Medium-Voltage Switchgear

Air-Insulated Medium-Voltage Switchgear NXAirS, up to 12 kV

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Catalog
HA 1702
Edition 2024 A

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Application

Typical application

Air-insulated medium-voltage switchgear NXAirS is used in transformer and switching substations, mainly at the primary distribution level, e.g.:

Application
Public power supply
- Power supply companies
- Energy producers
- System operators.

Application
Industry and offshore
- Automobile industry
- Traction power supply systems
- Mining industry
- Lignite open-cast mines
- Chemical industry
- Diesel power plants
- Electrochemical plants
- Emergency power supply installations
- Textile, paper and food industries
- Iron and steel works
- Power stations
- Petroleum industry
- Offshore installations
- Petrochemical plants
- Pipeline installations
- Data centers
- Shipbuilding industry
- Steel industry
- Rolling mills
- Cement industry

Contents

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The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).

Customer benefit

Ensures peace of mind

For power supply companies and industrial plants, the platform concept of the NXAirS family introduced at all production locations has very concrete advantages:

Smooth operation,
exemplary availability and
optimal safety.

Features

- No handling of insulating gas and low and high pressure monitoring required
- As insulating medium, air is always available
- Factory-assembled, type-tested switchgear according to IEC 62271-200 , GB 3906 and DL/T 404
- Platform concept introduced worldwide, centrally controlled development, local manufacture
- Use of standardized block-type current transformers
- Use of standard components available worldwide, locally manufactured components, under consideration of regional standards
- More than 510,000 air-insulated switchgear panels of Siemens in operation worldwide
- Use of maintenance-free vacuum circuit-breakers or contactors
- Type testing of the vacuum circuit-breaker, the vacuum contactor and the make-proof earthing switch in the panel
- Pressure-resistant partitions
- Flexibility regarding the low-voltage equipment (removable compartment, plug-in wires)
- Quality assurance in accordance with DIN EN ISO 9001

Customer benefit

Saves lives

All switchgear types of the NXAirS family are approved with internal arc classification IAC A FLR, loss of service continuity category LSC 2B and partition class PM.

This makes them suitable for universal installation, meeting the higher requirements regarding personal safety.

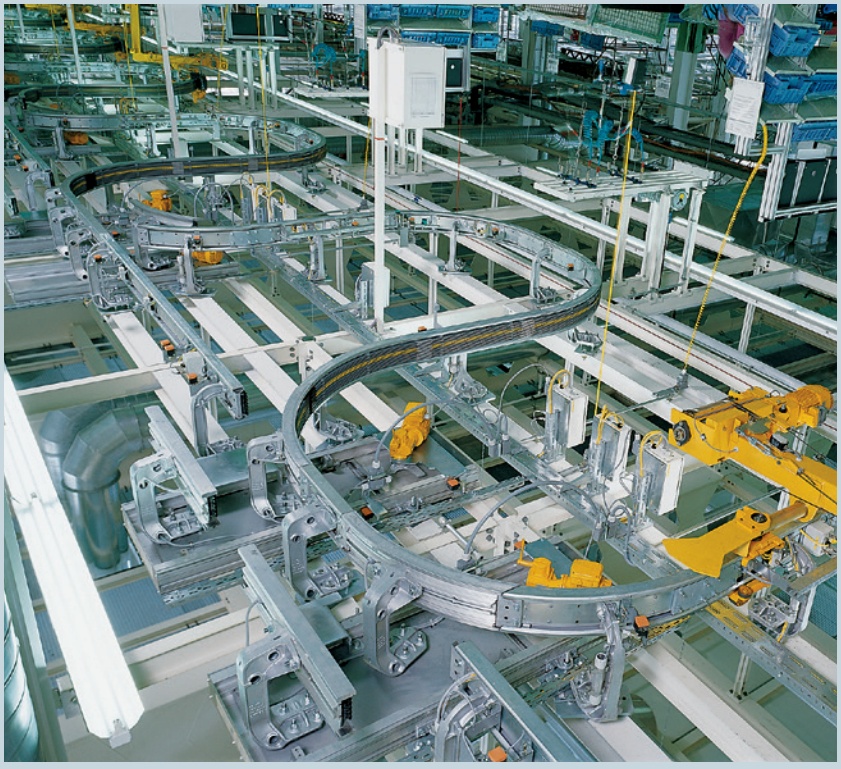
In addition the arc quenching device SIQuench can be selected for protection beyond the standards.

Features

- All operations with closed high-voltage door including manual operation of vacuum circuit-breaker
- Metallic enclosure, earthed shutters and partitions
- Internal arc classified switchgear according to IAC A FLR (front, lateral and rear accessibility) for all short-circuit currents and an arc duration of 1 s
- Loss of service continuity category LSC 2B (separate partitions for busbar, connection and switching-device compartments)
- Partition class PM (metal-clad in pressure-resistant design)
- Unambiguous position indicators and control elements on the high-voltage door
- Use of Siemens 3AE vacuum circuit-breakers or 3TM contactors
- Standard degree of protection IP4X; different degrees of protection possible as an option
- Positively driven shutters (separately lockable)
- Logical mechanical interlocking system
- Optional available arc quenching device SIQuench

Customer benefit

Increases productivity



Properties such as modular design, type tests of the switching devices in the switchgear, confinement of an internal arc to the respective compartment, and thus high operational reliability, contribute to optimum operation and a remarkable increase of productivity.

Features

- Loss of service continuity category LSC 2B
- Partition class PM
- Positively driven shutters
- Use of standardized block-type current transformers
- Cable testing without isolating the busbar
- Functions such as establishment of the isolating distance, as well as feeder and busbar earthing, can be completely controlled from remote
- Confinement of an internal arc to the respective compartment
- Use of maintenance-free Siemens 3AE vacuum circuit-breakers or 3TM contactors
- Control cables in metallic wiring ducts
- Easy access to panel components

Customer benefit

Saves money

The compact design of the NXAirS family pays twice for owners due to the use of the Siemens 3AE vacuum circuit-breaker.

On the one hand, building costs can be reduced in this way, and on the other hand, the maintenance-free circuit-breakers and the modular design enable continuous operation without expensive shutdown times.

In case of an unlikely event of an internal arc, the optional available arc quenching device SIQuench reduces the system repair time from days and weeks to hours and minutes.

Features

- Use of maintenance-free Siemens 3AE vacuum circuit-breakers or 3TM contactors
- Interruption of operation reduced to very low level by logical mechanical interlocking system
- Minimized space requirements (reduced building investments)
  - due to compact design and flexible cable connection options
  - and/or flexible pressure relief duct systems
- Optional arc quenching device SIQuench

Customer benefit

Preserves the environment

Air used as insulating medium, local production locations with short transportation ways and times, as well as a service life of more than 30 years, optimize the total energy balance.

Features

- As insulating medium, air is neutral to the environment
- Local production presence in all regions, very low level energy consumption regarding transport
- Service life of more than 30 years optimizes the energy balance additionally
- The materials used are fully recyclable without special knowledge
- Easy disposal

NXAirS: A sustainable investment for today and tomorrow

At Siemens, we believe in sustainable development that meets current needs without compromising the future.

Siemens supports sustainability with a customized program, our "DEGREE framework". Our DEGREE framework guides our efforts in six crucial areas of action that drive sustainability and continuously evolve.

Decarbonization: Support the 1.5 °C target to fight global warming

Ethics: Foster a culture of trust, adhere to ethical standards, and handle data with care

Governance: Apply state-of-the-art systems for effective and responsible business conduct

Resource efficiency: Achieve circularity and dematerialization

Equity: Foster diversity, inclusion, and community development to create a sense of belonging

Employability: Enable our people to stay resilient and relevant in a permanently changing environment.

Air-insulated medium-voltage switchgear NXAirS is a prime example for our commitment to sustainability. Decades of experience have made **NXAirS** a leader in resource **efficiency and decarbonization:**

- Use of natural air as insulating medium and vacuum interrupters for switching
- Free of all materials harming the environment (e.g., asbestos, mercury, SF6 gas or other F-gases)
- Reduced fire load by using a minimum of insulating material
- Easily recyclable and reusable thanks to the use of homogenous material
- Use of maintenance-free vacuum circuit-breakers, and 10-year maintenance intervals for the switchgear
- Long product lifetime and serviceable life of more than 30 years
- Safe spare part supply over a period of minimum 10 years after phase-out
- Short transportation routes to customers thanks to global manufacturing network
- Global service network close to the customer
- Possibility for remote factory acceptance tests (FAT) and remote support for commissioning, service and maintenance
- Upgradable with condition monitoring systems for predictive maintenance
- Continuous improvement of durability by means of simulation software for development, testing and production based on the corresponding international standards and design directives

Customer benefit

Sustainability

NXAirS: A sustainable investment for today and tomorrow

With our technologies we serve the markets which are the backbone of economies and societies. We leverage our global ecosystems to develop holistic solutions for the global sustainability challenges.

Our focus on sustainability in own operations has always been strong.

The certificates of Green Factory, Zero Carbon Benchmark Factory, Green Supply Chain, Zero Waste Landfill Management System validate our commitment to sustainable development.

We as Siemens commit ourselves to comply with all legal provisions and regulations like REACh, the Minamata Convention, the Responsible Minerals Initiative, as well as the Stockholm Convention consequently to ensure a sustainable future for all.

For NXAirS, Life Cycle Assessments (LCA) are performed, and Environmental Product Declarations (EPD) for reference installations are available.

With its environmentally friendly design, resource-efficient production, and long-lasting performance, NXAirS is the ideal solution for your power supply.

NXAirS – Enjoy the Air

Explanations:

REACh (Registration, Evaluation, Authorization and Restriction of Chemicals)

REACh - Regulation (EC) 1907/2006 is the European Chemicals Regulation concerning the registration, evaluation, authorization and restriction of chemicals. It has been in force since 2007 and replaces 40 individual laws. The REACh Regulation is considered to be one of the world's most stringent chemicals laws.

Environmental Product Declaration (EPD)

An Environmental Product Declaration (EPD) is used to provide the customer with information about the "ecological footprint" of a product. Siemens has a clearly formulated strategy for the development of EPDs. EPDs are based on independently verified data from life cycle assessments, life cycle inventory analyses, or information modules, which comply with the ISO 14040 series of standards.

Life Cycle Assessments (LCA)

We use Life Cycle Assessments (LCA) to help us calculate the ecological footprint of our products and systems over their entire life cycle. Siemens follows the strict requirements of the ISO 14040 and ISO 14044 standards when applying an LCA.

Circuit-breaker switchgear NXAirS is factory-assembled, type-tested, metal-enclosed and metal-clad switchgear for indoor installation according to IEC 62271-200, GB 3906 and DL/T 404 and corresponds to the following classifications.

Loss of service continuity category and partition class	
Loss of service continuity category	LSC 2B
Partition class	PM
Accessibility to compartments Busbar compartment Switching-device compartment Connection compartment	 Tool-based Interlock-controlled Interlock-controlled or tool-based
Internal arc classifications	
The following internal arc classifications are fulfilled: IAC A FLR, I_{sc}, t	
IAC	= Internal arc classification
A	= 300 mm distance of indicators for test (installation in closed electrical service location)
F	= Front arrangement of indicators for test
L	= Lateral arrangement of indicators for test
R	= Rear arrangement of indicators for test
I_{sc}	= Test current up to 40 kA
t	= Arc duration 1 s
In this way, NXAirS switchgear is suitable for unrestricted application (wall- or free-standing arrangement) in electrical service locations up to the maximum short-circuit ratings.	

National approval GOST

By certification in the system GOST R in Russia, NXAirS switchgear is approved for application at the voltage levels up to 12 kV.

Compliance with the requirements of the GOST standard has been confirmed in the declaration.

The approval is valid in the countries Russia, Belarus, Kazakhstan and Ukraine.

Operation at the panel

Features

- Integrated mimic diagram
- Indication of the respective switch positions for circuit-breaker CLOSED/OPEN, disconnected position, earthing switch CLOSED/OPEN, on the integrated mimic diagram
- Unambiguous assignment of actuating openings and control elements to the corresponding position indicators
- All switching operations only with high-voltage door closed
- Ergonomically favorable height for all control and indicator elements
- Option: Verification of safe isolation from supply for feeder or busbar by means of the capacitive voltage detecting system with panel front closed.

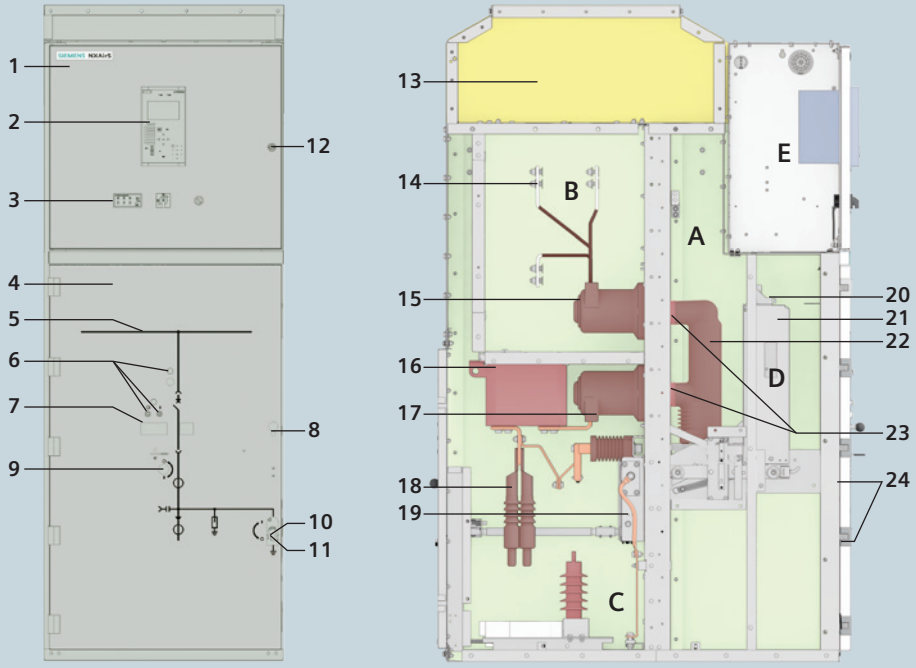
Interlocks

- Interlocking conditions specified according to IEC 62271-200 and GB 3906 are fulfilled
- Feeder earthing switch can only be operated with switching device in disconnected position and test position
- Switching device can only be racked on the movable part with the associated switching device OPEN position and with earthing switch OPEN
- Switching device can only be operated in interlocked disconnected or service or test position.

Beyond the specifications of the standards

- Coding prevents insertion of switching devices with a lower rated normal current into panels with a higher rated normal current
- Interlocking between the high-voltage door and the position of the withdrawable part
- Option: Electromagnetic interlocks, mechanical key interlocking systems and padlocks.

Basic panel design (example of circuit-breaker panel)



1 Door to low-voltage compartment
2 Protection device
3 Option: Voltage presence indicator
4 High-voltage door
5 Mimic diagram
6 "CLOSE-OPEN" actuating openings for the circuit-breaker, opening for spring charging
7 Inspection window to recognize the "CLOSED-OPEN" indicator of the circuit-breaker, "closing spring charged" indicator, operations counter
8 Handle for opening the high-voltage door
9 Actuating opening for racking the switching device
10 Mechanical position indicator for feeder earthing switch
11 Actuating opening for feeder earthing switch, manual or optionally motor operation
12 Door lock of LV compartment
13 Pressure relief duct, if required with top-mounted arc absorber
14 Busbars
15 Bushing-type insulator
16 Block-type current transformer
17 Bushing-type insulator
18 Cable connection
19 Make-proof earthing switch
20 Low-voltage connection, plug-in type
21 Operating and interlocking unit for circuit-breaker
22 Vacuum interrupters
23 Contact system
24 Operating and interlocking unit for racking the switching device and for earthing, manual or optionally motor operation

A Switching-device compartment
B Busbar compartment
C Connection compartment
D Withdrawable circuit-breaker
E Low-voltage compartment

Switching-device compartment

- Enclosure made of sendzimir-galvanized sheet steel
- Pressure relief upwards
- Panel front powder-coated with epoxy resin
- Standard color RAL 7035
- Separate shutter mechanism for opening and closing the
  - Busbar compartment
  - Connection compartment
- Metallic shutters can be opened and locked separately
- High-voltage door pressure-resistant in the event of internal arcs in the panel
- Pressure-resistant partitions to connection and busbar compartments
- Lateral metallic wiring duct for laying the control cables
- Low-voltage plug connector for connection of control cables between primary part and secondary part
- Switching-device compartment for the different panel versions with withdrawable devices:
  - Vacuum circuit-breaker
  - Vacuum contactor
  - Disconnector link
  - Metering unit
  - Load-break switch and fuse combination equipment
- Endurance classes for:
  - Circuit-breaker: E2, M2, C2
  - Withdrawable part: M0, manually or partly motor-operated for withdrawable circuit-breaker and disconnector link
  - Vacuum contactor: 1,000,000 times for non-latching
    200,000 times for latching

Busbar compartment

- Enclosure made of sendzimir-galvanized sheet steel
- Pressure relief upwards
- Transverse partition from panel to panel
- Busbars made of flat copper, bolted from panel to panel
  - Option: Insulated
- Pressure-resistant partitions to connection and switching-device compartment
- Shutters can be opened and locked separately
- Bushing-type insulators for supporting the busbars and for accommodating the upper fixed contacts for the switching device
  - Option: Coupling electrode for voltage presence indicator

Additional compartments (option) for busbar components, see also product range

- Top-mounted compartment over the busbar compartment, within the pressure relief duct
- Separate pressure relief of the additional compartment via pressure relief flaps
- Options: Possibility of installing the following components (but not for panels with natural and forced ventilation, see also product range)
  - Voltage transformers
  - Make-proof earthing switch (endurance class: M1, E1), manual or optionally motor operation
  - Bar or cable connection
  - SIQuench arc quenching device

Connection compartment

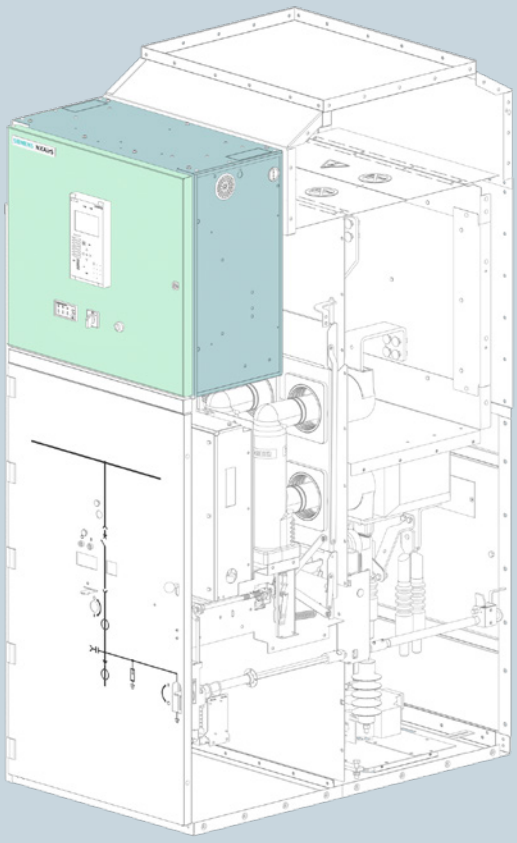
- Enclosure made of sendzimir-galvanized sheet steel
- Pressure relief upwards through rear pressure relief duct
- Pressure-resistant partitions to switching-device and busbar compartments
- Earthing busbar
- Option: Installation of bushing-type insulators or block-type current transformers
- Option: Coupling electrode for capacitive voltage presence indicator
- Pressure-resistant floor cover
- Connection from front/bottom, or from rear/bottom, or from rear/top
- Suitable for connection of:
  - Single-core XLPE cables up to 6 and the cross-area depending on the rated normal current and other build in components
  - TThree-core XLPE cables up to 6 and the cross-area depending on the rated normal current and other build in components
  - Flat copper bars with bushings in a base plate or fully-insulated bars including floor cover
- Installation of voltage transformers
  - Cast-resin insulated
  - 3 × 1-pole
  - Fixed-mounted, without primary fuses or optional with primary fuses
  - Or withdrawable with primary fuses in a separate compartment, with bushings and shutters to the connection compartment
- Make-proof earthing switch
  - With manual operating mechanism, optionally motor operating mechanism
  - In addition to the standard interlock: Earthing switch optionally lockable or electromagnetically interlocked against the withdrawable switching device
- Endurance class for earthing switch: M1, E1
- Surge arrester or surge limiter
  - Surge arrester for protecting the switchgear against external over-voltages
  - Surge limiter for protecting consumers against switching overvoltages while operating motors with starting currents ≤ 600 A.

Design
Low-voltage compartment

Features

- Low-voltage compartment for accommodation of all protection, control, measuring and metering equipment
- Partitioned safe-to-touch off the high-voltage part
- Low-voltage compartment can be removed
- Option: Higher low-voltage compartment with 980 mm height
- Low-voltage cables are flexible and protected by metal covers
- Connection of withdrawable part and panel wiring to low-voltage compartment via 64-pole, coded plug connectors
- Specific key for low voltage door.

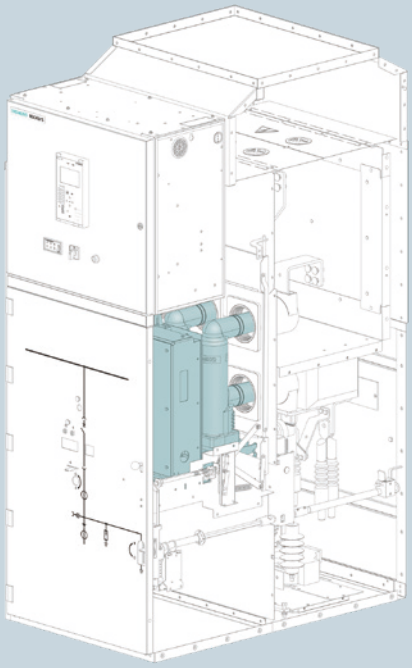
Door of low-voltage compartment (example)



Features

- According to IEC 62271-100, GB 1984
- Suitable for all switching duties
- Stored-energy spring mechanism with motor operating mechanism, manual operation always possible
- Racking the circuit-breaker with manual operating mechanism, optionally with motor operating mechanism
- 64-pole low-voltage plug connector between circuit-breaker and fixed part
- Maintenance-free operating mechanisms under normal climatic conditions and for the max. permissible number of operating cycles.

3AE vacuum circuit-breaker



Circuit-breaker		≤ 40 kA
Model		3AE
Rated voltage	kV	12
Rated 1-min power frequency withstand voltage	kV	42 / 48
Lightning impulse withstand voltage (peak)	kV	75 / 85
Rated operation sequence		O-0.3s-CO-180s-CO
Pole-center distance	mm	150, 210, 275
Rated current	max. A	4000, 5000*
Rated short-circuit breaking current	max. kA	40
Rated short-time withstand current/duration	max. kA/s	40 / 4
Rated mechanical life		10,000 (30,000 optional)
Total breaking time	ms	≤80
Closing time	ms	≤75
Opening time	ms	<65
Arcing time	ms	<15
Closing/opening non-synchro-nism	ms	≤2
Voltage range of opening coil	%	65% to 110%
Voltage range of closing coil	%	85% to 110%
Spring charging time	s	≤15
Voltage of charging motor	V	DC110, DC220, AC110, AC220
Voltage range of charging motor	%	85% to 110%

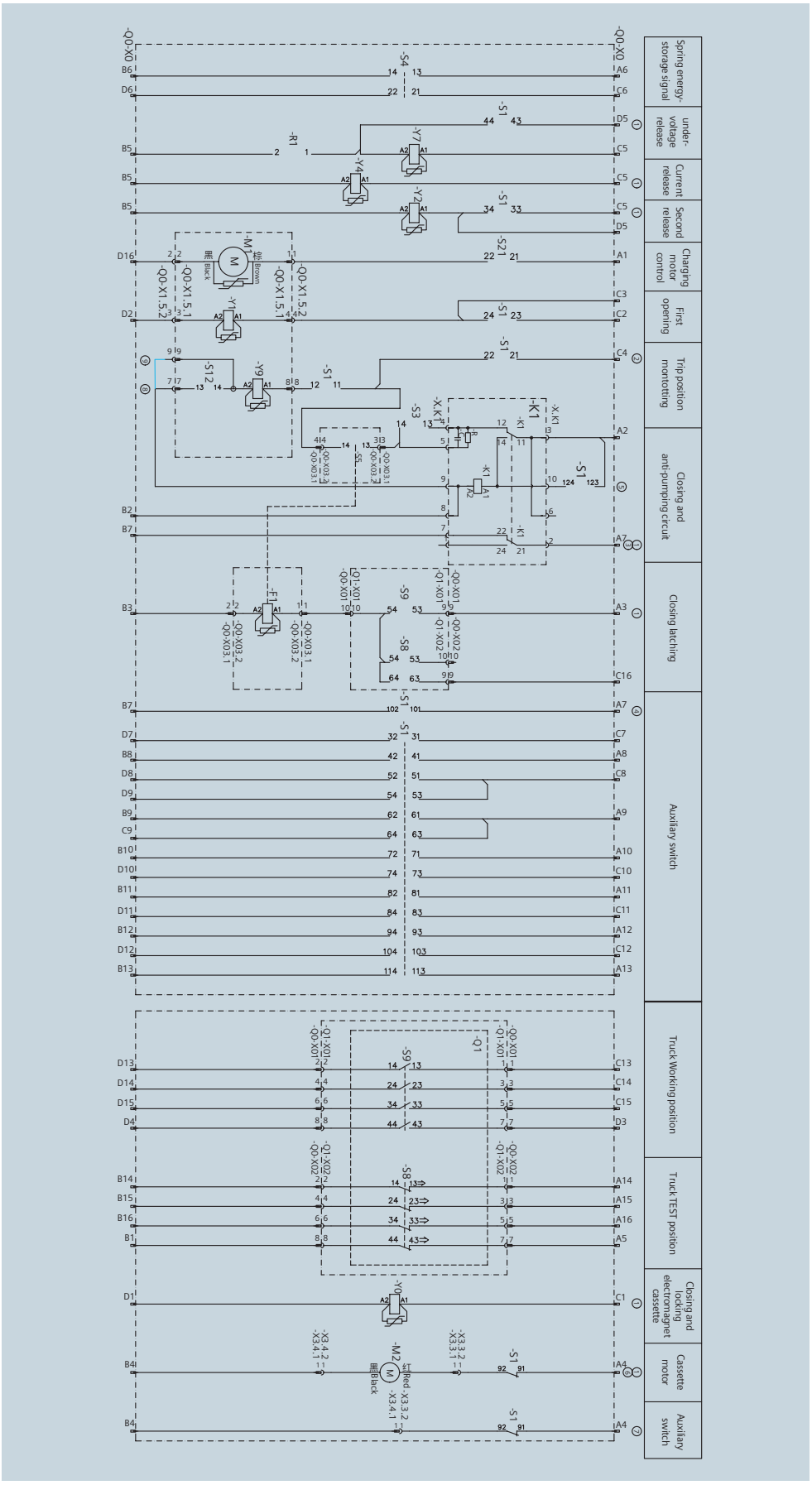
* Force Ventilation inside NXAirS can achieve 5,000A on request

Components

Secondary Wiring Diagram

Designation

- M1, M2 Charging motor, cassette motor
- Y1, Y9 Opening coil, closing coil
- K1 Anti-pumping relay module
- S8, S9 Cassette position switch
- S1 Auxiliary switch
- S3, S4, S5, S12, S21 Position switch
- F1, Y0 Closing and locking electromagnet,cassette locking electromagnet
- Q0, Q1 Circuit-breaker, cassette
- Y2, Y4, Y7, R1 Second release, current release, under-voltage release, resistor



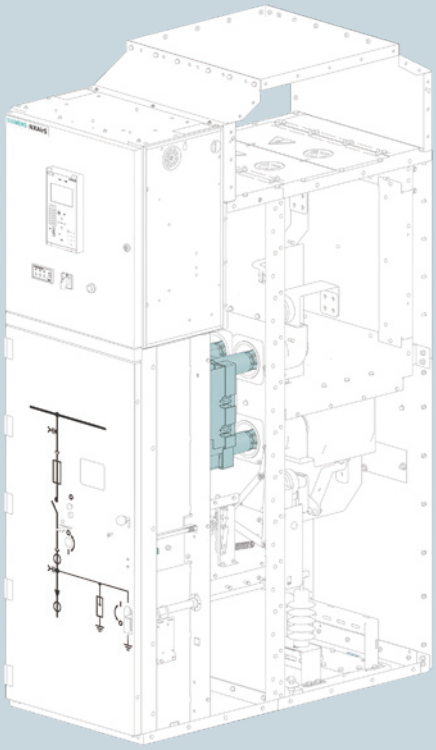
Notes:

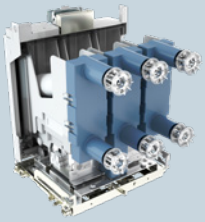
1) The circuit-breaker is in the TEST, OFF and Not Charged status.
2) Optional for parts marked with (1). If necessary, please specify individual requirements in the order.
3) Only one of the second release, under-voltage release and current release can be configured.
4) Part marked with (2) is the trip position monitoring circuit. If necessary, the trip position relay of the relay protection device can be connected at -X0:C4.
5) Part marked with (5) is the anti-pumping function wiring. If the anti-pumping function is not required, -S1:123/124 do not need to be wired.
6) -S12 is the signal switch for TEST/SERVICE position of the circuit-breaker.
7) NC contacts of (3) anti-pumping relay and (4) auxiliary switch can not be selected simultaneously. NC contact of (4) auxiliary switch is selected by default.
8) Wiring with mechanical interlocking according to (8)
9) Wiring without mechanical interlocking according to (9)
10) NC contacts of (6) motor-driven cassette and (7) auxiliary switch can not be selected simultaneously. NC contact of (7) auxiliary switch is selected by default.

Features

- According to IEC 62271-106, GB/T 14808
- Suitable for operating consumers with high switching rates
- Short-circuit protection via 1 HV HRC fuse per phase
- Voltage supply of contactor coil via primary-fused control transformer or via external power supply
- Optional latching module for the contactor
- Racking the contactor via manual operating mechanism
- 64-pole low-voltage plug connector between contactor and fixed part
- Maintenance-free operating mechanisms under normal climatic conditions and for the max. permissible number of operating cycles
- Contact arms generally with silver-plated tulip contacts.

Withdrawable contactor and fuse combination equipment 3TM





3TM vacuum contactor on withdrawable part, with contacts

Electrical data for	3TM43	3TM45
Rated operating voltage	7.2 kV	12 kV
Rated short-time withstand current [1]	8 kA	8 kA
Rated normal current [2]	250 A	160 A
Number of operating cycles: of contactor, mechanical of contactor, electrical I_N	 up to 1,000,000 up to 200,000	 up to 1,000,000 up to 200,000

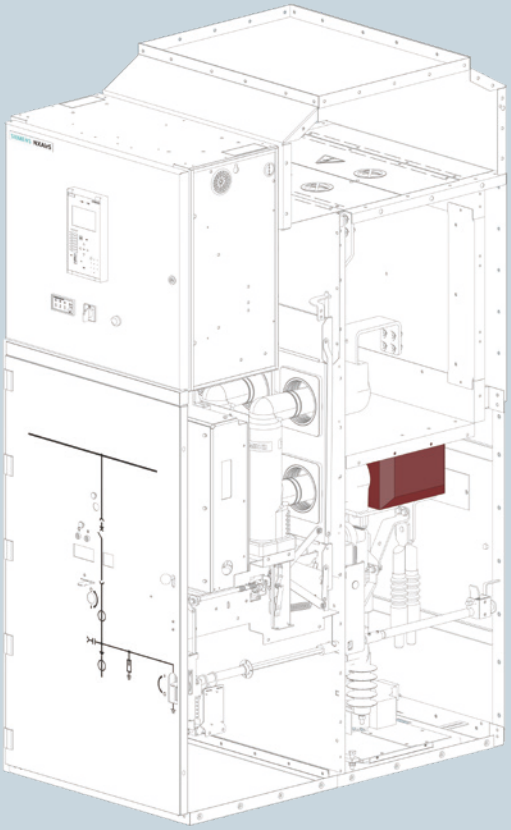
1) Can be used in switchgear with short-time withstand currents up to 50 kA due to the current limitation provided by HV HRC fuses.
2) Depending on the HV HRC fuses installed.

Typical parameters of vacuum circuit-breaker				
Parameter		**Unit**	**Value**	**Value**
Rated voltage		kV	7.2	12
Rated Frequency		Hz	50	50
Rated dielectric level	Rated Short-duration power-frequency withsatnd voltage (r.m.s value,1 min)	kV	32	42
	Rated lightning impulse withstand voltage (peak value)		60	75
	Secondary circuit (1 min)		2	2
Rated breaking current (depending on HV HRC fuses), max		kA	50	50
Rated Peak withstand current (depending on HV HRC fuses), max		kA	125	125
Rated take-over current		A	3600	3600
Contact stroke		mm	5.5-6.5	5.5-6.5
Opening time	Electrical Self-maintenance	ms	20-40	20-40
	Mechanical Self-maintenance		25-45	25-45
Closing time		ms	36-56	36-56
Rated operation frequency	Electrical Self-maintenance	times/hour	1200	1200
	Mechanical Self-maintenance		60	60
Resistance of main circuit		μΩ	≤ 300	≤ 300
Pole center distance		mm	150 ± 2	150 ± 2

Features

- Inductive indoor support-type current transformer in block-type design according to IEC 61869-2, GB 20840.2, standardized, available worldwide
  - Cast-resin insulated
  - Insulation class E
  - Narrow design
  - Option:
    - With coupling electrode for capacitive voltage presence indicator for block-type current transformers
    - Secondary multi ratio possible
- Current transformer with type test certificate and declaration of conformity.

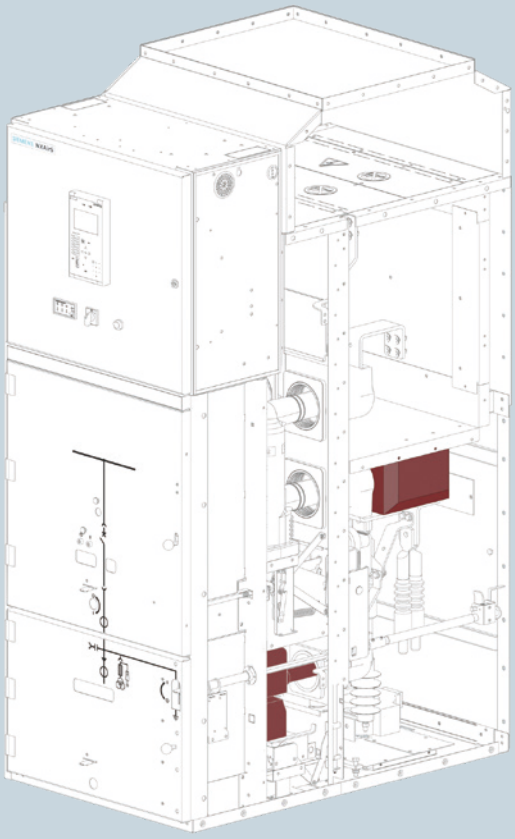
Block-type current transformer

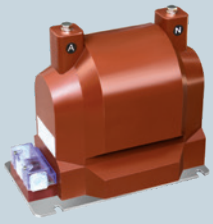


Electrical data for		
Operating voltage		12 kV
Rated primary current		up to 5000 A
Short-time thermal current		up to 40 kA
Duration of short-time current		max. 4 s
Rated peak withstand current		100 kA / 104 kA
Number of secondary cores		up to 3
Secondary current		1 A or 5 A
Accuracy classes	Measuring	0.2 - 0.5, depending on the type of CT
	Protection	5P/30-10P/20, depending on the type of CT
Rating		up to 60 VA, depending on the type of CT

Features

- Inductive principle according to IEC 61869-3, GB 20840.3
  - Cast-resin insulated single-pole
  - Insulation class E
  - Secondary connection via screw-type terminals
  - Option:
    - With earth-fault winding
    - Double-pole voltage transformer





Voltage transformer, fixed-mounted

Voltage transformer, withdrawable-mounted

Electrical data for	
Primary operating voltage	up to 12 kV
Secondary operating voltage	up to 100 V or up to 100 V / $\sqrt{3}$
Accuracy classes	0.2 / 0.5 / 1.0 / 3P / 6P
Rating	up to 200 VA

Siemens NXAirS Intelligent Solution

The intelligent distribution solution is mainly used for the intelligent operation and maintenance application of MV/LV substations, covering from data perception, collection, processing, analysis, storage to application, and featuring a three-level architecture, i.e. field level, edge level and application level.

Field level

Thanks to integrated intelligent sensing technology, such as temperature sensing units, circuit-breaker control loop coils, typical motor characteristics sensing units and arc light sensing technology, the intelligent MV air-insulated switchgear supports holographic status monitoring by data mining, analysis and processing through intelligent devices.

1. Intelligent NXAirS air-insulated switchgear

Control function

- Circuit-breaker ON/OFF control
- Motor-driven cassette movement control
- Motor-driven earthing switch opening and closing control
- One-button sequence control
- max. driving power of the motor 400W, continuous current 3A

Monitoring function

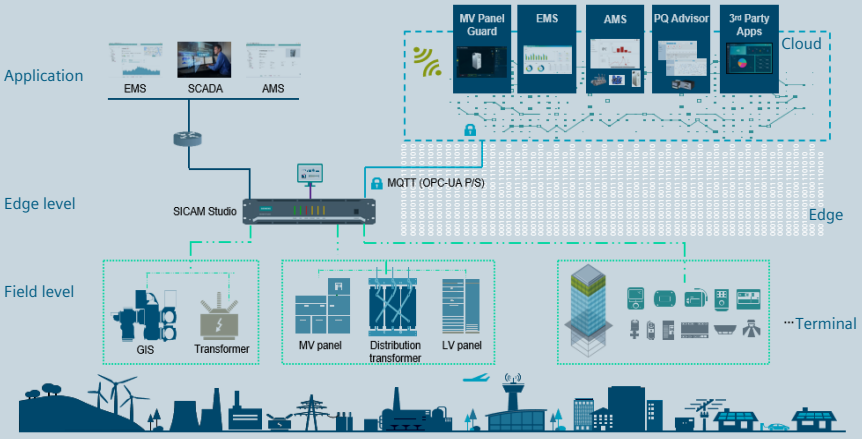
- Wireless temperature online monitoring
- Temperature measurement of cable compartment , busbars, contact arm of circuit-breaker
- Online monitoring of environmental temperature and humidity
- Video monitoring system

Monitoring function

- Operating characteristics of motor-driven cassette
- Operating characteristics of motor-driven earthing switches
- Operating characteristics of tripping and closing coils
- Operating characteristics of charging motor

Statistics of operating status of switchgear

- Analysis of vacuum interrupter life of circuit-breaker
- Statistics of tripping and closing cycles of the switchgear
- Statistics of operating loads



Online temperature monitoring (Busbars, circuit-breakers, cable terminals)

Online monitoring of environmental temperature and humidity

Online monitoring of mechanical characteristics
Operating characteristics of motor-driven cassette
Operating characteristics of motor-driven earthing switches
Operating characteristics of tripping and closing coils
Operating characteristics of charging motor

Electric control and circuit monitoring
Online monitoring of switching status
Closing/Opening/Earthing control
Fault alarm

Arc light protection

One-button sequence control

Video monitoring system

HMI

Intelligent solution

Architecture, device and function

7SJ686+All in One intelligent protection solution

- Protection function
- Arc light protection
- Motor-operated and one-button sequence control
- Diagnosis and warning of abnormal temperature rise
- Environmental temperature and humidity monitoring
- VCB characteristics
- Electrical life prediction of circuit-breaker

6MD685 intelligent solution

- Color touchscreen display supports embedded and DIN rail mounting
- 48/110/220 VDC power supply
- Wireless temperature measurement function
- Analysis and evaluation of the electrical life of circuitbreaker
- Online monitoring of VCB characteristics
- Multiple sensor connections
- Supports Modbus RTU/Modbus TCP/IEC 61850 communication protocols

Edge level

SICAM Studio intelligent gateway integrates many functions such as local monitoring backend (power monitoring), protocol conversion and cloud gateway, enabling edge computing and control functions and transferring the data collected from the field level to the backend via protocol conversion.

- Integrated Siemens professional power monitoring software
- Supports multiple power communication protocols
- Intelligent gateway enables data to be uploaded to the cloud
- Edge computing application deployment, ready to use

Application level

NXpower intelligent distribution management platform allows real-time monitoring of switchgear status, efficient asset management, reliable and proactive operation and maintenance, intelligent energy efficiency management and power quality insight.

- EMS Basic: for small and medium-sized enterprises, integrating the standard energy audit template and KPI into the IPC to reduce the use cost and realize rapid deployment and delivery
- AMS Asset Management System: allowing reasonable asset operation and maintenance, status monitoring and lifecycle management
- PQ Advisor online power quality analysis

Optical arc detection and protection system

Description

- Optical arc detection and protection system recognize internal arcs by means of optical sensors. This allows to detect arising internal arcs reliably and quickly. Accordingly, the protection device can trip quickly and without delay times.

Benefits

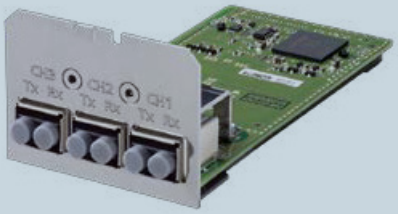
- Supports the self-checking function for optical circuit cut-off
- Arc action threshold value can be set by software
- Double criterion for fast arc and over-current with mutation algorithm
- 4ms action time - pure light criterion, 6ms - double criterion based on arc and rapid varying of current, 15ms - double criterion based on arc and over-current
- With arc wave recording function to record electrical value and arc sampling value, which is convenient for analysis and diagnosis
- The protection of busbar and outgoing switchgear can be configured
- To distinguish the fault of each busbar section and selectively switch-off the bus sectionalizer panel or incoming circuit breaker to minimize the outage range by the fault

Design and function

Siemens 7SJ686 with arc protection module

- Optical point sensors with optical fiber for signal transmission
- Line sensors in the busbar compartment possible

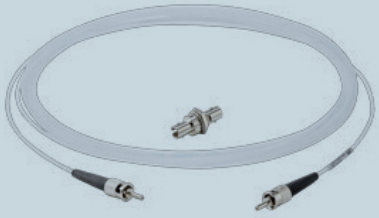
SIPROTEC 5 series



Arc protection module

Point sensor with optical fiber and connection

Supply cable for line sensor with connection



Line sensor

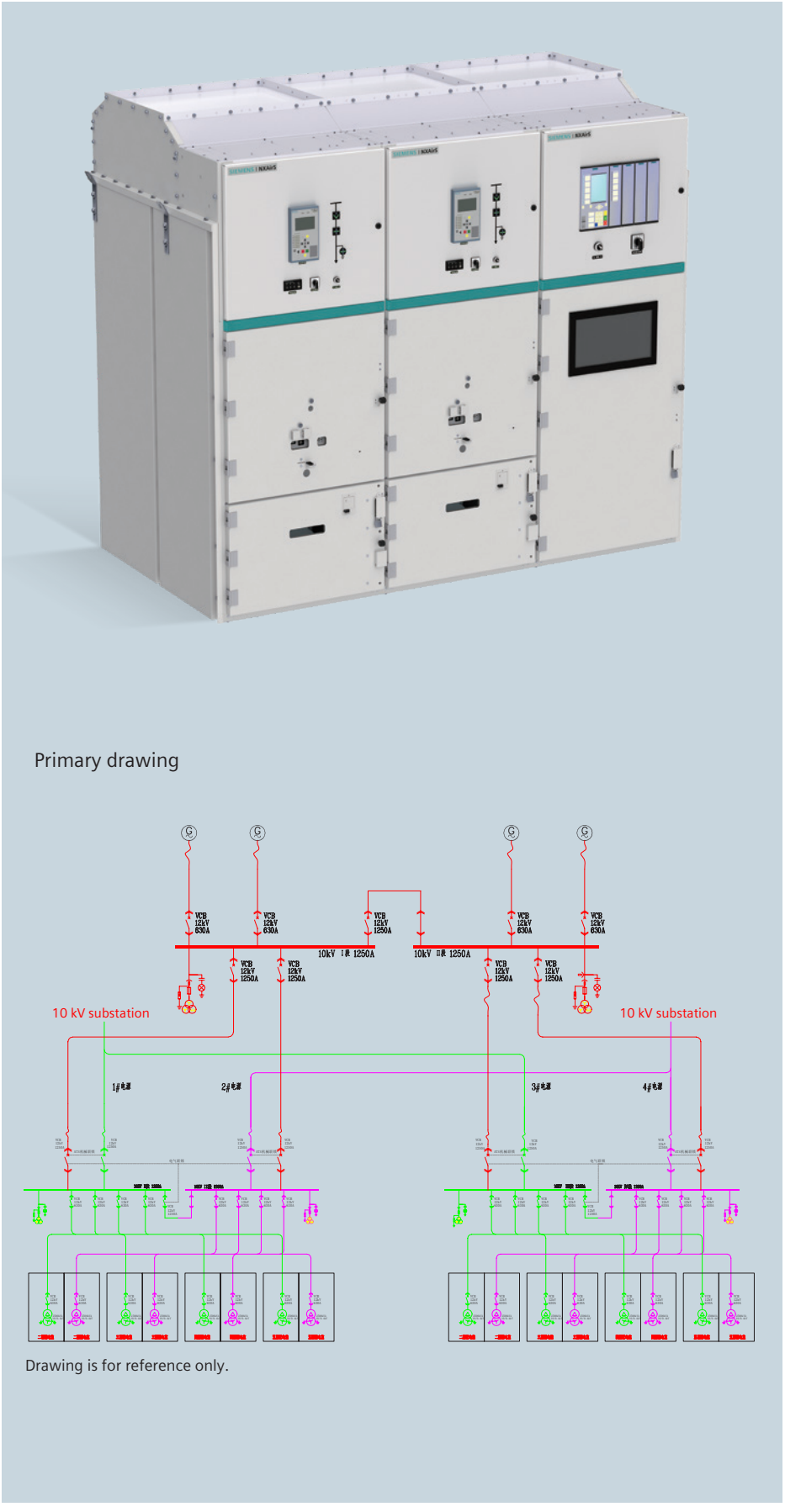
Intelligent solution

NXAirS-ATS medium-voltage automatic transfer switchgear

NXAirS-ATS medium-voltage automatic transfer switchgear is type tested and metal-enclosed switchgear for indoor installation according to IEC 62271-200, GB/T 3906 and T/CECS 10151 standard requirements.

NXAirS-ATS consists of two parts as power incoming switchgears and controlgear

NXAirS-ATS can be configured according to the requirements of the power distribution system. The following is a typical example of its application in a medium voltage distribution system.



Drawing is for reference only.

Description

- SIQuench is an active arc detection system by Siemens, which quenches the internal arc in a time span of less than 5 milliseconds.

Benefits

- Considerable reduction of pressure and arc energy
- Prevents thermal, contamination and toxicity effects from damaging the equipment with its surroundings
- Fast restart
- Minimization of switchgear downtimes and reduction of economic losses.

Design and function

- Basic components
  - SIQuench main switch unit
  - Controller
  - Optical sensors
  - Time-overcurrent protection
- Continuous monitoring of light and overcurrent; in the event of an internal arc, SIQuench earths the switchgear quickly by means of a controlled mechanical 3-phase short circuit
- Definitive breaking of the short-circuit current through the circuit-breaker of the incoming feeder.

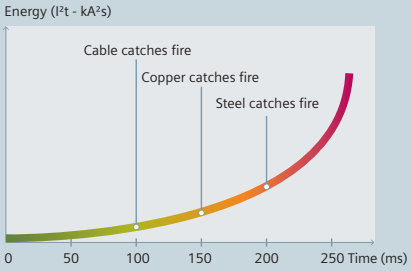
Technical data

- Up to 12 kV, up to 40 kA
- Fast mechanical stored-energy spring mechanism
- Continuous self-monitoring
- 5 switching operations at full rated short-time withstand current (with peak withstand current)
- Maintenance-free for 20 years
- Service life of 30 years as a minimum.

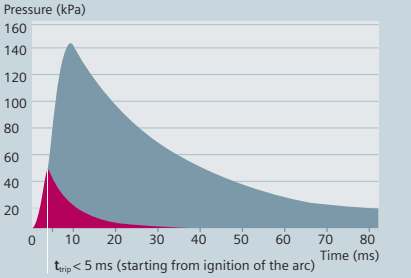
Installation possibilities

- In top box at the busbar (fixed mounted)
- Factory-assembled and -tested.

SIQuench fixed-mounted at the busbar



Damage caused by arc energy



Sample pressure curve in a compartment for an arc current of 80 kA (peak) / 31.5 kA (r.m.s.)

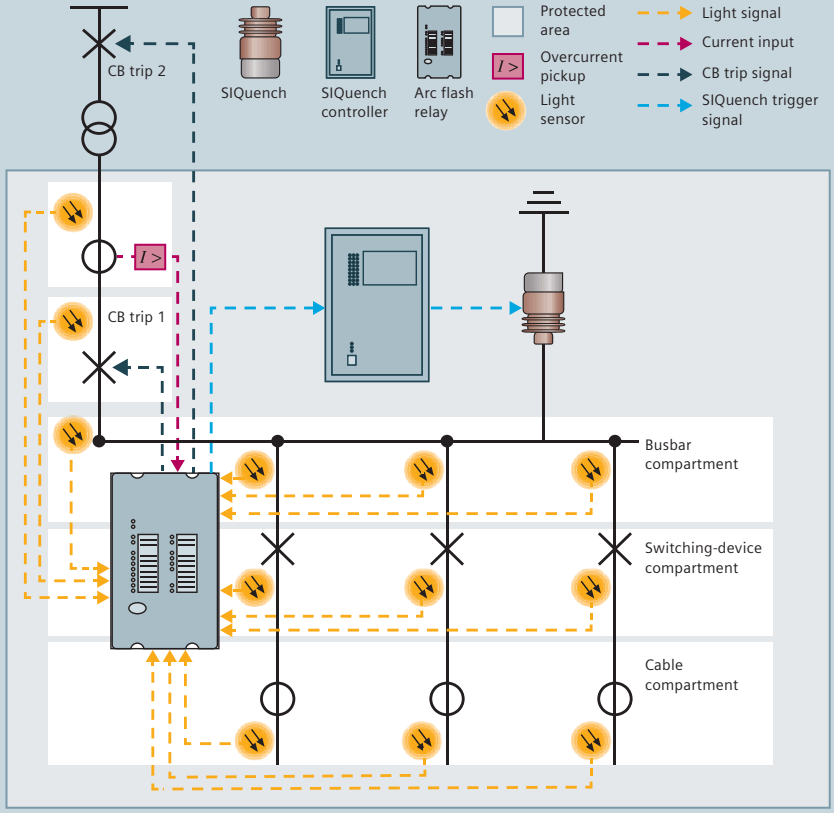
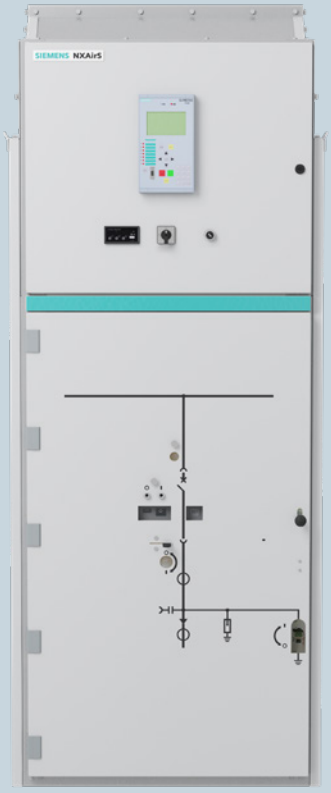


Illustration of the system integration in an exemplary arc protection application (one incoming feeder with single protection zone)

Technical data

Electrical data



Up to 12 kV; 40 kA; 5000 A

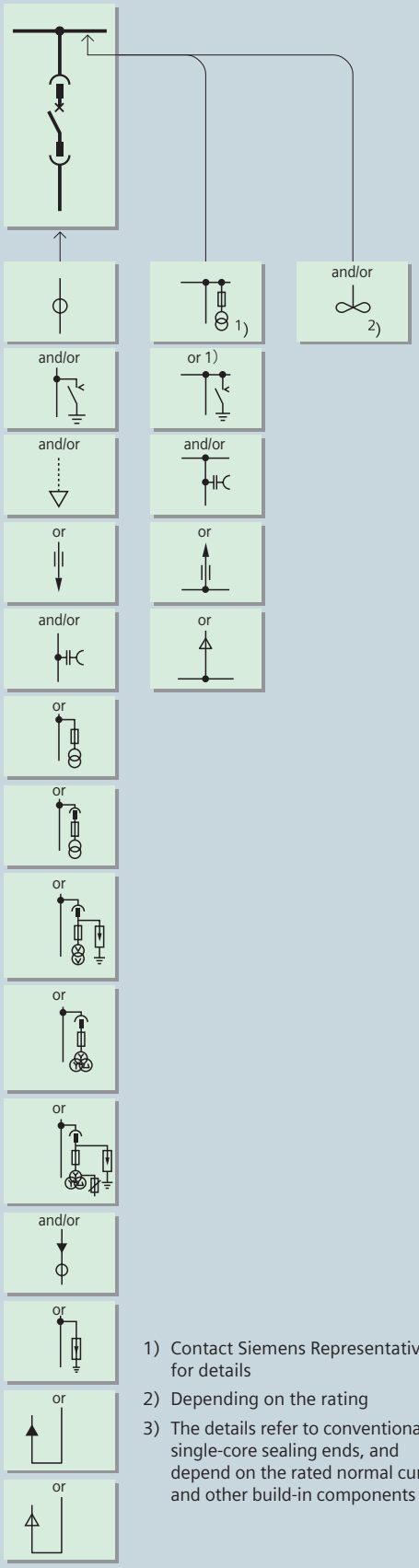
Rated values up to 40 kA

Rated	kV	7.2	12
frequency	Hz	50/60	50/60
short-duration power-frequency withstand voltage (phase-to-phase, phase-to-earth)	kV	20（32）	28（42）
lightning impulse withstand voltage (phase-to-phase, phase-to-earth)	kV	60	75
short-circuit breaking current	max. kA	40	40
short-time withstand current, 4 s	max. kA	40	40
short-circuit making current [1]	max. kA	100/104	100/104
peak withstand current [1]	max. kA	100/104	100/104
normal current of busbar	max. A	5000	5000
normal current of feeders:			
With circuit-breaker	max. A	5000	5000
With contactor [2]	max. A	250	160
With disconnector link	max. A	5000	5000
Bus sectionalizer	max. A	5000	5000
Busbar connection panel	max. A	5000	5000
Load-break switch and fuse combination panbel	max. A	250	140

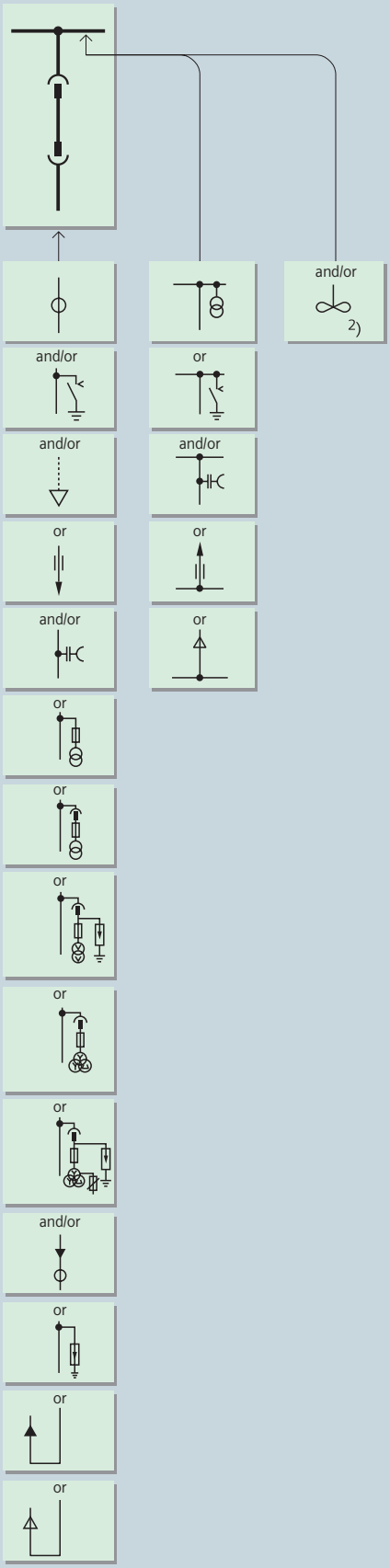
1) Values for 50 Hz: 100 kA
60 Hz: 104 kA

2) Current values dependent on HV HRC fuses

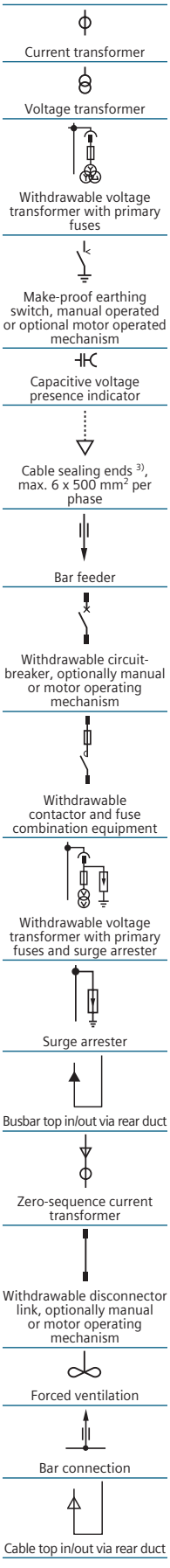
Circuit-breaker panel



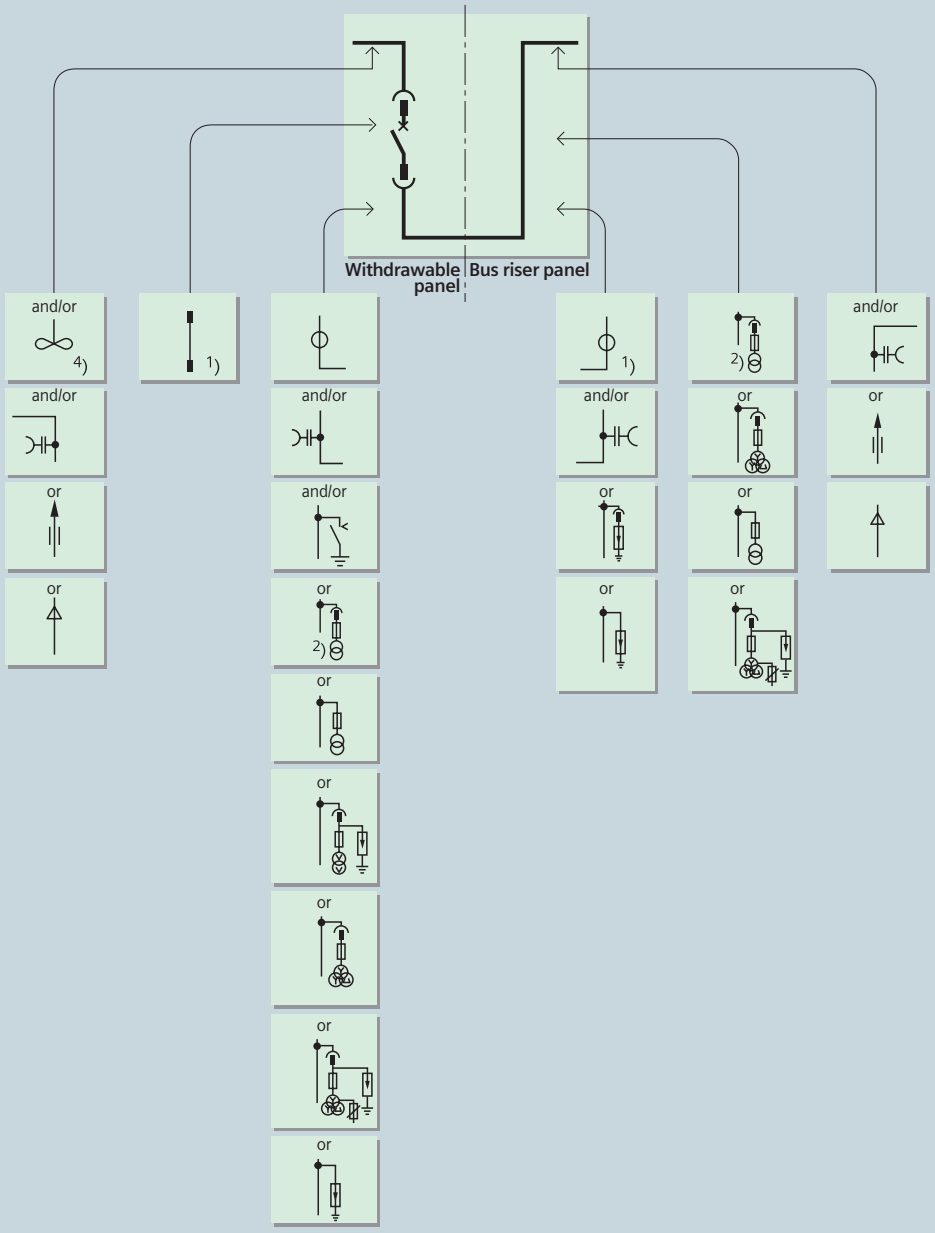
Disconnecting panel



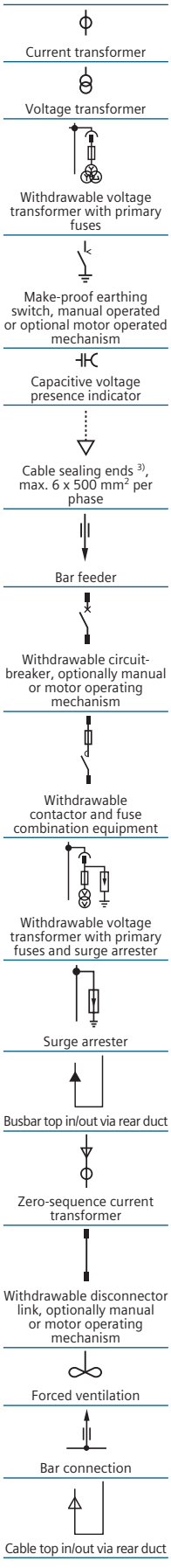
1) Contact Siemens Representative for details
2) Depending on the rating
3) The details refer to conventional single-core sealing ends, and depend on the rated normal current and other build-in components



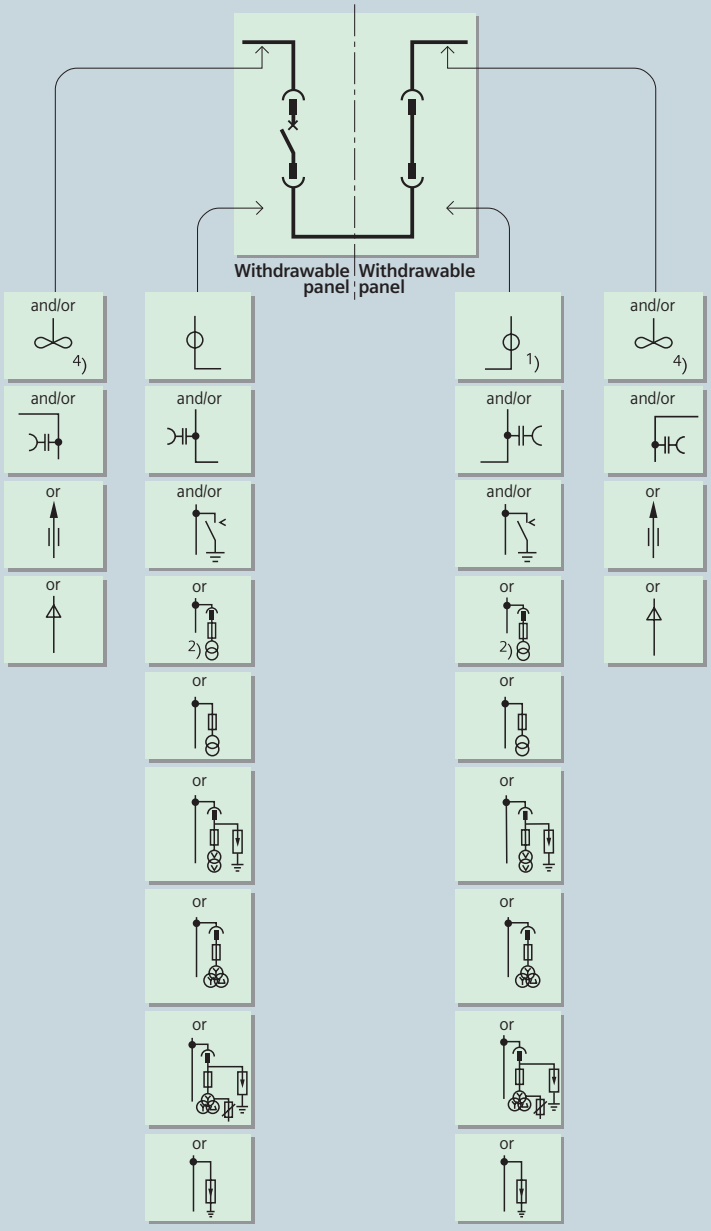
Bus sectionalizer (mirror-image installation also possible)



1) CT installation shall be combined with the withdrawable disconnector link
2) Withdrawable metering unit
3) The details refer to conventional single-core sealing ends, and depend on the rated normal current and other build-in components
4) Depending on the rating



Bus sectionalizer (mirror-image installation also possible)



1) CT installation shall be combined with the withdrawable disconnector link
2) Withdrawable metering unit
3) The details refer to conventional single-core sealing ends, and depend on the rated normal current and other build-in components
4) Depending on the rating


Current transformer


Voltage transformer


Withdrawable voltage transformer with primary fuses


Make-proof earthing switch, manual operated or optional motor operated mechanism


Capacitive voltage presence indicator


Cable sealing ends [3], max. 6 x 500 mm² per phase


Bar feeder


Withdrawable circuit-breaker, optionally manual or motor operating mechanism


Withdrawable contactor and fuse combination equipment


Withdrawable voltage transformer with primary fuses and surge arrester


Surge arrester


Busbar top in/out via rear duct


Zero-sequence current transformer

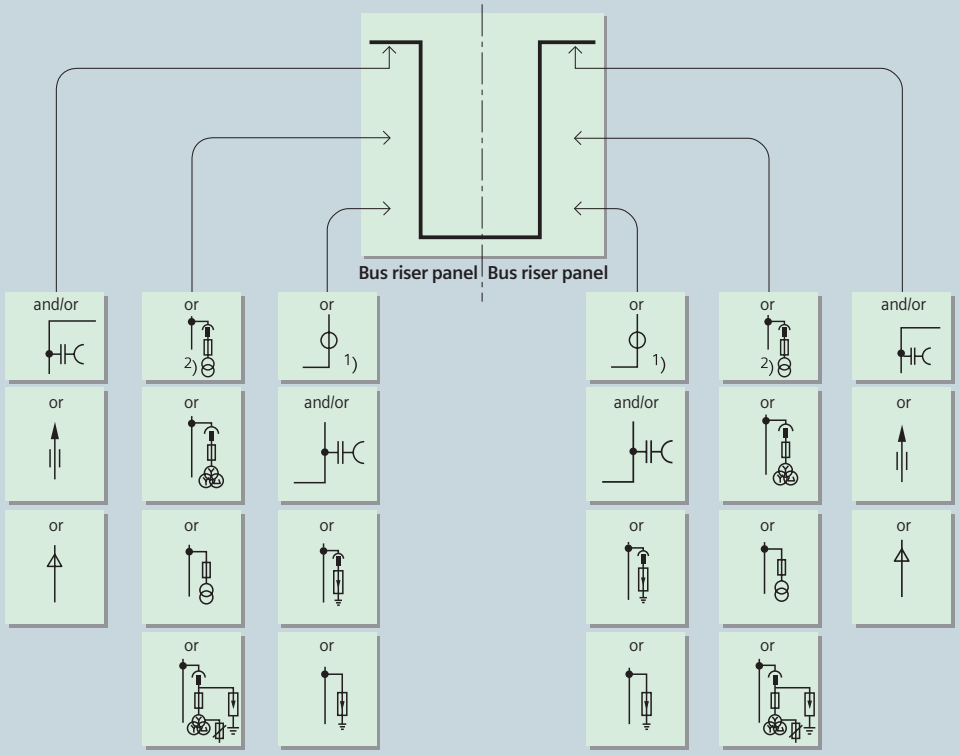
Withdrawable disconnector link, optionally manual or motor operating mechanism


Forced ventilation

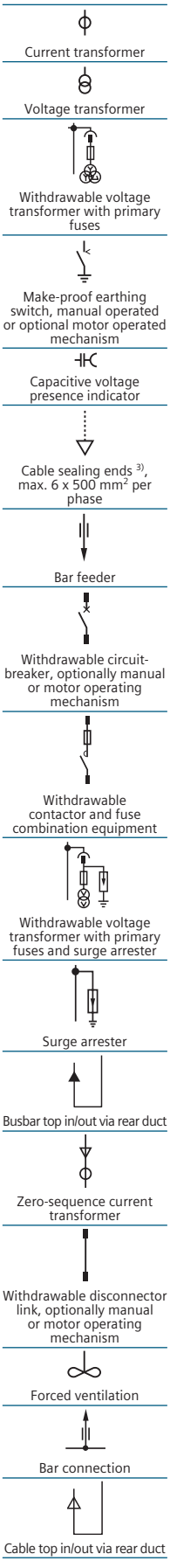

Bar connection


Cable top in/out via rear duct

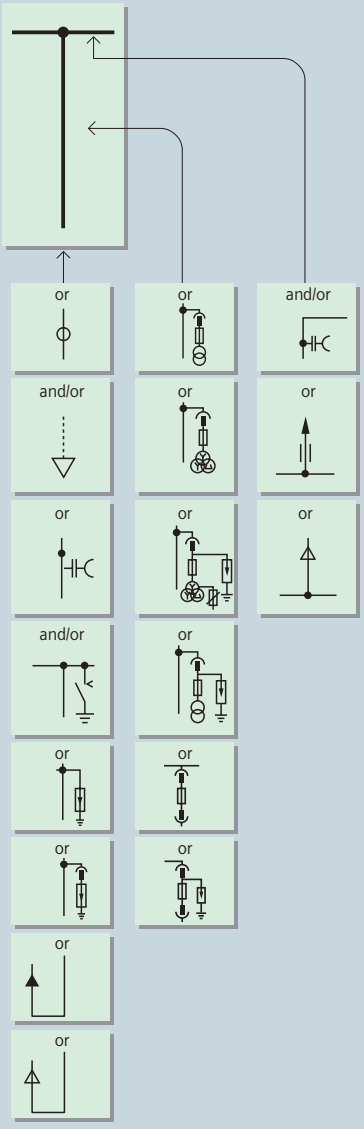
Bus sectionalizer (mirror-image installation also possible)



1) CT installation shall be combined with the withdrawable disconnector link
2) Withdrawable metering unit
3) The details refer to conventional single-core sealing ends, and depend on the rated normal current and other build-in components

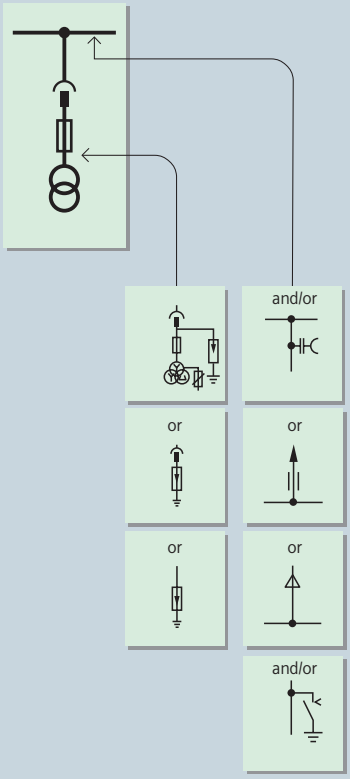


Busbar connection panel and metering panel



1) The details refer to conventional single-core sealing ends, and depend on the rated normal current and other build-in components

Voltage transformer panel



Current transformer

Voltage transformer

Withdrawable voltage transformer with primary fuses

Make-proof earthing switch, manual operated or optional motor operated mechanism

Capacitive voltage presence indicator

Cable sealing ends [1], max. 6 x 500 mm² per phase

Bar feeder

Withdrawable circuit-breaker, optionally manual or motor operating mechanism

Withdrawable contactor and fuse combination equipment

Withdrawable voltage transformer with primary fuses and surge arrester

Surge arrester

Busbar top in/out via rear duct

Zero-sequence current transformer

Withdrawable disconnector link, optionally manual or motor operating mechanism

Forced ventilation

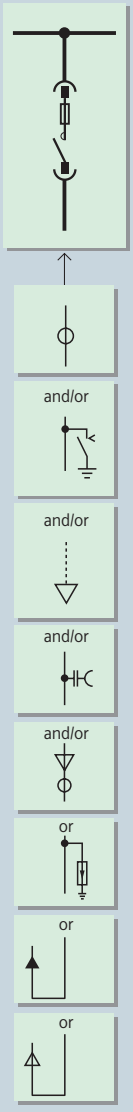
Bar connection

Cable top in/out via rear duct

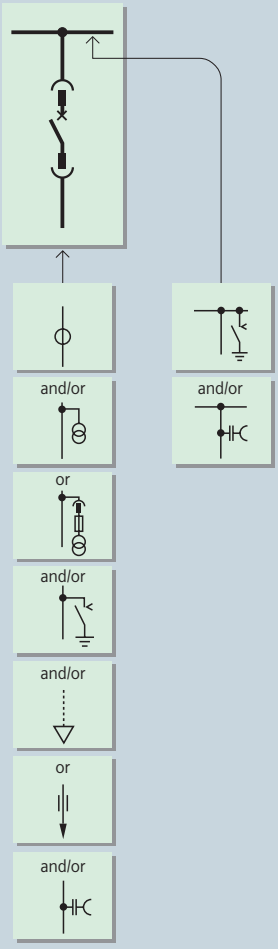
Technical data

Product range, switchgear panels

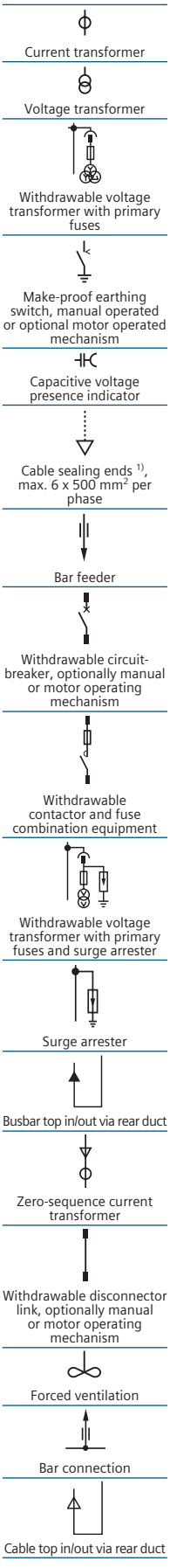
Vacuum contactor panel



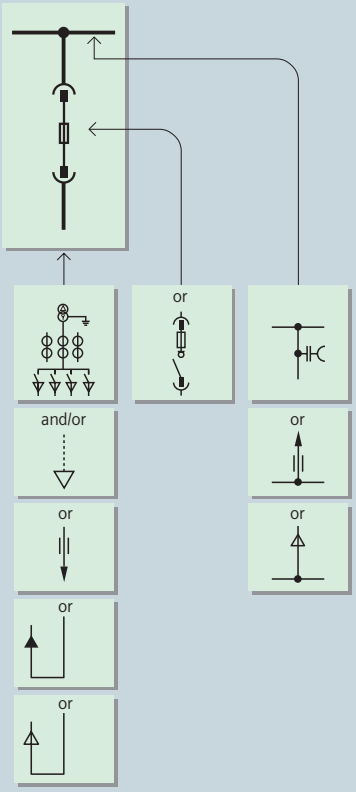
SIQuench fixed - mounted



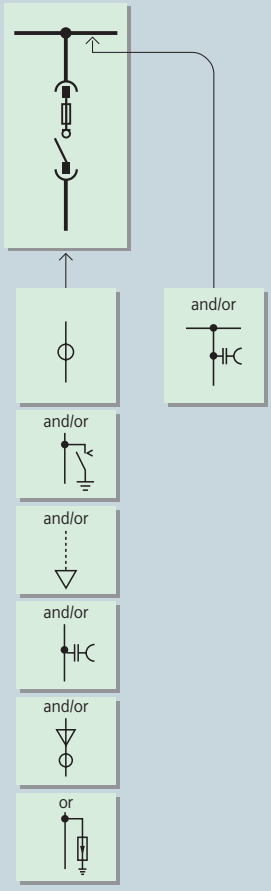
1) The details refer to conventional single-core sealing ends, and depend on the rated normal current and other build-in components



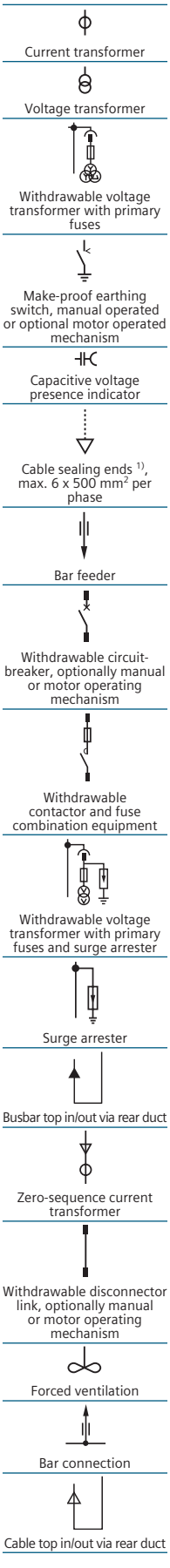
Self-used power transformer panel



Load-break switch and fuse combination panel

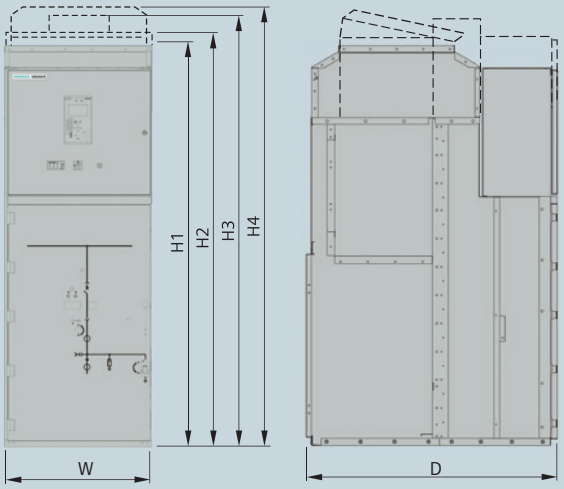


1) The details refer to conventional single-core sealing ends, and depend on the rated normal current and other build-in components



Technical data

Dimensions

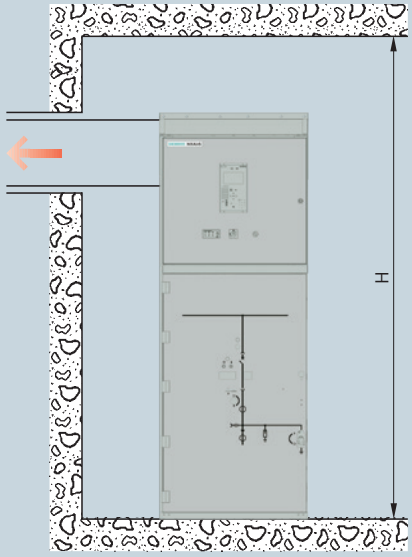


NXAirS ≤ 12 kV ; ≤ 40 kA ; ≤ 5000 A

		Panel type	Rated normal current	Short-time withstand current	
				≤ 31.5 kA	40 kA
Width in mm	W	Circuit-breaker panel, disconnecting panel	630 A 1250 A 1600 A 2000 A 2500 A 3150 A 4000 A 5000 A	550 / 650 / 800 550 / 650 / 800 800 800 800 / 1000 [1] 1000 1000 1000	800 800 800 800 800 / 1000[1] 1000 1000 1000
		Bus sectionalizer	1250 A 1250 A ~ 2500 A > 2500 A	2 x 550 / 650 / 800 2 x 800 / 1000 [1] 2 x 1000	2 x 800 2 x 800 / 1000[1] 2 x 1000
		Metering panel	–	550 / 650 / 800	800
		Contactor panel	≤ 250 A [4]	650	650
		Load-break switch and fuse combination equipment panel	≤ 140 A [4]	800	800
		Self-used transformer panel	–	550 / 650 / 800 / 1000	800 / 1000
		Busbar connection and metering panel	–	550 / 650 / 800	800 / 1000
Height mm	H1	Standard panel or standard panel with natural ventilation		2200	2200
	H2	With higher low-voltage compartment or additional compartment for busbar components		2350	2350
	H3	With forced ventilation		2380	2380
	H4	With optional arc absorber [2]		2400	2400
Depth mm	D [3]	Single-busbar, all panel types (except load-break switch and fuse combination equipment panel)		1350 / 1500	1350 / 1500
		550 mm width panel		1350	–
		Load-break switch and fuse combination equipment panel		1350	1500

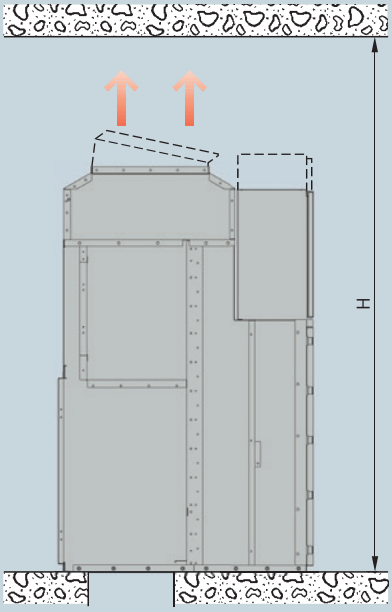
1) 1000 mm depends on the rating
2) Number of absorbers depends on switchgear configuration
3) Rear duct with depth 150 mm / 300 mm / 450 mm is used for the special configuration
4) Depending on the HV HRC fuses installed and the rated voltage

Pressure relief out of the switchgear room through a pressure relief duct



Horizontal pressure relief duct

Pressure relief into the switchgear room through absorbers

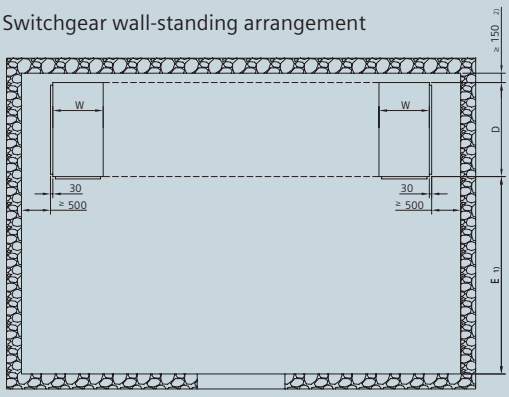


Type of pressure relief	Rated voltage	Ceiling height D in mm for short-circuit current		
		25 kA	31.5 kA	40 kA
Pressure relief into the switchgear room through absorbers	12 kV	≥ 2900	≥ 2900	≥ 2900
Pressure relief out of the switchgear room through a pressure relief duct	12 kV	≥ 2500	≥ 2500	≥ 2500
IP41/42	12 kV	2900	2900	2900
Width of control aisle E (min.) for panel replacement	12 kV	1800	1800	1800

Installation arrangement (bird-view)

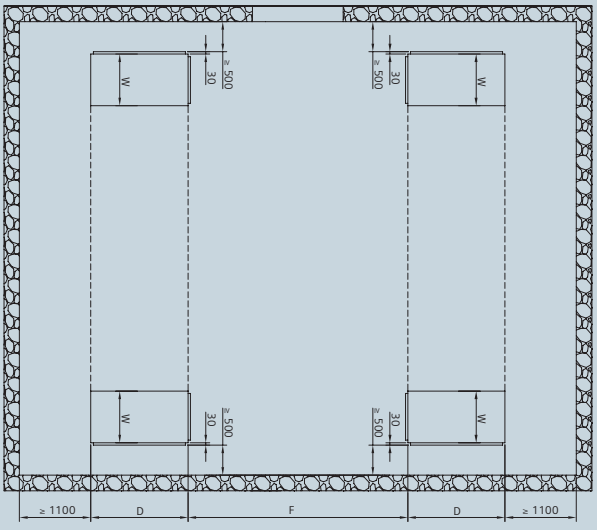
For dimensions W (width) and D (depth), see table on Page 34. (unit, mm)

Switchgear wall-standing arrangement



Recommandation value:
E=1800 mm
F=2500 mm
As the width of panel, value W is changed according to the request of actual project
As the depth of panel, value D is changed according to the request of actual project

Switchgear free-standing arrangement



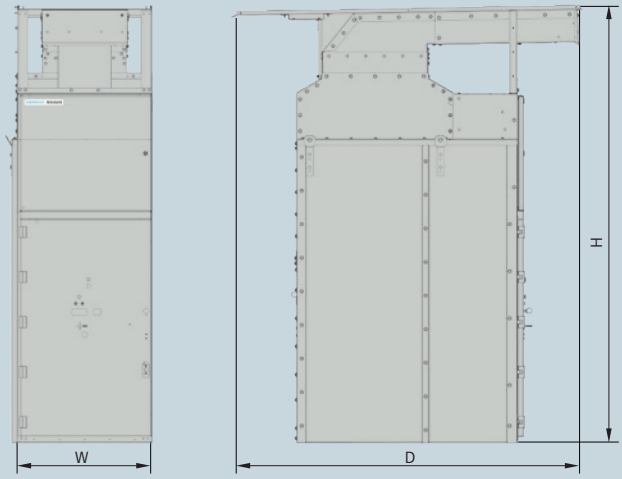
Technical data

Typical for IP41/42

Features

- Special design for application in marine, offshore, data center and some other areas, based on the NXAirS standard product range
- Factory-assembled, metal-enclosed and type-tested switchgear according to IEC 62271-200
- Internal arc classification IAC A FLR up to 40 kA for 1 second
- Pressure relief into the switchgear room through absorbers and exhaust, with an optimized ceiling height of 2900 mm
- Degrees of protection IP41 or IP42 are possible

Dimensions



Switchgear with IP41/42 front / side view

		Panel type	Rated normal current	Short-time withstand current	
				≤ 31.5 kA	40 kA
Width mm	W	Circuit-breaker panel, disconnecting panel	630 A 1250 A 2500 A 3150 A 4000 A 5000 A	550 / 650 / 800 550 / 650 / 800 800 / 1000 1000 1000 1000	- 800 800 / 1000 1000 1000 1000
Height mm	H	Standard panel with higher low-voltage compartment		2600	2600
Depth mm	D	Single busbar, all panel types with roof for IP41/42		2090	2090

Transport

NXAirS 12 kV switchgear is delivered in form of individual panels.
Please observe the following:
- Transport facilities on site
- Transport dimensions and transport weights
- Size of door openings in building.

Packing

Means of transport: Rail and truck
– Panels on pallets
– Open packing with PE protective foil.

Means of transport: Seafreight
– Panels on pallets
– Sealed in PE protective foil, with closed wooden crate
– With desiccant bags
– With sealed wooden base
– Max. storage time: 6 months.

Means of transport: Airfreight
– Panels on pallets
– In wooden latticed crate with sealed upper and lower PE protective foil.

These transport and packing stipulations apply to the Complete NXAirS product family. More information to transport dimensions/transport weights is given in the corresponding table and may change depending on the project.

NXAirS up to 40 kA

Transport dimensions, transport weights [1] for individual panels [1]

Panel widths	Transport dimensions Width x Height x Depth	Transport weight	
		with packing	without packing
mm	mm × mm × mm	~ kg	~ kg
Transport by rail or truck			
1 × 550	900 x 2440 x 1700	800	770
1 × 650	1100 x 2420 x 1700	980	950
1 × 800	1100 x 2420 x 1700	1240	1200
1 × 1000	1300 x 2700 x (1700 / 2000)	1390	1350
1 × 1000 [2]	1300 x 2700 x (1700 / 2000)	1690	1650
Transport by seafreight or airfreight			
1 × 550	900 × 2440 × 1700	900	770
1 × 650	1100 × 2420 × 1700	1080	950
1 × 800	1100 × 2420 × 1700	1350	1200
1 × 1000	1300 × 2700 × (1700 / 2000)	1510	1350
1 × 1000 [2]	1300 × 2700 × (1700 / 2000)	1810	1650

1) Average values depending on the components which panels are equipped
2) Panel with forced ventilation

Standards

Standards, specifications, guidelines

Type of service location

The switchgear can be used as indoor installation according to IEC 61936.1 (Power Installations exceeding AC 1 kV) and VDE 0101

- Outside lockable electrical service locations at places which are not accessible to the public. Enclosures of switchgear can only be removed with tools
- In lockable electrical service locations. A lockable electrical service location is a place outdoors or indoors that is reserved exclusively for housing electrical equipment and which is kept under lock and key. Access is restricted to authorized personnel and persons who have been properly instructed in electrical engineering. Untrained or unskilled persons may only enter under the supervision of authorized personnel or properly instructed persons.

Dielectric strength

- The dielectric strength is verified by testing the switchgear with rated values of short-duration power-frequency withstand voltage and lightning impulse withstand voltage according to IEC 62271-1 and GB/T 11022 (see table "Dielectric strength").
- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 °C, 11 g/m^3 water content according to IEC 60071 and GB 311.1).
- The dielectric strength decreases with increasing altitude. For site altitudes above 1000 m (above sea level) the standards do not provide any guidelines for the insulation rating, but leave this to the scope of special agreements.
- Site altitude
  - As the altitude increases, the dielectric strength of insulation in air decreases due to the decreasing air density. This reduction is permitted up to a site altitude of 1000 m according to IEC and GB.
  - For site altitudes above 1000 m, a higher insulation level must be selected. It results from the multiplication of the rated insulation level for 0 to 1000 m with the altitude correction factor K_a.

Standards

The switchgear complies with the relevant standards and specifications applicable at the time of type tests.

In accordance with the harmonization agreement reached by the countries of the European Union, their national specifications conform to the IEC standard.

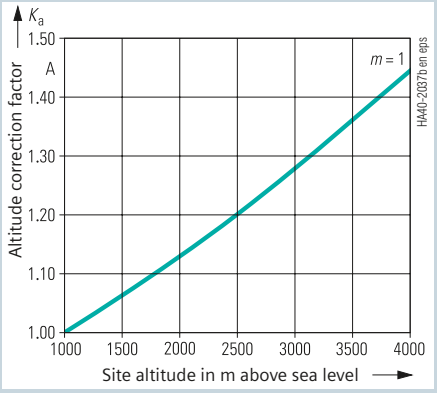
The switchgear NXAirS optional comforms to the GB standard.

Table – Dielectric strength

Rated voltage (r.m.s. value)	kV	7.2	12
Rated short-duration power-frequency withstand voltage (r.m.s. value)			
– Between phases and to earth	kV	20 (30)	28 (42)
– Across isolating distances	kV	23 (34)	32 (48)
Rated lightning impulse withstand voltage (peak value)			
– Between phases and to earth	kV	60	75
– Across isolating distances	kV	70	85

Altitude correction factor Ka

For site altitudes above 1000 m, the altitude correction factor K_a is recommended, depending on the site altitude above sea level.



Rated short-duration power-frequency withstand voltage to be selected for site altitudes > 1000 m
≥ Rated short-duration power-frequency withstand voltage up to ≤ 1000 m · K_a

Rated lightning impulse withstand voltage to be selected for site altitudes > 1000 m
≥ Rated lightning impulse withstand voltage up to ≤ 1000 m · K_a

Example:
1500 m site altitude above sea level,
12 kV switchgear rated voltage,
75 kV rated lightning impulse withstand voltage
Rated lightning impulse withstand voltage to be selected =
75 kV x 1.063 ≈ 80 kV

Result:
According to the above table, switchgear for a rated voltage of 12 kV with a rated lightning impulse withstand voltage of 85 kV for 2000 m application is to be selected.

Overview of standards

		IEC standard	GB standard
Switchgear	NXAirS	IEC 62271-1	GB/T 11022
		IEC 62271-200	GB 3906
Devices	Circuit-breakers	IEC 62271-100	GB 1984
	Vacuum contactors	IEC 62271-106	GB/T 14808
	Disconnectors and earthing switches	IEC 62271-102	GB 1985
	Switch-disconnectors	IEC 62271-103	GB/T 3804
	Switch-disconnector / fuse combination	IEC 62271-105	GB/T 16926
	HV HRC fuses	IEC 60282-1	GB/T 15166.2
	Voltage detecting systems	IEC 61243-5	-
Degree of protection	IP-Code	IEC 60529	GB/T 4208
	IK-Code	IEC 62262	GB/T 20138
Insulation	–	IEC 60071	GB 311.1
Instrument transformers	–	IEC 61869-1	
	Current transformers	IEC 61869-2	GB 20840.2
	Voltage transformers	IEC 61869-3	GB 20840.3
Installation, erection	–	IEC 61936-1	GB 36271.1

Current carrying capacity

- According to IEC 62271-200 or IEC 62271-1, GB 11022 or GB 3906 the rated normal current refers to the following ambient air temperatures:
  - Maximum of 24-hour mean + 35 °C
  - Maximum + 40 °C
- The current carrying capacity of the panels and busbars depends on the ambient air temperature outside the enclosure.

Internal arc classifications

- Protection of operating personnel by means of tests for verifying the internal arc classification
- Internal arcing tests must be performed in accordance with IEC 62271-200 / GB 3906
- Definition of criteria:
  - Criterion 1:
    Correctly secured doors and covers do not open, limited deformations are accepted.
  - Criterion 2:
    No fragmentation of the enclosure, no projection of small parts above 60 g
  - Criterion 3:
    No holes in accessible sides up to a height of 2 m
  - Criterion 4:
    No ignition of indicators due to hot gases
  - Criterion 5:
    The enclosure remains connected to its earthing point.
- Beyond the standards mentioned above, NXAirS switchgear up to 40 kA / 1 s is optionally provided with confinement of an internal arc to the respective compartment.

Seismic capacity (option)

NXAirS switchgear can be upgraded for regions at risk from earthquakes.
For upgrading, earthquake qualification testing has been carried out in accordance with the following standards:

- IEC 62271-2
  High-voltage switchgear and controlgear - Part 2: Seismic qualification for rated voltages of 72.5 kV and above
- IEC 62271-200
  High-voltage switchgear and controlgear - Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
- GB/T 13540
  Seismic qualification for high voltage switchgear and controlgear
- GB 3906
  Alternating-current metal-enclosed switchgear and controlgear for rated voltages above 3.6 kV and up to and including 40.5 kV

Color of the panel front

RAL 7035 (light gray).

Climate and environmental influences

The NXAirS switchgear is suitable for application in indoor installations under normal operating conditions as defined in the standard IEC 62271-1 and GB 11022.

- Temperature -5°C ~ +55°C
  -25°C ~ +55°C [1] (optional)
- Relative air humidity Mean value over 24 hours 1): ≤ 95 %
  Mean value over 1 month: ≤ 90 %
- Condensation Occasionally
  Frequently
- Site altitude Altitude correction to be considered (see page 30)
- No significant pollution of the ambient air (dust, gases, vapors, salts).

Recycling

The switchgear can be recycled in ecological manner in compliance with existing legislation. Auxiliary devices such as short-circuit indicators have to be recycled as electronic scrap.

Batteries have to be recycled professionally.

Terms

"Make-proof earthing switches" are earthing switches with short-circuit making capacity according to

- IEC 62271-102
- GB 1985

Protection against solid foreign objects, electric shock and water

NXAirS switchgear fulfills according to the standards

IEC 62271-1	GB 11022
IEC 62271-200	GB 3906
IEC 60529	GB 4208
IEC 62262	GB/T 20138

the following degrees of protection:

Switchgear panel	NXAirS ≤ 12 kV
Degree of protection for the enclosure optionally	IP3X IP4X, IP41, IP42
Degree of protection for the partitions	IP2X
Degree of protection for the enclosure against mechanical impacts from outside	IK07

For secondary devices in the low-voltage door, the stipulations of the IP degree of protection apply according to the definitions for the switchgear enclosure.

[1] Secondary devices (e.g. protection devices, meters, measuring transducers, etc.) must be suitable for the given operating conditions

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