



INDUSTRIAL SOLUTION SYSTEMS



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INDUSTRIAL SOLUTION SYSTEMS

NRTs-40.5KV

SF6气体绝缘环网柜

40.5kV Ring-Main-Unit systems with SF6 free unit technology



纳图电气集团股份有限公司
NATUS ELECTRIC GROUP CO.,LTD.

集团业务 Group Business

集团专注于中低压电力行业的系统集成、EPC工程总包服务及核心产品的研发、生产与销售。在电力设备领域，我们深耕智能电气成套产品、高端电力元器件、先进电能质量治理产品、智能控制仪表与控制系统。基于人工智能与大数据分析的技术积累，我们提供变电站与输电线路的气象灾害预防设备与安全运行综合解决方案。在新技术领域，我们聚焦小区域低空气象高精度预测技术，为低空经济发展提供综合性的产品与服务。



The Group specializes in system integration, EPC turnkey services, and the R&D, production, and sales of core products within the medium and low-voltage power industry. In the field of power equipment, we have deep expertise in intelligent electrical switchgear systems, high-end power components, advanced power quality management products, intelligent control instruments, and control systems. Leveraging accumulated expertise in artificial intelligence and big data analytics, we provide comprehensive solutions for meteorological disaster prevention equipment and the safe operation of substations and transmission lines. In the domain of new technologies, we focus on small-area, low-altitude meteorological high-precision prediction technology, offering integrated products and services to support the development of the low-altitude economy.

集团理念 Group Vision

纳图电气集团源自德国，立足中国，服务全球。自1956年成立以来，集团以德国技术为基础，深度融合中国智慧与全球视野，依托强大的中国研发与制造团队，精准响应全球市场需求，为各行业客户提供智慧电力的专业解决方案。集团坚持以客户为中心，致力于创新产品、可靠技术与精益制造，携手全球用户共同构建更智能、高效、可持续的电力能源未来。



Natus Electric Group originates from Germany, is firmly rooted in China, and serves the global market. Since its establishment in 1956, the Group has built upon German technology deeply integrating Chinese expertise and a global perspective. Supported by a robust Chinese R&D and manufacturing team, we precisely respond to global market demands, delivering professional intelligent power solutions for clients across various industries. Adhering to a customer-centric approach, the Group is committed to innovative products, reliable technology, and lean manufacturing, working hand-in-hand with global users to build a smarter, more efficient, and sustainable future for the power and energy sector.



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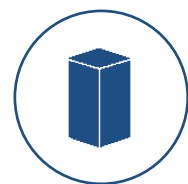
- NRTs-40.5kV SF6气体绝缘环网柜气箱采用高品质的不锈钢外壳。板材由激光切割成型并经过先进的焊接机械手自动焊接而成，保证气箱的气密性。气箱内充SF6气体，经过同步抽真空检漏，将断路器开关、负荷开关等开关活动部件及母线密封在不锈钢气箱内，气箱的防护等级达到IP67，不受凝露、凝霜、盐雾、污秽、腐蚀、紫外线等物质的影响。
- The gas tank of the NRTs-40.5kV SF6 gas-insulated ring main unit (RMU) adopts a high-quality stainless steel shell. The plates are laser-cut and automatically welded by advanced welding robots, ensuring the airtightness of the gas tank. The tank is filled with SF6 gas, and after synchronous vacuuming and leak detection, moving switch components such as circuit breakers and load switches, as well as busbars, are hermetically sealed inside the stainless steel tank. The tank achieves an IP67 protection rating and is not affected by condensation, frost, salt spray, pollution, corrosion, ultraviolet (UV) radiation, or other factors.



模块化设计
Modular Design



结构紧凑
Compact Structure



小型化
Miniaturization



全绝缘
Full Insulation



全密封
Full Sealing

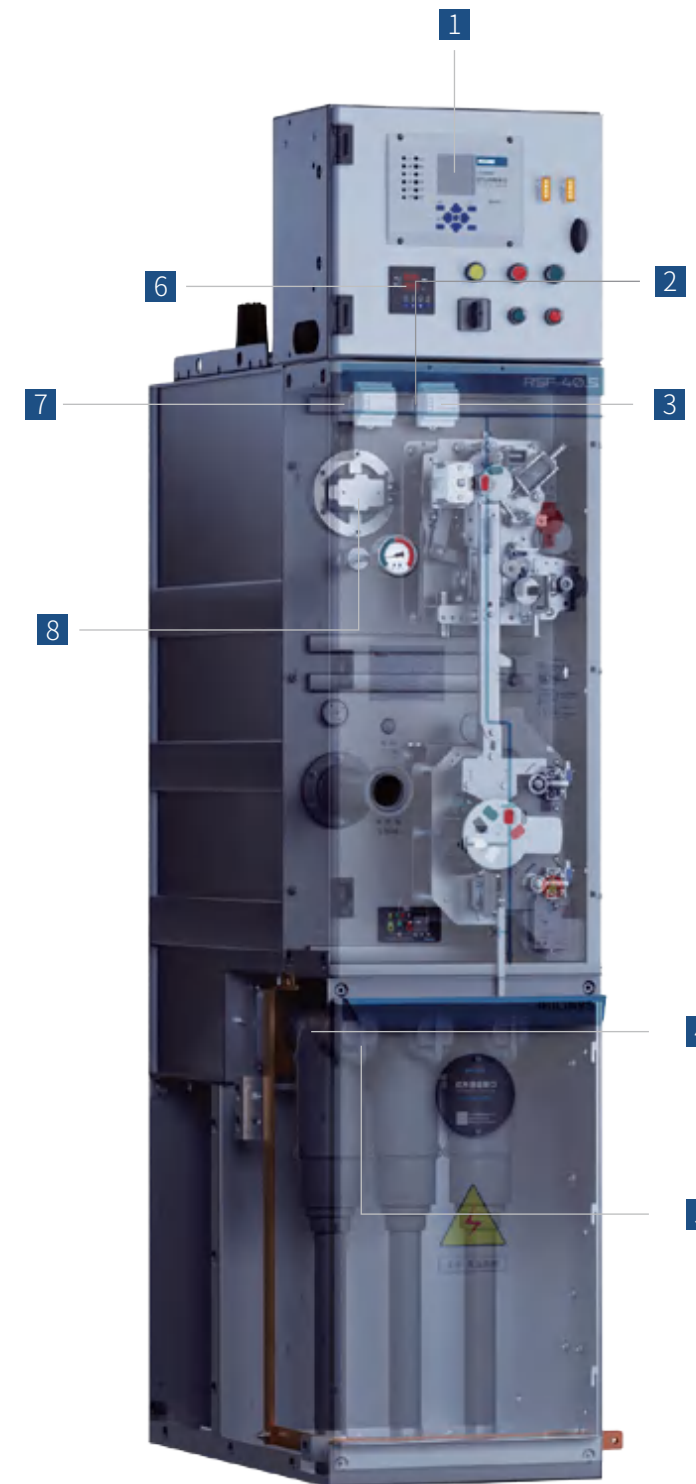


免维护
Maintenance-Free

全周期健康管理

Full-Cycle Health Management

移动端APP实时交互 “一键报修”快速响应 7X24小时专业服务
Real-Time Interaction via Mobile APP
"One-Click Maintenance Request" for Rapid Response
24/7 Professional Service

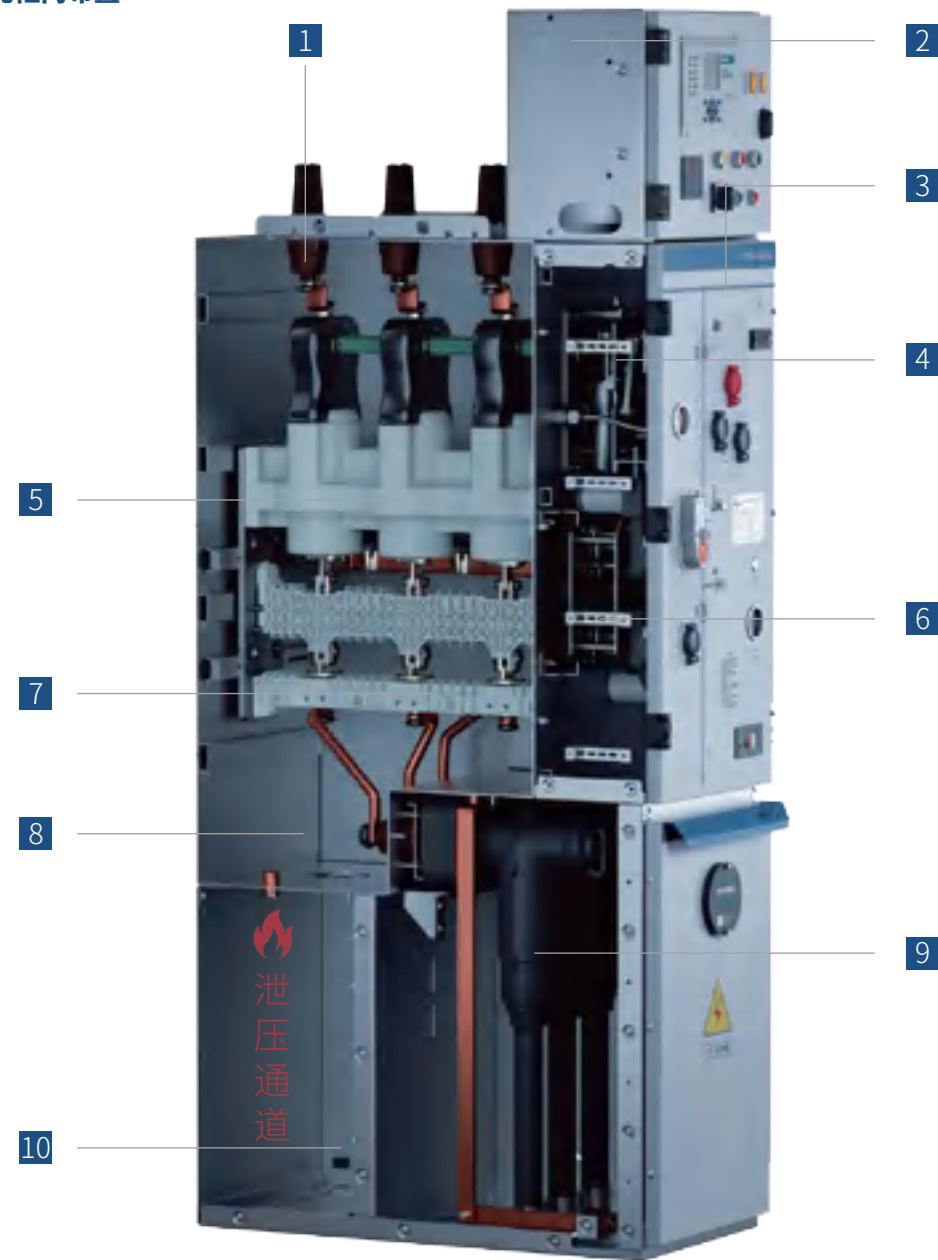


- 1 DTU间隔单元
DTU Bay Unit
远程测量与控制
Remote Measurement and Control
故障监测与保护
Fault Monitoring and Protection
数据采集与传输
Data Acquisition and Transmission
事件记录与告警
Event Logging and Alarm
- 2 状态监测
Condition monitoring
高压带电指示
High-Voltage Live Indication
接地故障指示
Ground Fault Indication
开关设备健康状态指示
Switchgear Health Status Indication
短路故障指示
Short-Circuit Fault Indication
- 3 智能操控
Intelligent operation and control
智能防误操作提示
Intelligent Misoperation Prevention Prompt
合分闸时间监测
Switching-On and Switching-Off Time Monitoring
电机/脱扣线圈电流检测
Motor/Trip Coil Current Detection
机构堵转告警
Mechanism Stalling Alarm

- 4 柜内局放检测
Partial discharge detection inside the cabinet
可靠接触式监测
Reliable Contact Monitoring
绝缘趋势预判
Insulation Trend Prediction
超标实时告警
Real-Time Alarm for Exceeding Standards
规避事故扩大
Prevent the Expansion of Accidents
- 5 接点温升监测
Contact temperature rise monitoring
温度实时监测
Real-Time Temperature Monitoring
准确反应温升
Accurately Reflect Temperature Rise
接点老化预判
Contact Aging Prediction
故障临界预警
Fault Critical Early Warning
- 6 柜内温湿度自动控制
Automatic control of temperature and humidity inside the abinet
环境温湿度实时监测
Real-Time Monitoring of Ambient Temperature and Humidity
柜内智能除湿
Intelligent Dehumidification Inside the Cabinet
柜内环境温度实时控制
Real-Time Control of Internal Cabinet Ambient Temperature
自动防凝露控制
Automatic Anti-Condensation Control

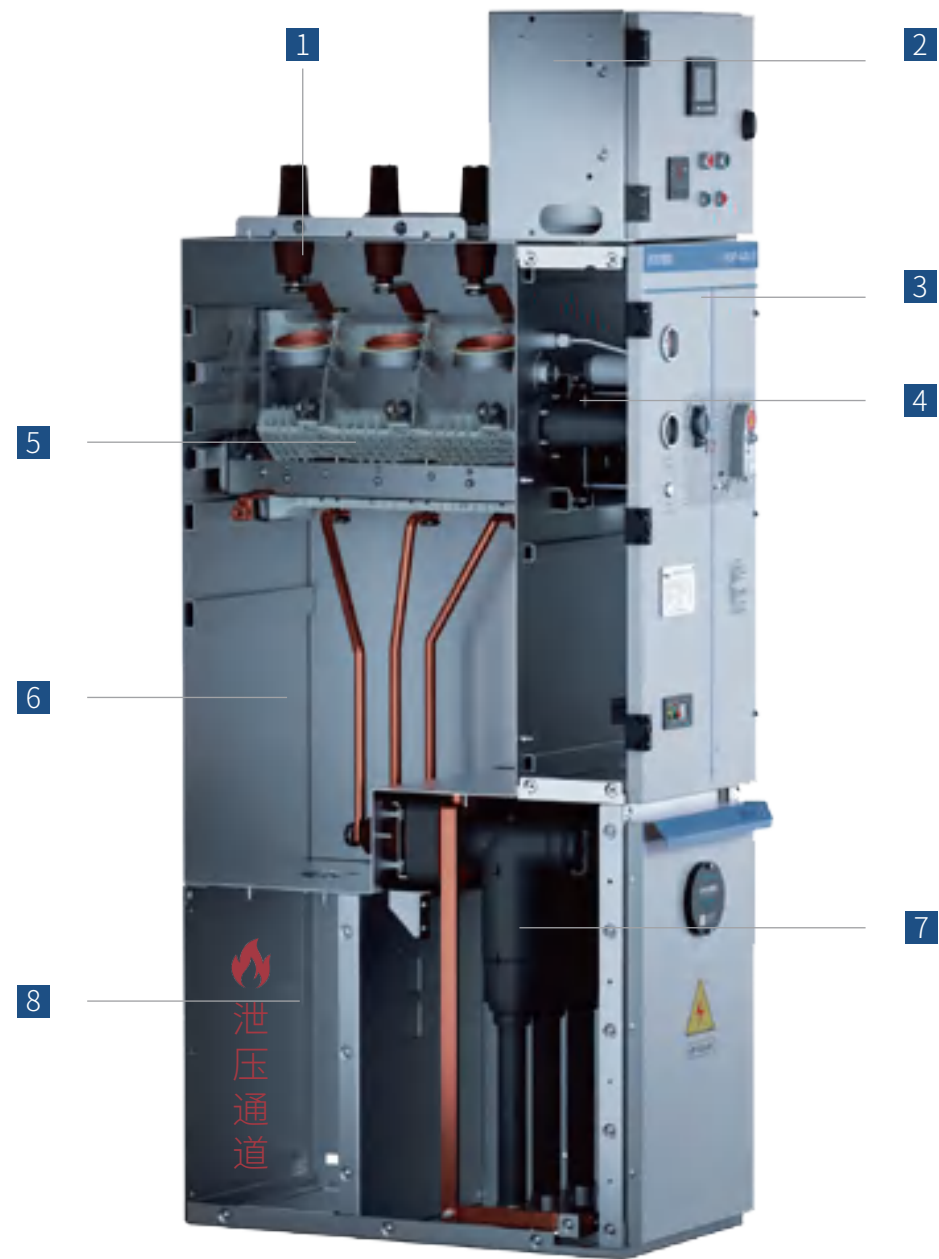
- 7 机械特性检测
Mechanical characteristic testing
合分寿命计算
Make-Break Life Calculation
动作异常预警
Abnormal Action Early Warning
合分速度监测
Make-Break Speed Monitoring
综合健康评估
Comprehensive Health Assessment
- 8 柜内视频识别
Video recognition inside the cabinet
断口可视化
Fracture Visualization
遥控可视化
Remote-Controlled Visualization
AI智能识别
AI Intelligent Recognition
故障自动预警
Automatic Fault Early Warning

断路器单元柜内布置



- 1 母线连接套管
Busbar Connection Bushing
- 2 二次控制箱
Secondary Control Cabinet
- 3 操作面板
Operation Panel / Control Panel
- 4 断路器机构
Circuit Breaker Mechanism
- 5 断路器开关
Circuit Breaker Switch
- 6 隔离机构
Isolation Mechanism
- 7 隔离开关
Isolating Switch
- 8 全封闭箱体
Fully Enclosed Cabinet
- 9 电缆仓
Cable Compartment
- 10 箱体内部泄压装置
Pressure Relief Device Inside the Cabinet

负荷开关柜内布置



- | | |
|---|---|
| 1 母线连接套管
Busbar Connection Bushing | 5 三工位负荷开关
Three-Position Load Switch |
| 2 二次控制箱
Secondary Control Cabinet | 6 全封闭箱体
Fully Enclosed Cabinet |
| 3 操作面板
Operation Panel / Control Panel | 7 电缆仓
Cable Compartment |
| 4 负荷开关机构
Load Switch Mechanism | 8 箱体内部泄压装置
Pressure Relief Device Inside the Cabinet |

电缆仓
Cable Compartment

- 只有馈线已经隔离或接地时才能打开电缆仓。
 - 套管符合DIN EN 50181标准, M16螺栓连接, 避雷器可连接在T型电缆头的后方。
 - 一体式CT位于套管侧, 安装电缆方便, 并且不受外力影响。
 - 套管安装处到地面的高度大于690mm。
- The cable compartment can only be opened when the feeder is isolated or earthed.
 - The bushing complies with the DIN EN 50181 standard, features an M16 bolt connection, and the surge arrester can be connected behind the T-type cable joint.
 - The integrated current transformer (CT) is located on the bushing side, facilitating easy cable installation and being unaffected by external forces.
 - The height from the bushing installation position to the ground is more than 690mm.



品质制胜

严守高标质量体系, IP67防护气室无惧恶劣环境, 多项测试认证铸就卓越品质, 契合市场对高品质电力设备的追求;

灵活定制

以客户为导向, 先进设备助力灵活工程设计与项目管理, 分散或集中控制方案随心定制, 高效满足多样需求;

模块扩展

模块化设计, 配置多样, 支持顶部扩展, 且预留扩容接口便于后期改造;

组件优选

高质量独立标准组件, 稳定兼容, 保障设备运行, 维护升级更便捷, 增强市场竞争力;

认证保障

通过国家型式试验, 部分指标超国标, 权威认证为品质背书, 市场推广更自信, 客户使用更安心;

集成便捷

集成电工交钥匙工程, 接口优化, 系统无缝对接, 一站式服务提升效率, 减少客户成本风险;

Quality Wins

Strictly adhering to high-standard quality systems, the IP67-rated protective gas tank withstands harsh environments. Multiple testing certifications ensure exceptional quality, meeting the market's demand for high-quality power equipment.

Flexible customization

Customer-centric approach, advanced equipment enabling flexible engineering design and project management, customized decentralized or centralized control solutions to efficiently meet diverse needs.

Module Extension

Modular design with diverse configurations, supporting top-mounted expansion and featuring reserved expansion interfaces for future upgrades.

Component Selection

High-quality independent standard components ensure stable compatibility, safeguard equipment operation, facilitate maintenance and upgrades, and enhance market competitiveness.

Certification Assurance

Passed national type testing with certain metrics exceeding national standards. Authoritative certification serves as a quality endorsement, boosting market confidence and ensuring customer peace of mind.

Seamless Integration

Turnkey electrical integration projects, optimized interfaces, seamless system integration, one-stop services to boost efficiency and reduce customer cost risks.



变电站
Electrical Substation



储能行业
Energy Storage Industry



风力发电
Wind Power Generation



工厂建设
Industrial Plant Construction



光伏新能源
Solar PV New Energy



热电行业
Thermal Power Industry



化工和石化行业
Chemical&Petrochemical Industry



石油和天然气行业
Oil & Gas Industry



市政公用事业和配电
Municipal Utilities & Power Distribution

断路器单元
Circuit Breaker Unit

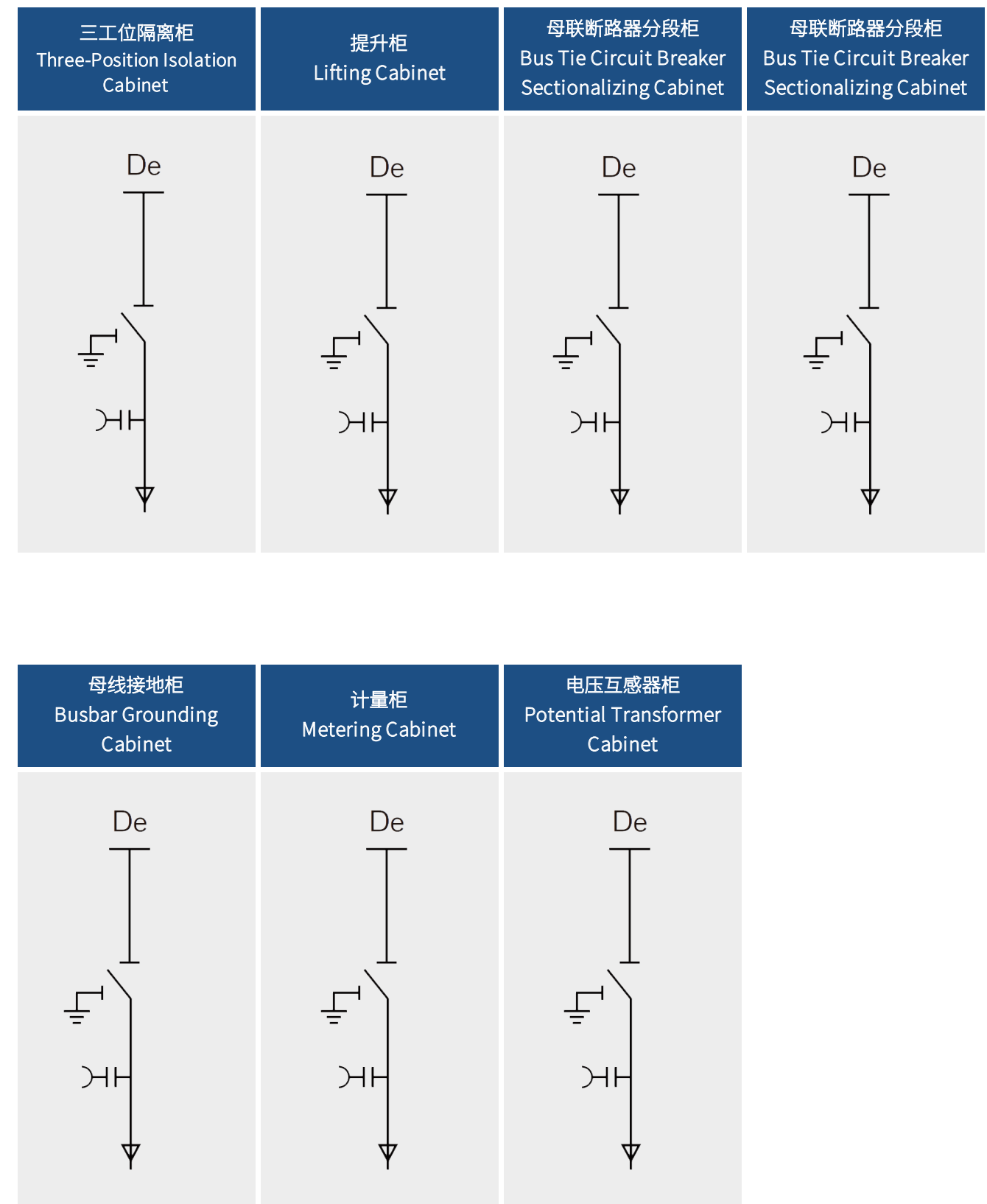
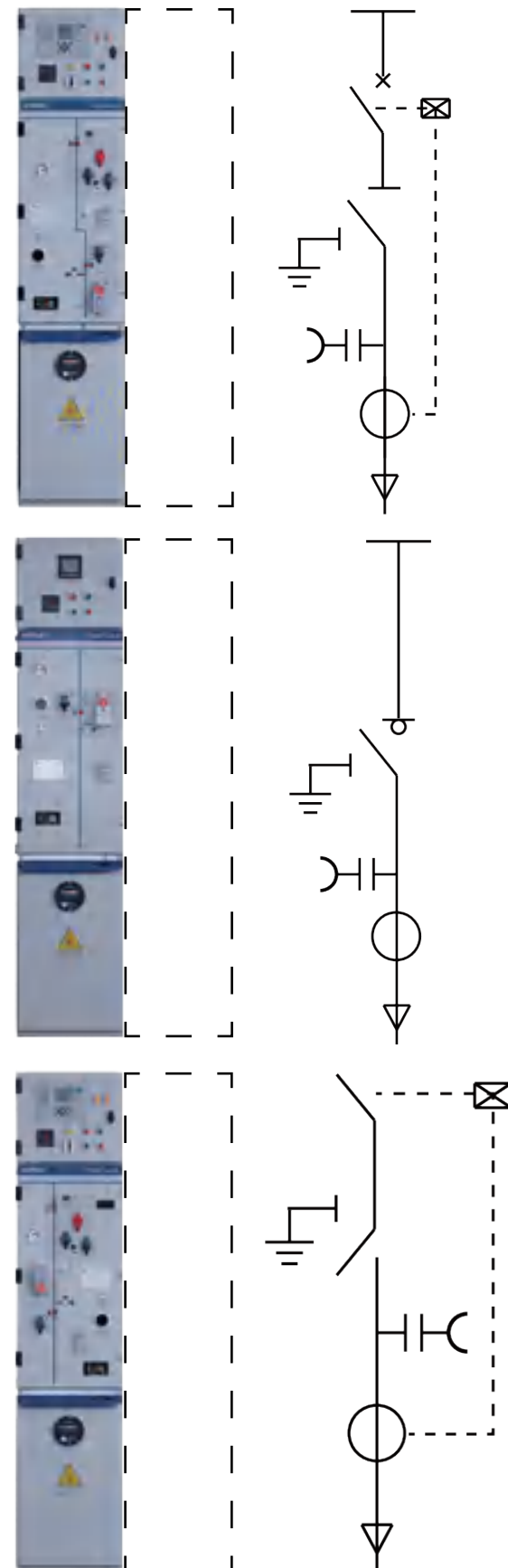
左扩展/右扩展450mm
Left Extension / Right
Extension 450mm

断路器单元(母线接地)
Circuit Breaker Unit
(Busbar Grounding)

左扩展/右扩展450mm
Left Extension / Right
Extension 450mm

负荷开关单元
Load Switch Unit

左扩展/右扩展450mm
Left Extension / Right
Extension 450mm



断路器单元
Circuit Breaker Unit

名称 Name	单位 Unit	参数 Parameter
额定电压 Rated Voltage	kV	40.5
工频耐受电压 Power Frequency Withstand	kV	95/118
雷电冲击耐受电压 Lightning Impulse Withstand Voltage	kV	190/220
额定电流 Rated Current	A	630
额定短路开断电流 Rated Short-Circuit Breaking Current	kA	20(25)
额定短路关合能力 Rated Short-Circuit	kA	50(63)
额定短时耐受电流 Rated Short-Time Withstand Current	kA/s	20/4(25/4)
机械寿命 Mechanical Life	次 Time	断路器10000／隔离5000/接地5000 Circuit Breaker: 10,000 / Isolation: 5,000 / Earthing: 5,000

断路器单元(母线接地)
Circuit Breaker Unit (Busbar Grounding)

名称 Name	单位 Unit	参数 Parameter
额定电压 Rated Voltage	kV	40.5
工频耐受电压 Power Frequency Withstand	kV	95/118
雷电冲击耐受电压 Lightning Impulse Withstand Voltage	kV	190/220
额定电流 Rated Current	A	630
额定峰值耐受电流 Rated Peak	kA	50(63)
额定短时耐受电流 Rated Short-Time Withstand Current	kA/s	20k/4(25/4)
机械寿命 Mechanical Life	次 Time	Load: 5,000 / Earthing: 5,000

负荷开关单元
Load Switch Unit

名称 Name	单位 Unit	参数 Parameter
额定电压 Rated Voltage	kV	40.5
工频耐受电压 Power Frequency Withstand	kV	95/118
雷电冲击耐受电压 Lightning Impulse Withstand Voltage	kV	190/220
额定电流 Rated Current	A	630
额定短路开断电流 Rated Short-Circuit Breaking Current	kA	20(25)
额定短路关合能力 Rated Short-Circuit	kA	50(63)
额定短时耐受电流 Rated Short-Time Withstand Current	kA/s	20/4(25/4)
机械寿命 Mechanical Life	次 Time	Circuit Breaker: 10,000 / Isolation: 5,000 / Earthing: 5,000



符合标准

Comply with Standards

序号 Number	标准号 Standard Number	标准名称 Standard Name
1	GB/T11022-2020	高压开关设备和控制设备标准的共用技术要求 Common Technical Requirements for High-Voltage Switchgear and Controlgear Standards
2	GB3906-2020	3.6 kV~40.5 kV 交流金属封闭开关设备和控制设备 3.6 kV ~ 40.5 kV AC Metal-Enclosed Switchgear and Controlgear
3	GB1985-2023	高压交流隔离开关和接地开关 High-Voltage AC Disconnectors and Earthing Switches
4	GB16926-2009	高压交流负荷开关-熔断器组合电器 High-Voltage AC Load Switch-Fuse Combination Device
5	GB3804-2017	3.6 kV~40.5 kV 高压交流负荷开关 3.6 kV ~ 40.5 kV High-Voltage AC Load Switch
6	GB1984-2024	高压交流断路器 High-Voltage AC Circuit Breaker
7	IEC62271-1	高压开关装置和控制装置通用规范 General Specification for High-Voltage Switchgear and Controlgear
8	IEC 60265-1	高压负荷开关 High-Voltage Load Switch
9	IEC62271-102	交流高压隔离开关和接地开关 AC High-Voltage Disconnectors and Earthing Switches
10	IEC62271-200	交流金属封闭开关设备和控制设备 AC Metal-Enclosed Switchgear and Controlgear
11	IEC62271-100	交流高压断路器 AC High-Voltage Circuit Breaker
12	IEC62271-105	交流高压负荷开关-熔断器组合电器 AC High-Voltage Load Switch-Fuse Combination Device
13	IEC 60255	电磁兼容 Electromagnetic Compatibility

一般特性

General Characteristics

- 内部故障电弧等级 IAC

● Internal Fault Arc Class IAC

AFLR 25kA 1s
- 运行连续性等级

● Operational Continuity Class

LSC2A
- 电缆套管标准

● Cable Bushing Standard

GB/T12706.4、IEC60502、NF-EN-50181
- 气体压力

● Gas Pressure

20°C下为1.4bar (绝对压力)
It is 1.4 bar (absolute pressure) at 20°C
- 浸水实验

● Immersion Test

水下施加0.3bar的压力 24小时
Apply a pressure of 0.3 bar underwater for 24 hours
- 年泄露率

● Annual Leak Rate

0.25‰/年
0.25‰ per year
- 防护等级

● Degree of ProtectionGas Chamber

气室 IP67
开关柜外壳 IP54
IP67Switchgear Enclosure: IP54

运行条件

Operating Conditions

- 环境温度

最高温度 +75°C;
最高温度 (24小时平均) +35°C;
最低温度 -45°C;

● Ambient Temperature

Maximum temperature: +75°C;
Maximum temperature (24-hour average): +35°C;
Minimum temperature: -45°C;
- 环境湿度

最大平均相对湿度 (24小时测量≤95%;1个月测量≤90%)

● Ambient Humidity

Maximum average relative humidity (≤95% for 24-hour measurement; ≤90% for 1-month measurement)
- 海拔高度

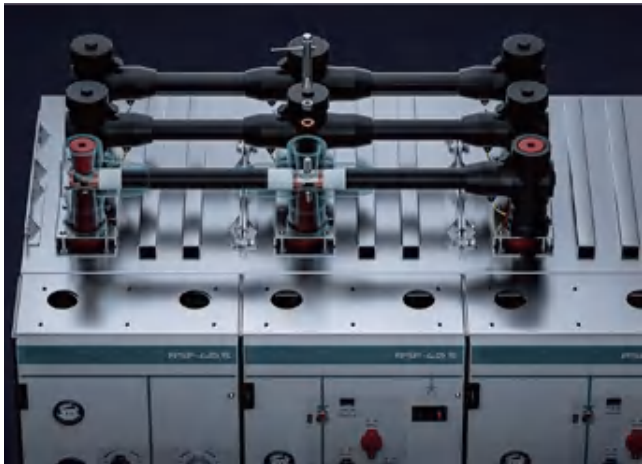
≤2000米 (标准充气压力下)

● Altitude

≤ 2000 meters (under standard gas-filled pressure)

顶扩并柜方式

Top-Expansion Cabinet Combination Method



侧扩并柜方式

Side-Expansion Cabinet Combination Method





PRECISION IN DETAIL