuring instrument |  | 个  a a | 2 |  |
| 19 | 接触网几何参数测量仪  Catenary geometric parameter measuring instrument Contact line geometric parameter measuring instrument |  | 套  sleeve set | 2 |  |
| 20 | 扭力扳手校验仪  Torsion wrench calibrator Torque wrench calibrator |  | 台  Taiwan Taiwan | 1 |  |
| 21 | 附盐密度检测仪  Salt density detector Salt density detector |  | 台  Taiwan Taiwan | 1 |  |
| 22 | 绝缘子在线检测仪  Insulator on-line tester Insulator online detector |  | 台  Taiwan Taiwan | 1 |  |
| 23 | 避雷器在线检测仪  On-line detector for lightning arrester Lightning arrester online detector |  | 台  Taiwan Taiwan | 1 |  |
| 24 | 绝缘电阻测试仪  Insulation resistance tester insulation resistance tester |  | 套  sleeve set | 1 |  |
| 25 | 激光测距仪  Laser rangefinder laser range finder |  | 套  sleeve set | 1 |  |
| 26 | 兆欧表  Megohmmeter megohmmeter | 500V、2500V | 块  block block | 各2  Each 2 each 2 |  |
| 27 | 高斯计 Gauss meter  Gaussian meter |  | 台 Taiwan  Taiwan | 2 | 有磁感应器的维修基  Maintenance base with magnetic sensor Maintenance base with magnetic sensor  地配备  Ground equipped equipped |
| 28 | 红外热像仪  Infrared thermal imager infrared thermal imager |  | 套  sleeve set | 1 |  |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 29 | 扭力扳手校验仪  Torsion wrench calibrator Torque wrench calibrator |  | 台  Taiwan Taiwan | 1 |  |
| 30 | 轻型车梯  Light truck ladder Light vehicle ladder |  | 套  sleeve set | 2 |  |
| 31 | 挂梯  Hanging ladder hanging ladder |  | 套  sleeve set | 1 |  |
| 32 | 小型绝缘部件冲洗设备  Flushing equipment for small insulating parts Small insulating part flushing equipment |  | 台  Taiwan Taiwan | 1 |  |
| 33 | 打杂杆  Handling rod Trash pole | 绝缘杆  Insulating rod insulating rod | 把  Put put | 2 | 含杆头  Include club head Gantou |
| 34 | 高枝油锯  High branch chainsaw high-branch chain saw |  | 台  Taiwan Taiwan | 2 |  |
| 35 | 油锯  Chainsaw chain saw |  | 台  Taiwan Taiwan | 2 |  |
| 36 | 接地线  Grounding wire ground line |  | 组  Group group | 6 | 含接地杆等  Including grounding rod, etc. Including grounding pole, etc. |
| 37 | 等电位线  Equipotential line equipotential lines |  | 套  sleeve set | 4 | 含等位线杆等  Including equipotential line rod, etc. Including equipotential line pole, etc. |
| 38 | 验电器  Electroscope electroscope |  | 个  a a | 6 |  |
| 39 | 绝缘手套、绝缘靴  Insulating gloves, insulating boots Insulating gloves, insulating boots |  | 双  Double double | 各4  Each 4 each 4 |  |
| 40 | 安全带、安全带 Seat belt, seat belt  Seat belt, seat belt |  | 个 a  a | 每人  Each person  1 |  |
| 41 | 微型防爆头灯 Miniature explosion-proof headlight  Miniature explosion-proof headlamp |  | 个 a  a | 每人  Each person  1 |  |
| 42 | 强光巡检灯 Strong light inspection lamp  Strong light inspection lamp |  | 个 a  a | 每人  Each person  1 |  |
| 43 | lighting tools  照明工具  Lighting tool |  | set  套  sleeve | 1 each  各1  Each 1 | 轻型升降泛光灯、防爆移动灯、轻便移动灯、轻便多功能强光灯含  Light lifting floodlights, explosion-proof mobile lights, portable mobile lights and portable multifunctional strong lights include Light lifting floodlight, explosion-proof mobile light, portable mobile light, portable multi-function strong light including  发电机  Generator generator |
| 44 | 通信工具  Communication tools communication tools |  | 台  Taiwan Taiwan | 8 |  |
| 45 | 数码照像机  Digital camera digital camera |  | 个  a a | 1 |  |
| 46 | 望远镜  Telescope telescope |  | 个  a a | 1 |  |
| 47 | 绝缘工具干燥装置  Drying device for insulated tools Drying device for insulating tools |  | 套  sleeve set | 1 |  |
| 48 | 接地电阻测试仪  Grounding resistance tester Earth resistance testers |  | 套  sleeve set | 1 |  |

注：本表供参考，可根据具体情况制定。

Note: This table is for reference and can be formulated according to specific conditions.  
Note: This table is for reference and can be formulated according to specific circumstances.

附件 12 接触网运行维修记录

Appendix 12 Operation and Maintenance Records of Catenary  
Attachment 12 Operation and Maintenance Records of OCS

|  |  |
| --- | --- |
| 记录名称  Record name record name | 主要内容  Main content main content |
| 接触网值班日志  Catenary duty log Contact network duty log |  |
| 接触网工前预备会及收工会记录  Records of catenary workers' preparatory meeting and collection union Records of OCS pre-work preparatory meeting and finishing meeting |  |
| 接触网检测监测记录 Contact line testing and monitoring records  Catenary detection and monitoring record | 1.监测图像视频  1. Monitor image video 1. Monitoring image video |
| 2.动静态参数（波形）  2. Dynamic and static parameters (waveform) 2. Dynamic and static parameters (waveform) |
| 接触网检查记录 Contact network inspection record  Catenary inspection record | 1.巡视检查  1. Patrol inspection 1. patrol inspection |
| 2.全面检查  Step 2: Overhaul 2. comprehensive inspection |
| 3.单项检查  3. Single inspection 3. single exam |
| 接触网分析诊断记录 Contact line analysis and diagnosis records  Catenary analysis and diagnosis record | 1.即时分析/定期分析  1. Immediate analysis/periodic analysis 1. Instant analysis/regular analysis |
| 2.缺陷通知单、反馈单  2. Defect notice and feedback sheet 2. Defect notice, feedback form |
| 接触网维修记录 Contact network maintenance records  Maintenance record of catenary | 1.一级修（临时修）  1. First-class repair (temporary repair) 1. Level 1 repair (temporary repair) |
| 2.二级修（综合修）  2. Secondary repair (comprehensive repair) 2. Second-level repair (comprehensive repair) |
| 3.绝缘部件清扫  3. Cleaning of insulating parts 3. Cleaning of insulating parts |

附件 13 铁路接触网动态检测评价标准

Appendix 13 Evaluation standard for dynamic detection of railway catenary  
Annex 13 Dynamic Inspection and Evaluation Standards for Railway OCS

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| 项目 project  Project | | | 一级缺陷 first-level defect  First-class defect | 扣分标准  Deduction standard deduction criteria | 二级缺陷 secondary defect  Secondary defect | 扣分标准  Deduction standard deduction criteria | 评价单位  Evaluation unit evaluation units |
| Geometric parameters of catenary  接触网几何参数  Geometric parameters of catenary | 接触线拉出值 a （mm） Contact wire pull-out value a (mm)  Contact wire pull-out value a (mm) | | a≥600 | 40 分  40 minutes 40 points | 450≤a＜500 | 5分 5 points  5 points | 跨 across  span |
| 500≤a＜600 | 10 分  10 points 10 points |
| Contact wire height H (mm)  接触线高度 H（mm）  Height of contact wire H (mm) | | 1.H≥6600 | 40 分 40 points  40 minutes | 1.标准值+150  1. Standard +150  ≤ H ＜ 标准值  ≤ H < standard value  +250 | 1 point  1分  1 point | across  跨  span |
| 2.H ＜ 该区段  2. H < this section 2.H <This section  允许的最低值  Minimum value allowed Minimum allowed value |
| 1.6500≤H＜  6600 1.6500≤H< | 5 points  5分  5 points | 2.标准值-150  2. Standard value-150  ≤ H ＜ 标准值  ≤ H < standard value  －100 |
| 2.H≥标准值  2. H ≥ standard value  +250 |
| 3.H＜标准值  3. H < standard value  -150 |
| 接触线平顺性  Contact line smoothness Contact line smoothness Contact line smoothness  参数  parameter parameters parameters | 硬点 Av（m/s2）  Hard point Av (m/s 2 ) Hard point Av (m/s2) Hard point Av (m/s2) | | Av≥490 | 5分  5 points 5 points | 392≤Av＜490 | 1分  1 point 1 point | 跨  span across |
| 一跨内高差 2A （mm） Height difference within one span 2A (mm)  Height difference within one span 2A (mm) | | 2A≥200 | 5分 5 points  5 points | 150≤2A＜200 | 1分 1 point  1 point | 跨 across  span |
| Pantograph current receiving parameters  弓网受流参数  Current collection parameters of pantograph and catenary | 弓网接触力F  Pantograph-catenary contact force F  （N） | 最大接触力  Maximum contact force  Fmax | Fmax≥250 | 5分 5 points  5 points | 180≤Fmax＜  250 180≤Fmax< | 1分 1 point  1 point | 跨 across  span |
| 最小接触力  Minimum contact force  Fmin | Fmin＜20 | 5分 5 points  5 points | 20≤Fmin＜40 | 1分 1 point  1 point | 跨 across  span |
| arcing  燃弧  Arc | 最大燃弧时间  Maximum arc time  Tmax（ms） | Tmax≥100 | 5分 5 points  5 points | 50≤Tmax＜  100 50≤Tmax< | 1分 1 point  1 point | 跨 across  span |
| 燃弧率μ  Arc rate μ Arc rate μ | μ ≥5% | 5分  5 points 5 points | 1%≤μ ＜5% | 1分  1 point 1 point | 公里  kilometres km |
| 燃弧次数n  Arc times n Number of arcing n  （次）  (times) (times) | n≥6 | 5分 5 points  5 points | 4≤n＜6 | 1分 1 point  1 point | 公里 km  kilometres |
| 接触线抬升量Δ H  Contact line lift Δ H  （mm） | | Δ H≥150 | 5分 5 points  5 points | 120 ≤ Δ H ＜  150 120 ≤ Δ H < | 1分 1 point  1 point | 跨 across  span |
| 网压 network voltage  Network voltage | 接触网电压 U（kV） Contact line voltage U (kV)  Catenary Voltage U (kV) | | 1.U＞29 | 5分 5 points  5 points | - | | 公里 km  kilometres |
| 2.U＜19 |

附件 14 接触网线索及绝缘件机械强度安全系数

Appendix 14 Safety factor of mechanical strength of catenary clues and insulators  
Annex 14 Safety factor for mechanical strength of catenary clues and insulation parts

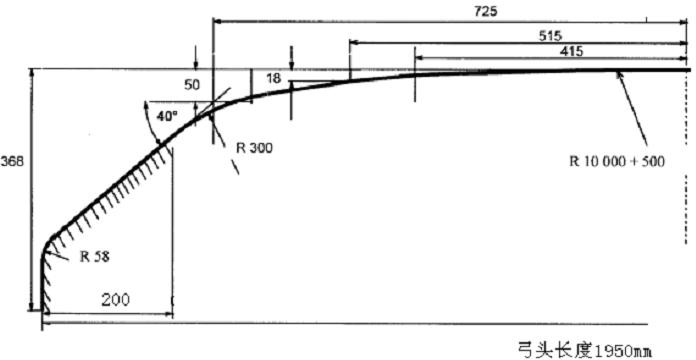
|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| 序号  Serial number serial number | 名称  Name name name | | 机械强度安全系数  Safety factor of mechanical strength Mechanical strength safety factor Mechanical strength safety factor | | 备注  Remarks remarks |
| 1 | 铜或铜合金接触线 Copper or copper alloy contact wire  Copper or copper alloy contact wire | | 不应小于 should not be less than  Should not be less than | 2.0 | 最大允许磨耗  Maximum allowable wear maximum allowable wear  面积 20%的情况下  Under the condition of 20% of the area, 20% of the area |
| 2 | carrier cable  承力索  Bearing cable | 铜或铜合金绞线  Copper or copper alloy stranded wire Copper or copper alloy stranded wire | 不应小于 2.0  Should not be less than 2.0 Should not be less than 2.0 Should not be less than 2.0 | |  |
| 钢绞线  Steel strand steel strand | 不应小于 3.0  Should not be less than 3.0 Should not be less than 3.0 Should not be less than 3.0 | |  |
| 钢芯铝绞线、铝包钢和铜包钢系列  Steel-cored aluminum stranded wire, aluminum-clad steel and copper-clad steel series Steel core aluminum stranded wire, aluminum-clad steel and copper-clad steel series  绞线  Stranded wire strand | 不应小于 2.5 Should not be less than 2.5  Should not be less than 2.5 | |  |
| 3 | 软横跨 head span  Soft span | 横向承力索  Transverse bearing cable transverse carrier cable | 不小于 4.0  Not less than 4.0 not less than 4.0 not less than 4.0 | |  |
| 固定绳  Fixed rope fixed rope | 不应小于  Should not be less than should not be less than | 3.0 |  |
| 4 | 供电线、回流线等接触网附加导线  Additional conductors of catenary such as power supply line and return line Additional wires for contact networks such as power supply lines and return lines Additional wires for contact networks such as power supply lines and return lines | | 不应小于  Should not be less than should not be less than | 2.5 |  |
| 5 | insulating member  绝缘部件  Insulating component | 瓷及钢化玻璃悬式绝缘子 Porcelain and tempered glass suspension insulators  Porcelain and tempered glass suspension insulators | 不应小于 2.0 Should not be less than 2.0  Should not be less than 2.0 | | 受机电联合负  Acceptor joint negative Receiver joint negative  载时抗拉  Tensile strength under load tensile strength during load |
| 瓷棒式绝缘子  Porcelain rod insulator porcelain rod insulator | 不应小于  Should not be less than should not be less than | 2.5 | 抗弯  Bending resistance bending |
| 针式绝缘子  Pin insulator pin insulator | 不应小于  Should not be less than should not be less than | 2.5 | 抗弯  Bending resistance bending |
| 合成材料悬式绝缘子及绝缘元件  Composite suspension insulators and insulating elements Composite suspension insulators and insulating elements | 不应小于 5.0  Should not be less than 5.0 Should not be less than 5.0 Should not be less than 5.0 | | 抗拉  Tensile resistance tensile |
| 合成材料棒式绝缘子  Composite rod insulator Composite rod insulators | 不应小于  Should not be less than should not be less than | 2.5 | 抗弯  Bending resistance bending |
| 6 | 耐张零件  Tensile part strain parts strain parts | | 不应小于  Should not be less than should not be less than | 3.0 |  |

附件 15 受电弓弓头轮廓及动态包络线示意图

Appendix 15 Schematic diagram of contour and dynamic envelope of pantograph head  
Annex 15 Schematic diagram of the outline and dynamic envelope of the pantograph head

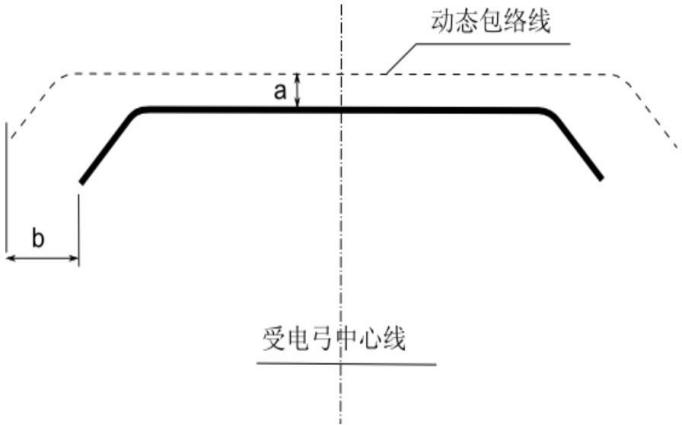
1. 受电弓弓头外形轮廓

Contour of pantograph head  
Outline of Pantograph Head



1. 受电弓动态包络线示意图

Schematic diagram of dynamic envelope of pantograph  
Schematic diagram of dynamic envelope of pantograph



a—设计规定的受电弓动态抬升量； b—设计规定的受电弓横向摆动量。

a-The dynamic lift of the pantograph specified in the design; b-Transverse swing of pantograph specified by design.  
a-Dynamic lifting amount of the pantograph specified in the design; b-Horizontal swinging amount of the pantograph specified in the design.

附件 16 隔离开关交接试验标准

Appendix 16 Interface Test Standard for Isolating Switches  
Annex 16 Handover Test Standards for Isolators

一、隔离开关的试验项目，应包括下列内容：

1. The test items of isolating switches shall include the following contents:  
1. The test items of the isolating switch shall include the following contents:

* 1. 测量绝缘电阻；

Measure insulation resistance;  
Measure insulation resistance;

* 1. 测量高压限流熔丝管熔丝的直流电阻；

Measure the DC resistance of the fuse of the high voltage current limiting fuse tube;  
Measure the DC resistance of the fuse of the high-voltage current-limiting fuse tube;

* 1. 测量负荷开关导电回路的电阻；

Measure the resistance of the conductive loop of the load switch;  
Measure the resistance of the conductive loop of the load switch;

* 1. 交流耐压试验；

AC withstand voltage test;  
AC withstand voltage test;

* 1. 检查操动机构线圈的最低动作电压；

Check the lowest operating voltage of the coil of the operating mechanism;  
Check the minimum operating voltage of the operating mechanism coil;

* 1. 操动机构的试验。

Test of operating mechanism.  
Testing of the operating mechanism.

二、测量绝缘电阻，应符合下列规定：

Two, the measurement of insulation resistance, shall meet the following requirements:  
2. When measuring insulation resistance, the following requirements shall be met:

1. 应测量隔离开关的有机材料传动杆的绝缘电阻值；

The insulation resistance value of the organic material transmission rod of the isolating switch shall be measured;  
The insulation resistance value of the organic material transmission rod of the isolating switch shall be measured;

1. 隔离开关的有机材料传动杆的绝缘电阻值，在常温下不应低于表 1 的规定。

The insulation resistance value of organic material transmission rod of isolating switch shall not be lower than the provisions in Table 1 at normal temperature.  
The insulation resistance value of the organic material transmission rod of the isolating switch shall not be lower than the provisions in Table 1 at room temperature.

表 1 有机材料传动杆的绝缘电阻值

Table 1 Insulation resistance value of organic material transmission rod  
Table 1 Insulation resistance value of organic material transmission rod

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| 额定电压（kV）  Rated voltage (kV) Rated voltage (kV) | 3.6～12 | 24～40.5 | 72.5～252 | 363～800 |
| 绝缘电阻值（MΩ）  Insulation resistance value (M Ω) Insulation resistance value (MΩ) | 1200 | 3000 | 6000 | 10000 |

三、测量高压限流熔丝熔丝的直流电阻值，与同型号产品相比不应有明显差别。

3. Measuring the DC resistance value of high-voltage current-limiting fuse, there should be no obvious difference compared with products of the same model.  
3. Measure the DC resistance value of the high-voltage current-limiting fuse fuse, which should not be significantly different from the same model product.

四、隔离开关应进行交流耐压试验，可在母线安装完毕后一起进行，试验应符合表 2 的规定。

Four, isolating switch should be AC withstand voltage test, can be carried out together after the bus installation, the test should comply with the provisions of Table 2.  
4. The isolating switch should be subjected to AC withstand voltage test, which can be carried out together after the bus is installed. The test should comply with the provisions of Table 2.

表 2 高压电气设备绝缘的工频耐压试验电压

Table 2 Power frequency withstand voltage test voltage of insulation of high voltage electrical equipment  
Table 2 Power frequency withstand voltage test voltage for insulation of high-voltage electrical equipment

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| ex-factory  出厂  Ex-factory | ex-factory  出厂  Ex-factory | 1min 工频耐受电压（kV）有效值（湿试/干试）  RMS of 1min power frequency withstand voltage (kV) (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) 1min power frequency withstand voltage (kV) effective value (wet test/dry test) | | | | | | | | | |
| 电压互感器 voltage transformer  Voltage transformer | | 电流互感器 current transformer  Current transformer | | 穿墙套管 wall bushing  Wall bushing | | 支柱绝缘子  Post insulator post insulator post insulator post insulator post insulator | | | |
| 湿试  Wet test wet test wet test | | 干试  Dry test dry test dry test | |
| 出厂  Ex-factory ex-factory | 交接  Handover handover | 出厂  Ex-factory ex-factory | 交接  Handover handover | 出厂  Ex-factory ex-factory | 交接  Handover handover | 出厂  Ex-factory ex-factory | 交接  Handover handover | 出厂  Ex-factory ex-factory | 交接  Handover handover |
| 3 | 3.6 | 18/25 | 14/20 | 18/25 | 14/20 | 18/25 | 15/20 | 18 | 14 | 25 | 20 |
| 6 | 7.2 | 23/30 | 18/24 | 23/30 | 18/24 | 23/30 | 18/26 | 23 | 18 | 32 | 26 |
| 10 | 12 | 30/42 | 24/33 | 30/42 | 24/33 | 30/42 | 26/36 | 30 | 24 | 42 | 34 |
| 15 | 17.5 | 40/55 | 32/44 | 40/55 | 32/44 | 40/55 | 34/47 | 40 | 32 | 57 | 46 |
| 20 | 24.0 | 50/65 | 40/52 | 50/65 | 40/52 | 50/65 | 43/55 | 50 | 40 | 68 | 54 |
| 35 | 40.5 | 80/95 | 64/76 | 80/95 | 64/76 | 80/95 | 68/81 | 80 | 64 | 100 | 80 |
| 66 | 72.5 | 140 | 112 | 140 | 112 | 140 | 119 | 140 | 112 | 165 | 132 |

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  |  | 160 | 120 | 160 | 120 | 160 | 136 | 160 | 128 | 185 | 148 |
| 110 | 126 | 185/  185/  200 | 148/  148/  160 | 185/  185/  200 | 148/  148/  160 | 185/  185/  200 | 160/  160/  184 | 185 | 148 | 265 | 212 |
| 220 | 252 | 360 | 288 | 360 | 288 | 360 | 306 | 360 | 288 | 450 | 360 |
|  |  | 395 | 316 | 395 | 316 | 395 | 336 | 395 | 316 | 495 | 396 |
| 330 | 363 | 460 | 368 | 460 | 368 | 460 | 391 | 570 | 456 |  |  |
|  |  | 510 | 408 | 510 | 408 | 510 | 434 |  |  |  |  |
| 500 | 550 | 630 | 504 | 630 | 504 | 630 | 536 |  |  |  |  |
|  |  | 680 | 544 | 680 | 544 | 680 | 578 | 680 | 544 |  |  |
|  |  | 740 | 592 | 740 | 592 | 740 | 592 |  |  |  |  |
| 750 |  | 900 | 720 |  |  | 900 | 765 | 900 | 720 |  |  |
|  |  | 960 | 768 |  |  | 960 | 816 |  |  |  |  |

五、检查操动机构线圈的最低动作电压，应符合制造厂的规定。六、操动机构的试验，应符合下列规定：

Five, check the minimum operating voltage of the operating mechanism coil, should comply with the provisions of the manufacturer. Six, the test of the operating mechanism shall meet the following requirements:  
5. Check the minimum operating voltage of the operating mechanism coil, which should comply with the manufacturer's regulations. 6. The test of the operating mechanism shall comply with the following requirements:

1. 动力式操动机构的分、合闸操作，当其电压或气压在下列范围时，应保证隔离开关的主闸刀或接地刀闸可靠地分闸和合闸：

For the opening and closing operation of the power operating mechanism, when the voltage or air pressure is in the following range, the main knife or grounding knife switch of the isolating switch shall be guaranteed to open and close reliably:  
For the opening and closing operation of the power operating mechanism, when the voltage or air pressure is within the following ranges, the main blade or grounding blade of the isolating switch shall be reliably opened and closed:

1. 电动机操动机构：当电动机接线端子的电压在额定电压的 80%～110%范围内时；

Motor operating mechanism: When the voltage of the motor terminal is in the range of 80% ~ 110% of the rated voltage;  
Motor operating mechanism: When the voltage at the motor terminal is within the range of 80%~110% of the rated voltage;

1. 压缩空气操动机构：当气压在其额定气压的 85%～110%范围内时；

Compressed air operating mechanism: when the air pressure is in the range of 85% ~ 110% of its rated air pressure;  
Compressed air operating mechanism: When the air pressure is within the range of 85% to 110% of its rated air pressure;

1. 二次控制线圈和电磁闭锁装置：当其线圈接线端子的电压在其额定电压的 80%～ 110%范围内时。

Secondary control coil and electromagnetic locking device: When the voltage of its coil terminal is in the range of 80% ~ 110% of its rated voltage.  
Secondary control coil and electromagnetic blocking device: When the voltage at its coil terminal is within the range of 80% to 110% of its rated voltage.

1. 隔离开关的机械或电气闭锁装置应准确可靠。

Mechanical or electrical locking devices of isolating switches shall be accurate and reliable.  
The mechanical or electrical locking device of the isolating switch shall be accurate and reliable.

1. 具有可调电源时，可进行高于或低于额定电压的操动试验。

With adjustable power supply, operating test above or below rated voltage can be carried out.  
When an adjustable power supply is available, operation tests above or below the rated voltage can be carried out.

附件 17 电流致热型设备缺陷诊断判据

Appendix 17 Diagnostic criteria for defects of electric heating equipment  
Annex 17 Diagnosis criteria for defects in current-induced heating equipment

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 设备类别和部位 Equipment category and location  Type and location of equipment | | 热像特征 thermal image characteristics  Thermal image characteristics | 故障特征 fault feature  Fault characteristics | 缺陷性质  Defect property defect properties defect properties | | 备注  Remarks remarks remarks |
| 二级缺陷  Secondary defect secondary defect | 一级缺陷  First-class defect first-level defect |
| 电气设备与金属部件的连接 Connection of electrical equipment to metal parts  Connection between electrical equipment and metal parts | Connectors and clamps  接头和线夹  Connectors and clamps | 以线夹和接头为中心的热像，热点明显 Thermal image centered on clip and connector, hot spots are obvious  Hot spots are obvious in thermal images centered on clamps and joints | poor contact  接触不良  Poor contact | 温差不超过15K，未达到一级缺陷的要  The temperature difference is not more than 15K, and the first-class defect is not reached The temperature difference does not exceed 15K, and the requirement for first-level defect is not met.  求  seek please | 热点温度>80 ℃ 或δ ≥80% Hot spot temperature>80 ℃ or δ ≥80%  Hot spot temperature > 80 ℃ or δ ≥ 80% | δ: Relative temperature difference  δ ：相对温差  Delta: Relative temperature difference |
| 金属部件  Metal parts metal parts | 接头和线  Connectors and wires Joints and wires | 以线夹和  With wire clamps and Clamp and | 接触不良  Poor contact poor contact | 温差不超  Temperature difference does not exceed Temperature difference does not exceed | 热点温  Hot spot temperature hot spot temperature |  |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| 与金属部件的连接  Connection with metal parts Connections to metal parts | 夹  clamp clip | 接头为 中心的热像，热点明显  The hot spot is obvious in the thermal image centered on the joint Thermal image centered on the joint, with obvious hot spots |  | 过15K，未达到一级缺陷的要  After 15K, those who do not reach the first-class defect should Over 15K, the requirement for first-level defect is not met  求  seek please | 度>90 ℃ 或δ ≥80%  Degree > 90 ℃ or δ ≥ 80% Degree>90 ℃ or δ ≥80% |  |
| metal wire  金属导线  Metal wire | | 以导线为中心的热像，热点明显 Thermal image centered on wire, hot spots are obvious  Hot spots are obvious in the thermal image centered on wires | 松股、断股、老化或截面积不够 Loose strands, broken strands, aging or insufficient cross-sectional area  Loose strands, broken strands, aging or insufficient cross-sectional area | 温差不超过15K，未达到一级缺陷的要  The temperature difference is not more than 15K, and the first-class defect is not reached The temperature difference does not exceed 15K, and the requirement for first-level defect is not met.  求  seek please | 热点温度>80 ℃ 或δ ≥80% Hot spot temperature>80 ℃ or δ ≥80%  Hot spot temperature > 80 ℃ or δ ≥ 80% |  |
| 输电导线的连接器（耐张线夹、接续管、修补管、并勾线夹、跳线线夹、T 型线夹、设备线  Connectors for transmission conductors (tension clamps, splice tubes, repair tubes, parallel clamps, jumper clamps, T-type clamps, equipment wires Connectors for transmission conductors (strain clamps, splicing pipes, repair pipes, parallel hook clamps, jumper clamps, T-type clamps, equipment wires Connectors for transmission conductors (strain clamps, splicing pipes, repair pipes, parallel hook clamps, jumper clamps, T-type clamps, equipment wires  夹）  Clamp) clip) clip) | | 以线夹接头为中心的热像，热点明显 The hot image centered on the clamp joint, the hot spots are obvious  The hot spot is obvious in the thermal image centered on the clamp joint | poor contact  接触不良  Poor contact | 温差不超过15K，未达到一级缺陷的要  The temperature difference is not more than 15K, and the first-class defect is not reached The temperature difference does not exceed 15K, and the requirement for first-level defect is not met.  求  seek please | 热点温度>90 ℃ 或δ ≥80% Hot spot temperature>90 ℃ or δ ≥80%  Hot spot temperature > 90 ℃ or δ ≥ 80% |  |
| isolating switch  隔离开关  Isolating switch | turned  转头  Turn one's head | 以转头为中心的热像 Thermal image centered on the head  Thermal image centered on turning head | 转头接触不良或断股 Poor contact with the head or broken strands  Poor contact or broken strand of turning head | 温差不超过15K,  The temperature difference does not exceed 15K, The temperature difference does not exceed 15K,  未达到一级缺陷的  Not reaching the first-class defect Failure to achieve level 1 defect  要求  Requirements requirements | 热点温度>90 ℃ 或δ ≥80% Hot spot temperature>90 ℃ or δ ≥80%  Hot spot temperature > 90 ℃ or δ ≥ 80% |  |
| knife edge  刀口  Knife edge | 以刀口压接弹簧为中心的热像 Thermal image centered on the knife-edge crimping spring  Thermal image centered on knife edge crimping spring | Poor spring crimping  弹簧压接不良  Poor spring crimping | 温差不超过15K,  The temperature difference does not exceed 15K, The temperature difference does not exceed 15K,  未达到一级缺陷的  Not reaching the first-class defect Failure to achieve level 1 defect  要求  Requirements requirements | 热点温度>90 ℃ 或δ ≥80% Hot spot temperature>90 ℃ or δ ≥80%  Hot spot temperature > 90 ℃ or δ ≥ 80% | Measuring contact resistance  测量接触电阻  Measure contact resistance |

注： 温升：被测设备表面温度和环境温度参照体的温度之差。

Note: Temperature rise: The difference between the surface temperature of the measured equipment and the temperature of the ambient temperature reference body.  
Note: Temperature rise: The difference between the surface temperature of the equipment under test and the temperature of the ambient temperature reference body.

温差：不同被测设备或同一被测设备不同部分的表面温度之差。

Temperature difference: The difference between the surface temperatures of different devices under test or different parts of the same device under test.  
Temperature difference: The difference in surface temperatures between different devices under test or different parts of the same device under test.

相对温差：两个对应测点之间的温差与其中较热点的温升之比的百分数。相对温差δ1=（τ1－τ2）/τ1×100%=（T1－T2）/（T1－T0）×100%；

Relative temperature difference: Percentage of the ratio of the temperature difference between two corresponding measuring points to the temperature rise of the hotter one. Relative temperature difference δ 1 = (τ 1-τ 2)/τ 1 x 100% = (T1-T2)/(T1-T0) x 100%;  
Relative temperature difference: The percentage of the ratio of the temperature difference between two corresponding measurement points to the temperature rise of the hotter spot among them. Relative temperature difference δ1=(τ1-τ2)/τ1×100%=(T1-T2)/(T1-T0) ×100%;

τ1、T1—发热点的温升和温度；

T\_1, T\_1-the temperature rise and temperature of the hot spot;  
τ1, T1-Temperature rise and temperature of the heating point;

τ2、T2—正常相对应点的温升和温度； T0—环境温度参照体的温度。

τ 2, T2-temperature rise and temperature of normal corresponding points; T0-the temperature of the ambient temperature reference body.  
τ2, T2-Temperature rise and temperature at the normal corresponding point; T0-Temperature of the ambient temperature reference body.