SIEMENS

Ingenuity for life

Air Insulated Switchgear NXAirS, 40.5kV

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Applications

Type

NXAirS 40.5kV withdrawable metal enclosed medium voltage switchgear is indoor switchgear, type tested, in compliance with GB3906 - 2006, DL404 - 2007, IEC 62 271 - 200, GOST 1516.3-96 standards

Loss of service continuity category	LSC 2B
Partition class	PM(metal)
Internal arc classification (IAC)	A FLR 31.5kA 1 second

NXAirS

Maximum rating

40.5kV/31.5kA/3150A

Applications

Typical uses

NXAirS 40.5kV withdrawable metal - enclosed medium voltage switchgear is used in substation and power distribution system, mainly for primary power distribution system:

Application

Public power supply

- Power supply companies
- Energy producers
- System operators.

Application

Industry

- Power stations
- Cement industry
- Iron and steel works
- Rolling mills
- Mining industry
- Chemical industry
- Petroleum industry
- Pipeline installations
- Offshore installations
- Electrochemical plants
- Petrochemical plants
- Lignite open-cast mines
- Traction power supply systems.

Classification

The switchgear is designed and manufactured in accordance with GB3906 - 2006, DL404 - 2007, IEC 62 271 - 200 standards, and the following classes

Loss of service continuity category and degree of protection	
Loss of service continuity category	LSC 2B
Partition class	PM (metal)
Accessibility to compartments Busbar compartment Switching device compartment Connection compartment	 Tool-based Interlock-controlled Interlock-controlled or tool-based
Bus Room	Pecial tools must be used
High voltage room	In compliance with interlock control requirements
Cable vault	In compliance with interlock control requirements or special tools are used

Internal arc classifications	
The following internal arc classification are fulfilled: IAC A FLR, I_{sc}, t	
IAC	= internal arc classification
A	= 300mm 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 for up to 31.5kA
t	= Arc duration 1 s
In this way, switchgear is suitable for unrestricted application (wall or free-standing arrangement) in electrical service locations up to the maximum short-circuit ratings.	

Customers' benefits

Peace of mind

For power supply companies and industrial plants, the platform concept of the NXAIR 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, GB3906-2006, DL404-2007
- Platform concept introduced worldwide, centrally controlled development, local manufacture
- Use of standardized block-type current transformers
- Use of standard components available worldwide
- More than 450,000 air-insulated switchgear panels of Siemens in operation worldwide
- Use of maintenance-free vacuum circuit-breakers
- Type testing of the vacuum circuit-breaker 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.

Customers' benefits

Save lives

All switchgear types of the NXAIR 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 highest requirements regarding personal safety.

Features

- All operations with closed high-voltage door
- 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 the busbar, connection and switching device compartments)
- Partition class PM
- Unambiguous position indicators and control elements on the high-voltage door
- Use of vacuum circuit-breakers or contactors
- Standard degree of protection IP4X
- Positively driven shutters (separately lockable)
- Logical mechanical interlocking system.

Customers' benefits

Increases productivity

Properties such as modular design, type tests of the circuit-breaker in the switchgear, confinement of an internal arc to the respective compartment, and thus maximum operational reliability, contribute to optimized operation and a remarkable increase of productivity.

Features

- Loss of service continuity category LSC 2B
  (separate partitions for the busbar, connection and switching device compartments)
- 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 vacuum circuit-breakers
- Control cables in metallic wiring ducts
- Easy access to all panel components.

Customers' benefits

Saves money

The compact design of the NXAIR family pays twice for owners due to the use of the new SION circuit-breaker series.

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.

Features

- Use of maintenance-free vacuum circuit-breakers
- Interruption of operation reduced to a minimum 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.

Customers' benefits

Preserves the environment

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

Features

- As insulating medium, air is absolutely neutral to the environment
- Local production presence in all regions, minimized energy consumption (CO_2) regarding transport
- Service life > 30 years optimizes the energy balance additionally
- The materials used are fully recyclable without special knowledge
- Easy disposal.

Electrical parameters and dimension

Electrical parameters rating

- rated voltage	kV	40.5
- rated frequency	Hz	50
- rated 1 min short time power frequency withstand voltage phase - to - phase, to ground (through disconnections)	kV	95 (118)
- rated lightning impulse withstand voltage phase - to - phase, to ground (through disconnections)	kV	190 (215)
- rated short circuit breaking current	kA	25，31.5
- rated short time withstand current, 4 s	kA	25，31.5
- rated short circuit making current	kA	63，80
- rated peak withstand current	kA	63，80
- rated main busbar current	A	1250, 2500, 3150
- rated feeder current	A	1250, 2500

Dimensions and weights

Width W	mm	1200/1400[1)]
Height H	mm	2800/3010[2)]
Depth D	mm	2650/3450[3)]
Weight	kg	1800～2300

Low voltage box dimensions

	Standard type
W mm	1200/1400[1)]
H mm	705
D mm	450

Cable compartment dimensions

W mm	1200/1400[1)]
H mm	1280
Distance from cable terminal to the ground mm	⩾750

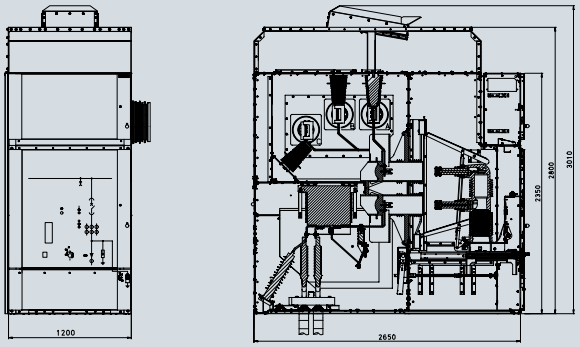
1) Auxiliary transformer panel
2) Switchgear with absorber
3) Extended design

Technical data

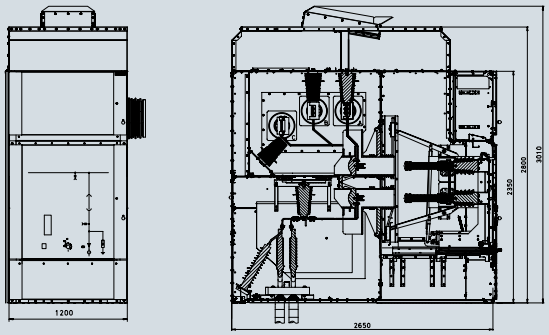
Design data

Panels design

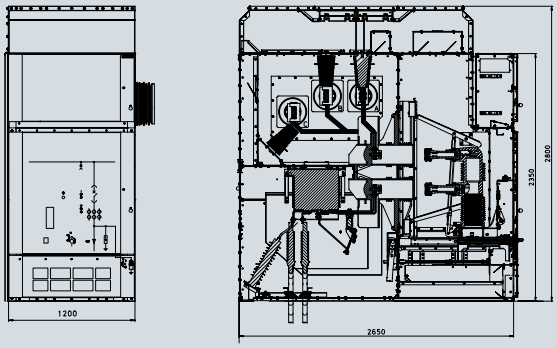
- if the height of the room is too low, please consult Siemens
- The different absorbers are for different ratings of the switchgears



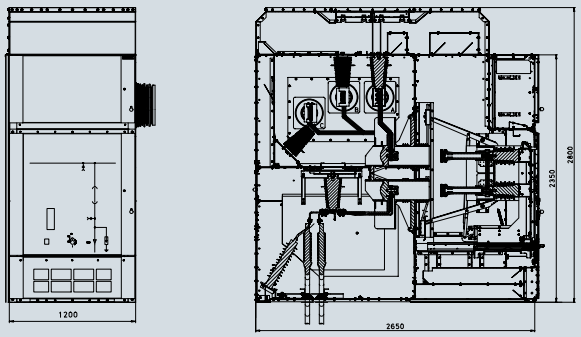
31.5kA 1250A circuit breaker panel



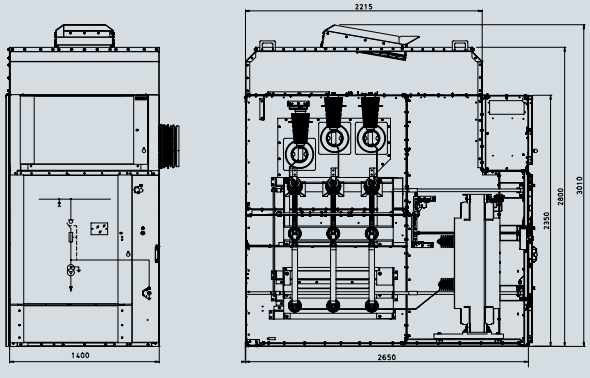
31.5kA 1250A disconnector panel



31.5kA 2500A circuit breaker panel



31.5kA 2500A disconnector panel



Auxiliary transformer panel

Design data

Single row arrangement (top view)

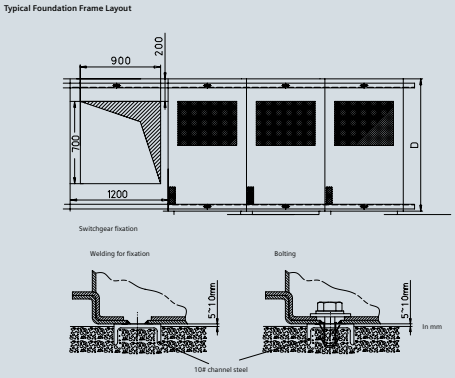
For width and depth, see electrical parameters and dimension part.

To facilitate the replacement of switchgear, advisable operating corridor in front of the cabinet should be no less than 3000mm, the distance from the top of the switchgear to the ceiling of switch room should be no less than 800mm.

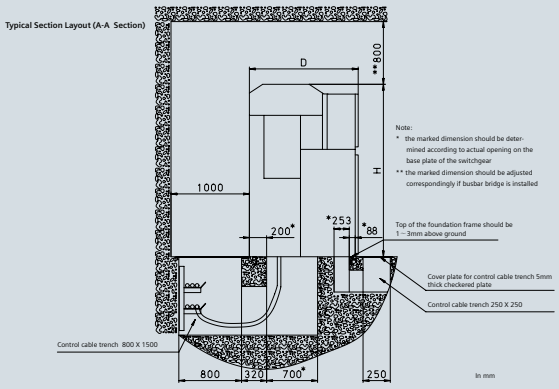
Face to face arrangement, switch room may be determined according to the dimension of single row arrangement.

Size should be reserved in the switch room, and corresponding building regulations must also be consulted.

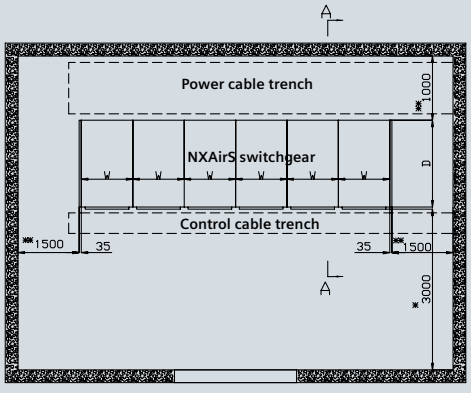
Floor cutouts and mounting



Cable layout



Example of the switchgear arrangement



In mm

Note:

* refers to single row arrangement dimension for switchgear, if the switchgear adopts double row face-to-face arrangement, the recommended distance between two rows of switchgear should be no less than 3000m.

** specific dimension of control aisle should be determined according to actual space of the switch room。

W=1200/1400mm

D=2650mm (standard depth)

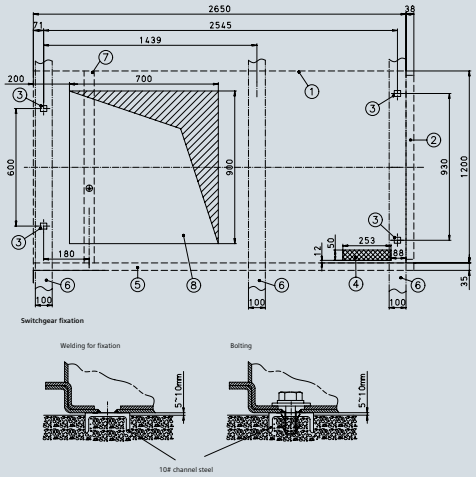
H=2800mm

Technical data

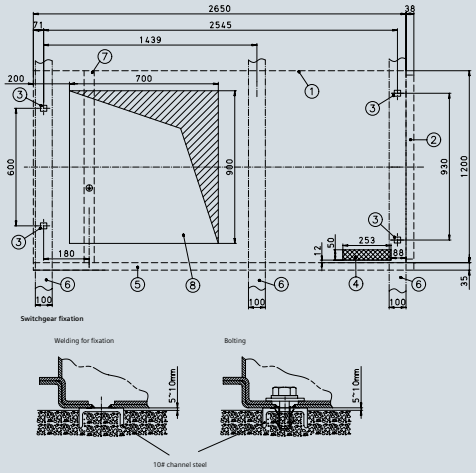
Design data

Switchgear plane foundation drawings

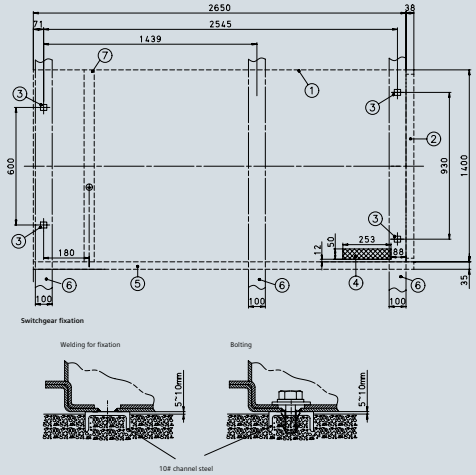
31.5kA 1250A circuit breaker and disconnector panel



31.5kA 2500A circuit breaker and disconnector panel



Auxiliary transformer panel



① Bottom frame of the switchgear
② HV door of the switchgear
③ Switchgear mounting hole 20x20 mm
④ Secondary cable outlet
⑤ End wall
⑥ 10# channel steel 100x48x10
⑦ Main grounding copper bar (in the cabinet)
⑧ High voltage cable connecting outlet

Precautions for groundwork structure:
Groundwork must adopt artificial floor, double floor or concrete groundwork;
Concrete groundwork must adopt channel steel for fixing the switchgear;
Tolerance zone should comply with DIN 43661;
Linearity within 1 m should be 1 mm, linearity on the whole length should be 2 mm; average measured linearity within 1 m should be 1 mm.

Transport and packaging

Transport

Only one panel per pallet is possible.

The following factors should be considered in selecting the size of transport unit:

- Transport facilities on site
- Transport weights and dimensions
- Size of door openings in building

Number of switchgear on pallet	Dimension, volume and weight				
	W m	D m	H m	Volume m^3	Gross weight is about kg
1 unit	1.50	3.00	3.00	13.50	2300

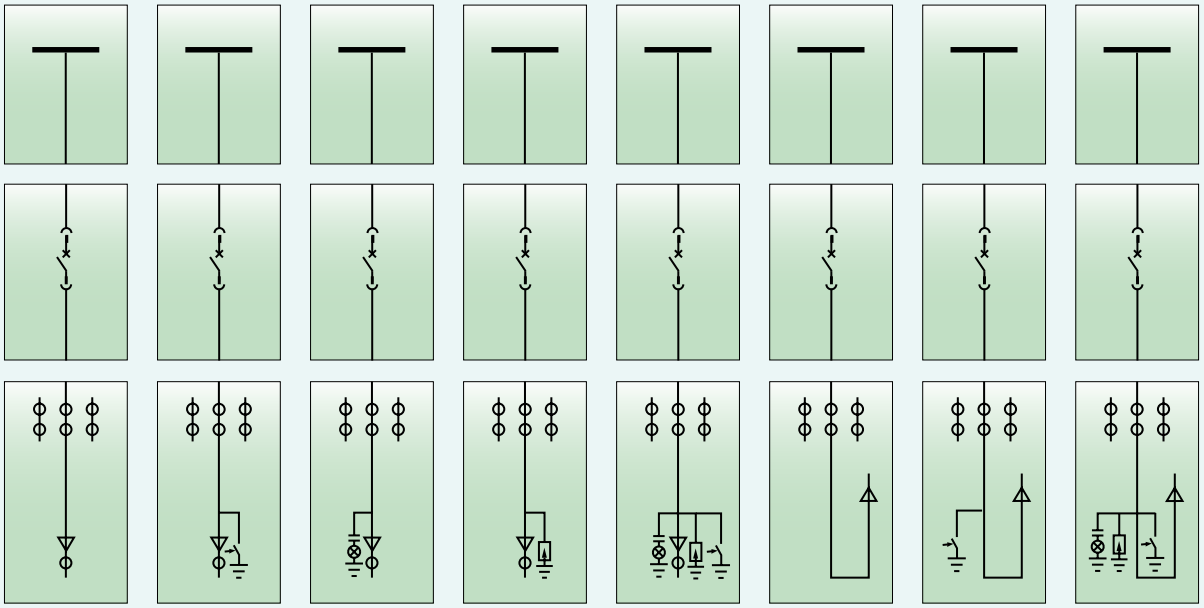
Packing

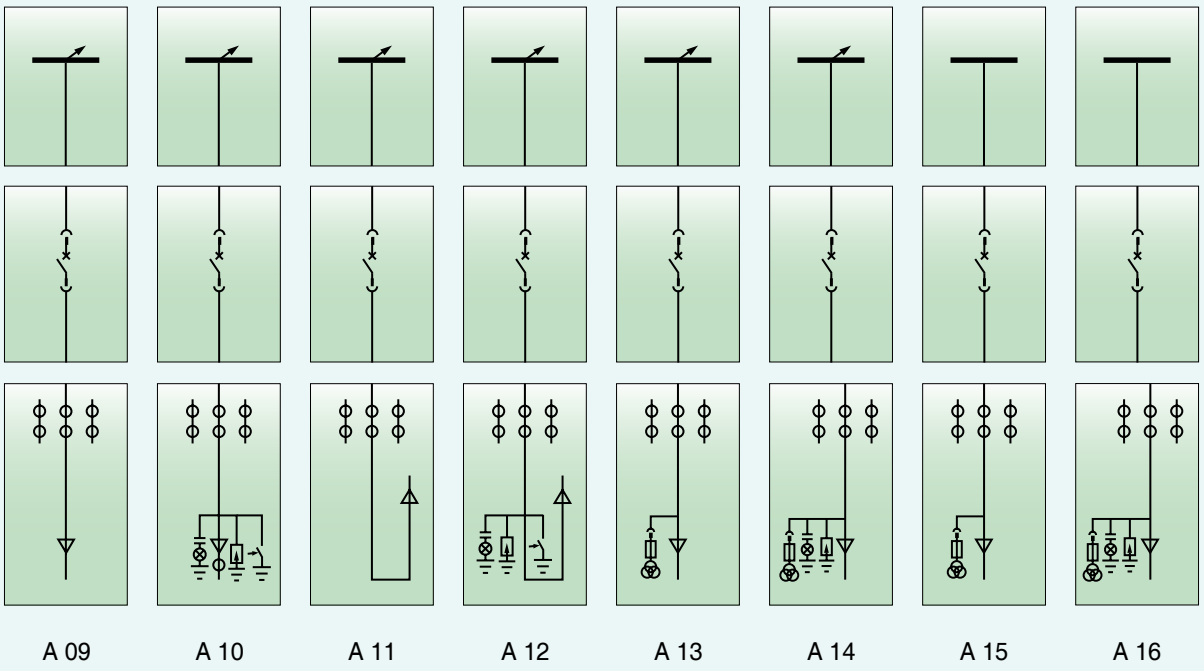
There are three kinds of packing available

Packing type	Transport method	Packing method
Simple	Highway	The switchgear is placed on wood pallet, covered by polyethylene film bag
Standard	Railway and highway	The switchgear is placed on wood pallet, covered by polyethylene film bag, packaged in wooden boards
Export	Shipping	Switchgear is placed on wood pallet, vacuumized and sealed by polyethylene film bag, with desiccant inside, packaged in fumigated wooden boards, maximum storage period is 6 months

Offer range (Primary circuits)

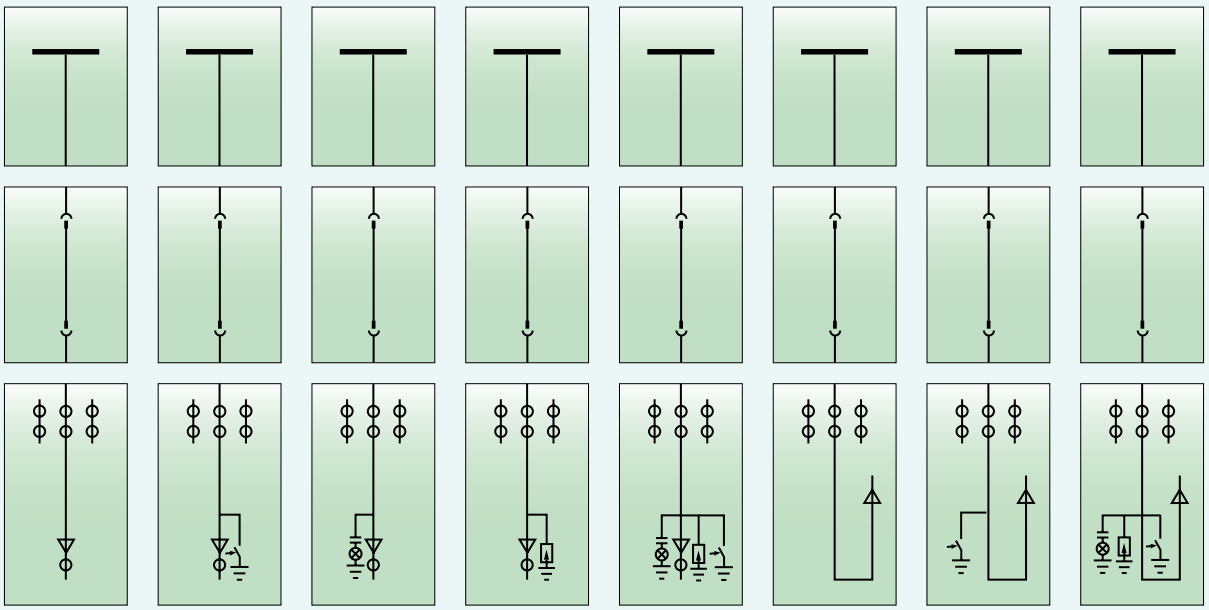
Circuit breaker panel, Incoming/Outgoing, Offer A

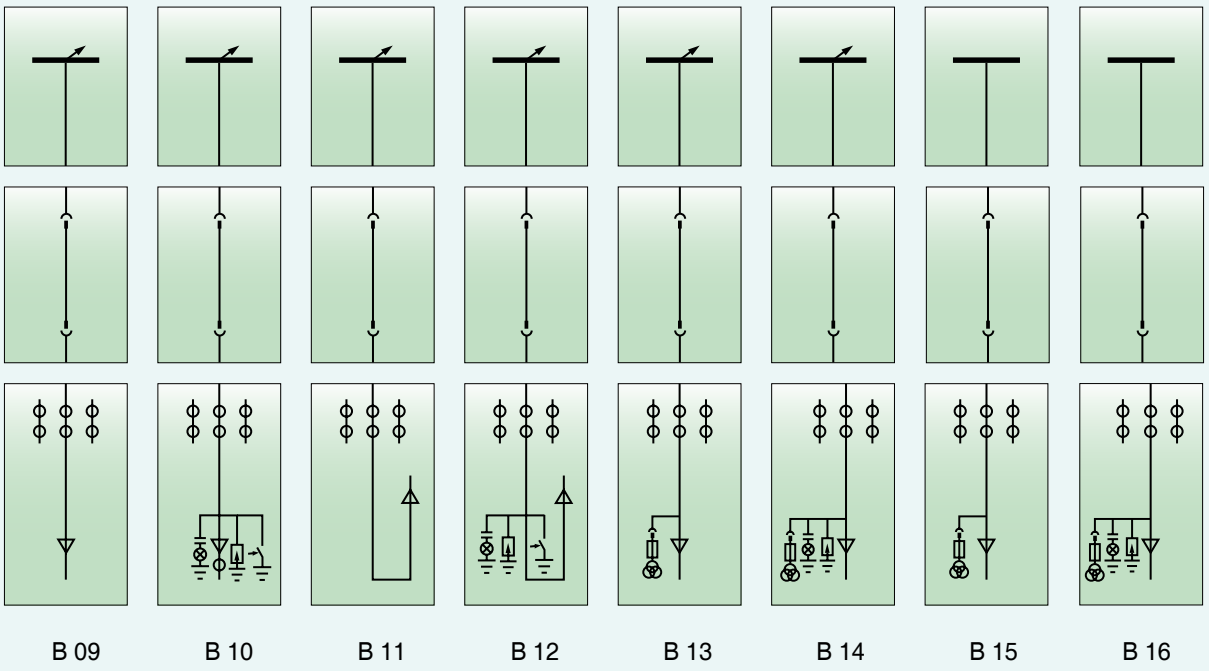




Offer range (Primary circuits)

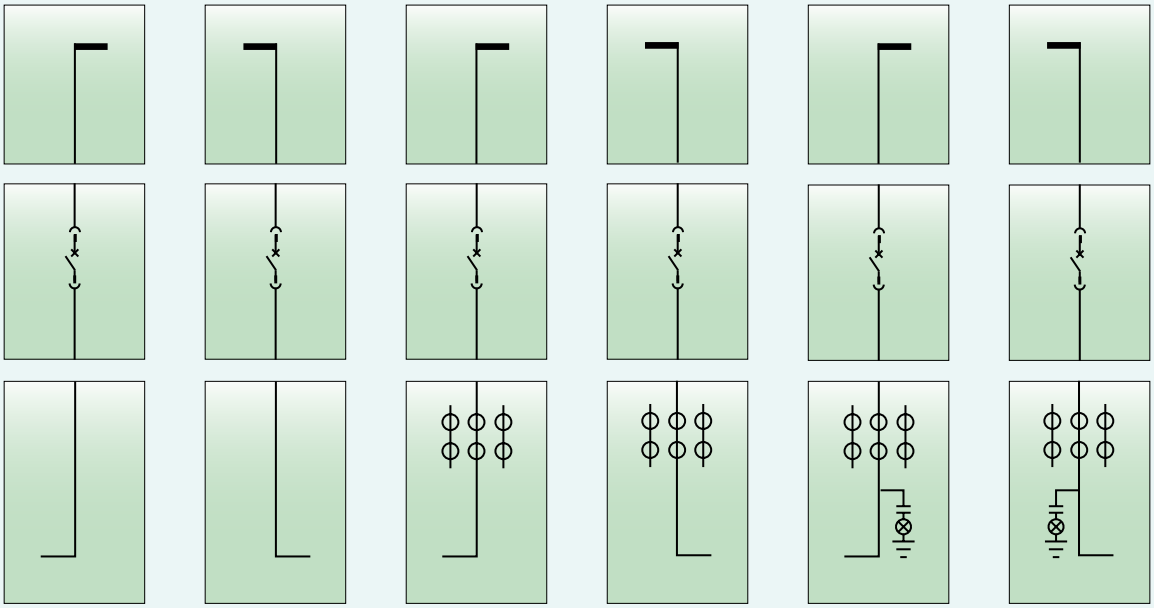
Disconnector panel, Offer B



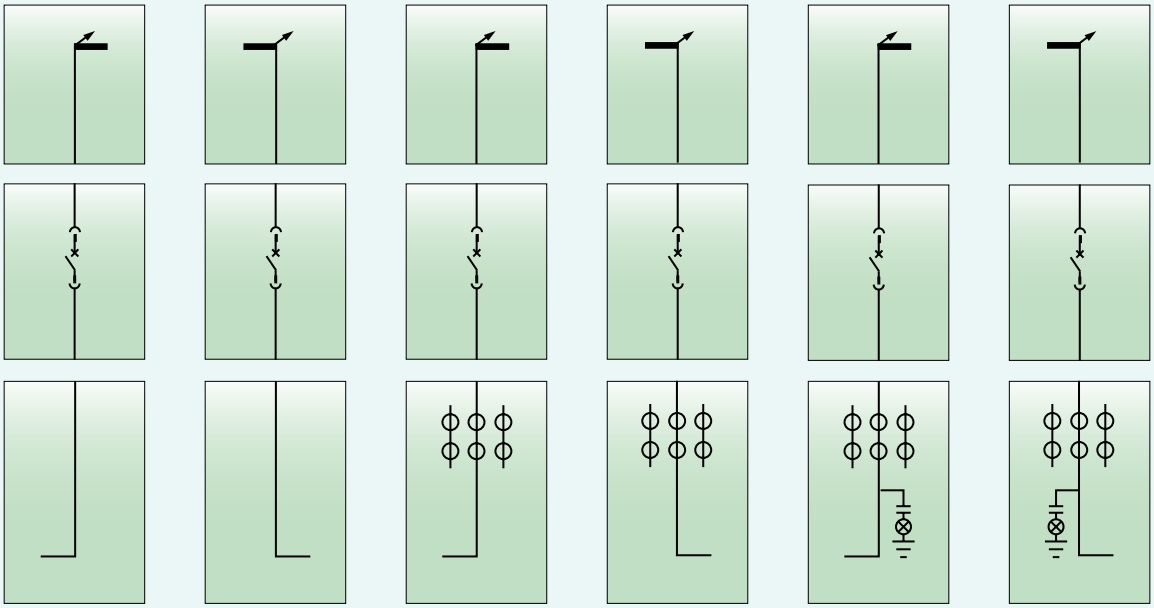


Offer range (Primary circuits)

Sectionalizer panel, Offer C



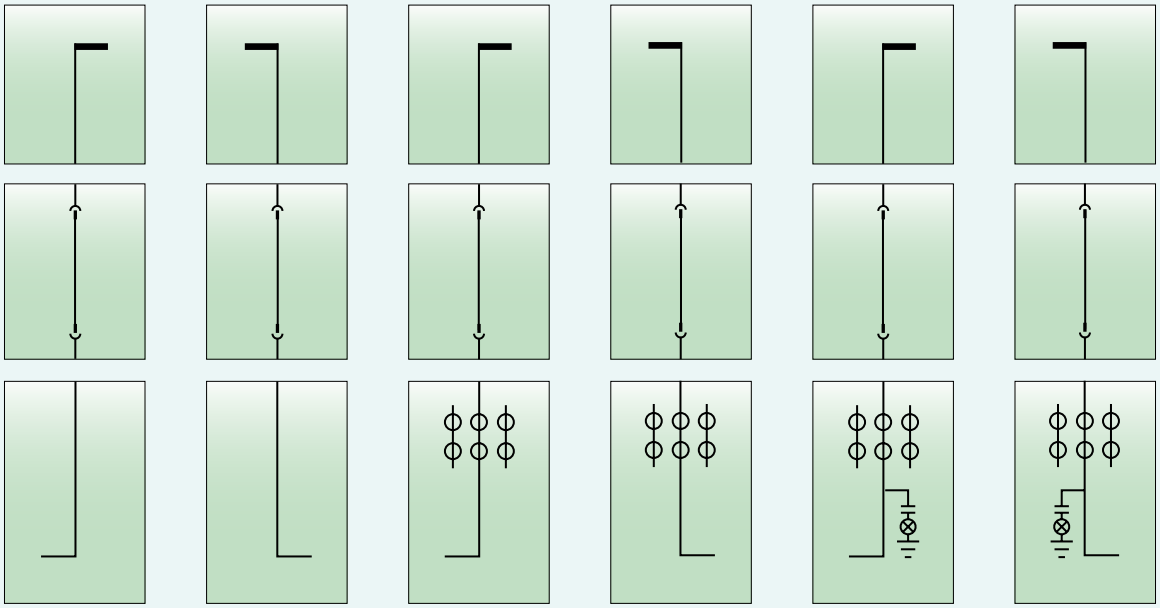
C 01 C 02 C 03 C 04 C 05 C 06



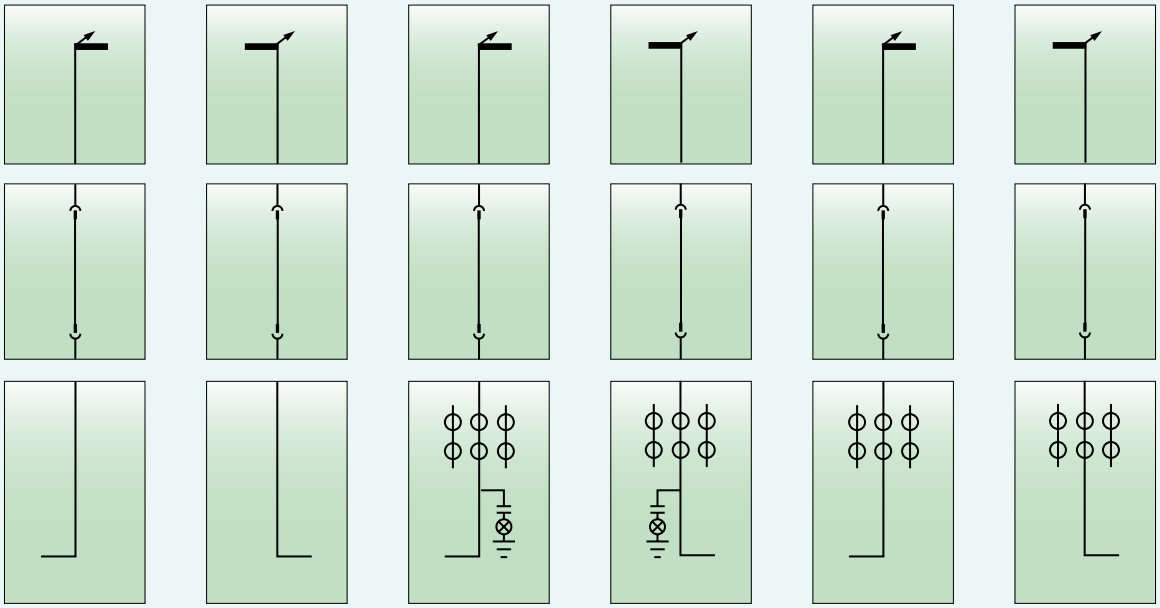
C 07 C 08 C 09 C 10 C 11 C 12

Offer range (Primary circuits)

Sectionalizer panel, Offer D



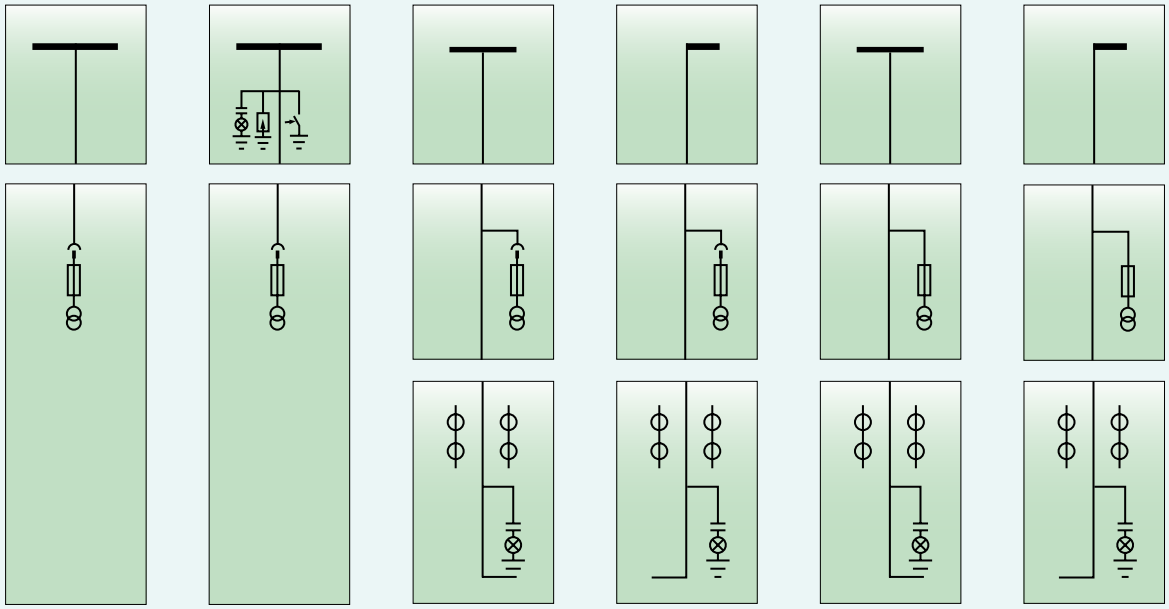
D 01 D 02 D 03 D 04 D 05 D 06



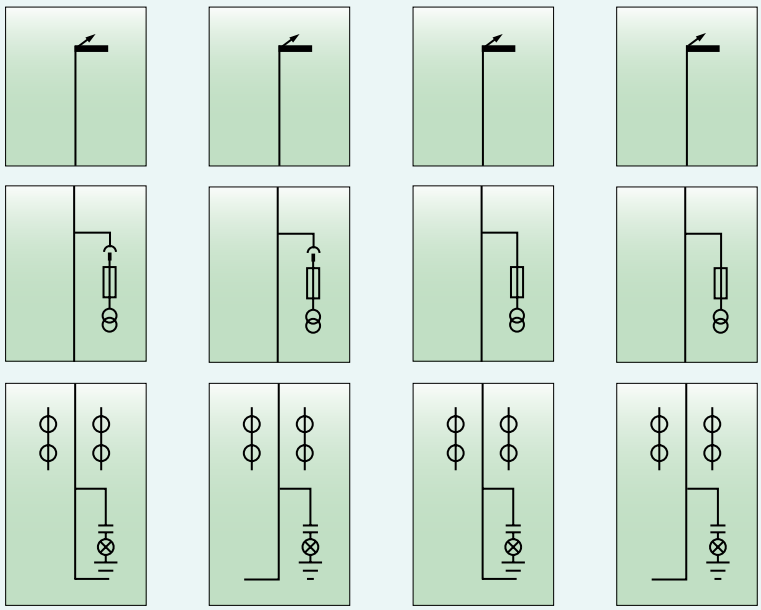
D 07 D 08 D 09 D 10 D 11 D 12

Offer range (Primary circuits)

Metering panel, Offer E



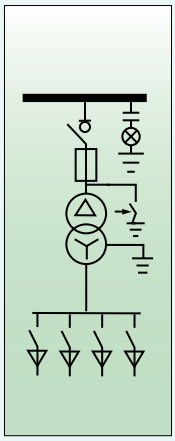
E 01 E 02 E 03 E 04 E 05 E 06



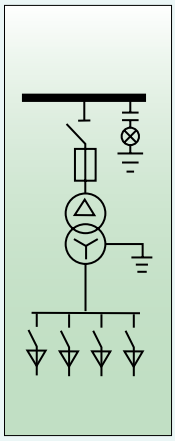
E 07 E 08 E 09 E 10

Offer range (Primary circuits)

Auxiliary transformer panel, Offer F



F 01



F 02

Note: special design could be offered for different panel types according to the project requirements
Please contact Siemens representatives

Design instruction

Switchgear design

Features

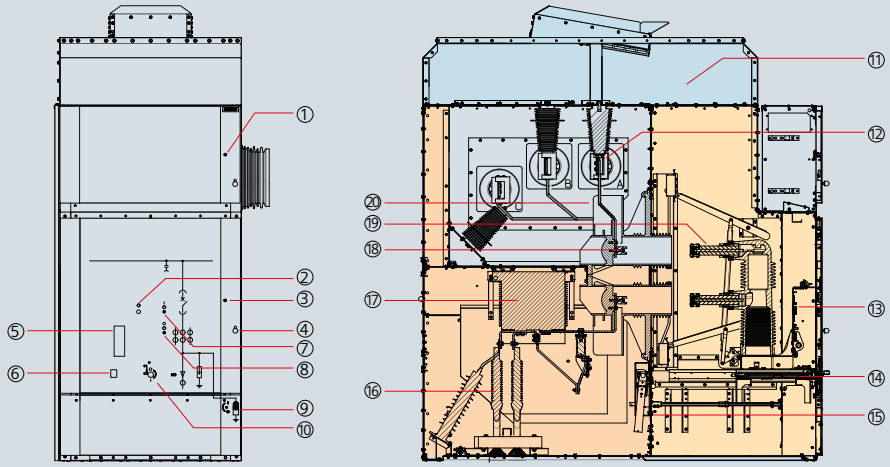
- Integrated mimic diagram
- Recognition of the respective switch positions, circuit-breaker CLOSED / OPEN, disconnected position, earthing switch CLOSED / OPEN, on the integrated mimic diagram
- Unambiguous assignment of actuating openings and control elements to the corresponding position indicators
- All switching operations always 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 / GB 3906-2006 are fulfilled
- Feeder earthing switch can only be operated with switching device in disconnected position
- Switching device can only be racked on the movable part with the associated switching device in OPEN position and with earthing switch OPEN
- Switching device can only be operated in interlocked disconnected or service position.

Beyond the specifi cations 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, padlocks.



1. Low voltage room door lock
2. Manual charging handle hole
3. High voltage room door lock
4. Handle for opening the door of high voltage room
5. Inspection window to recognize close/open state of the circuit breaker, energy storage and counting observation hole
6. Withdrawable part position/test position state indication observation window
7. Circuit breaker closing button
8. Circuit breaker opening button
9. Mechanical position indication and actuating opening of the earthing switchgear
10. Chassis in/out operating hole
11. Pressure release channel
12. Busbars
13. Circuit breaker
14. Withdrawable part
15. Earthing switch
16. Cables' connection
17. Current transformer
18. Fixed contact in the bushing type insulator
19. Withdrawable contact of the circuit breaker
20. Contact cover box

Switchgear design

Panel enclosure

- consists of bolted steel frame and steel plates
- the withdrawable part is supported by guide rails
- steel frame and steel plate adopt galvanized/ aluminized zinc plates
- door and front frame are painted with RAL7035 standard color powder coating

Partition between compartments

- end plate is painted with RAL7035 standard color powder coating
- the bolted galvanized steel plates divide the switchgear into: busbar compartment, circuit breaker compartment and cable compartment
- degree of protection between separate compartments is: ⩾IP2X
- since contact cover box with embedded contacts is used, the compartments are not connected even if the withdrawable part is in work position
- upper and lower fixed contacts are fixed on the contact cover box
- to move the withdrawable part, metal shutter may be opened or closed by mechanism
- after the withdrawable part is pulled out, metal shutter covers the contact cover box
- upper shutter (accessible to BBC) or lower shutter (accessible to CC) may be unbolted for removal, there is no contact between them

Partition

The function of partition is to separate the adjacent cubicles into compartments without connection

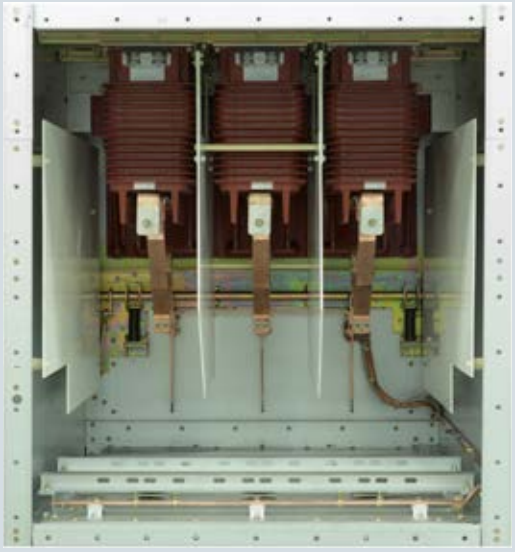
- galvanized steel plate
- partition class PM
- partition with bushing can be selected in busbar compartment, degree of protection with adjacent panel should be IP4X

Pressure relief

Any excess pressure generated by arc fault in the panel may be released upward by pressure absorber on top of the panel or guided out of the switchgear room by pressure velief channel

- galvanized steel plate
- busbar compartment, high voltage compartment and cable compartment have their own pressure release channels

Pressure relief channel (partial)



Cable compartment

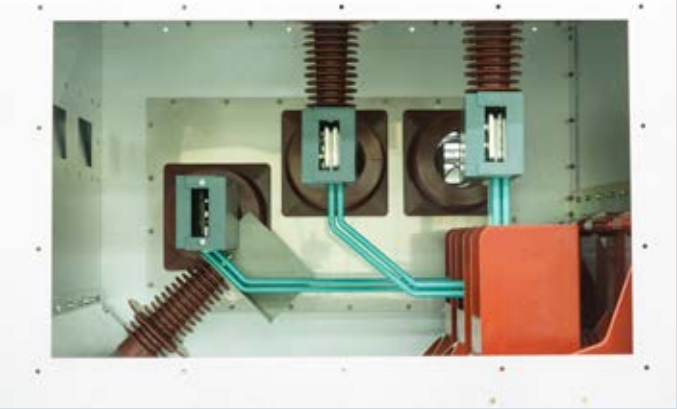
Design instruction

Switchgear design

Switching device compartment
- Enclosure made of aluminum zinc plate
- 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
- High-voltage door pressure-resistant in the event of internal arcs in the panel
- Pressure-resistant partitions to connection and busbar compartments
- Low-voltage plug connector for connection of control cables between primary part and secondary part;
- Switching device compartment with withdrawable devices:
– Vacuum circuit-breaker
– Disconnector link
– Metering unit
- Endurance classes for:
– Circuit-breaker: E2, M2, C2
– Isolating distance (withdrawable part): M0 manually or optionally motor-operated for withdrawable circuit-breaker and disconnector link

Busbar compartment
- Enclosure made of aluminum zinc plate
- Pressure relief upwards
- Busbars made of flat copper, bolted from panel to panel:
– Coated with epoxy resin powder
- Pressure-resistant partitions to connection and switching device compartment, pressure-resistant rear wall
- 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
- Top-mounted compartment above the busbar compartment within the pressure relief duct
- Options: Possibility of installing the following components
– Voltage transformers
– Make-proof earthing switch (endurance class: M0, E1), manual or optionally motor operation.

Cable compartment
- Enclosure made of aluminum zinc plate
- Pressure relief upwards through rear pressure relief duct
- Pressure-resistant partitions to switching device and busbar compartment
- Shutters can be opened and locked separately
- Earthing busbar
- 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 4 × 500 mm^2 depending on the rated normal current and other built-in components
– Three-core cables 4 × 300 mm^2 per panel depending on the rated normal current and other built-in components
- Installation of voltage transformers
– Cast-resin insulated
– 3 × 1-pole
– Fixed-mounted, without primary fuses
- 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: M0, E1
- Surge arrester



Busbar compartment

Vacuum circuit breaker

Features

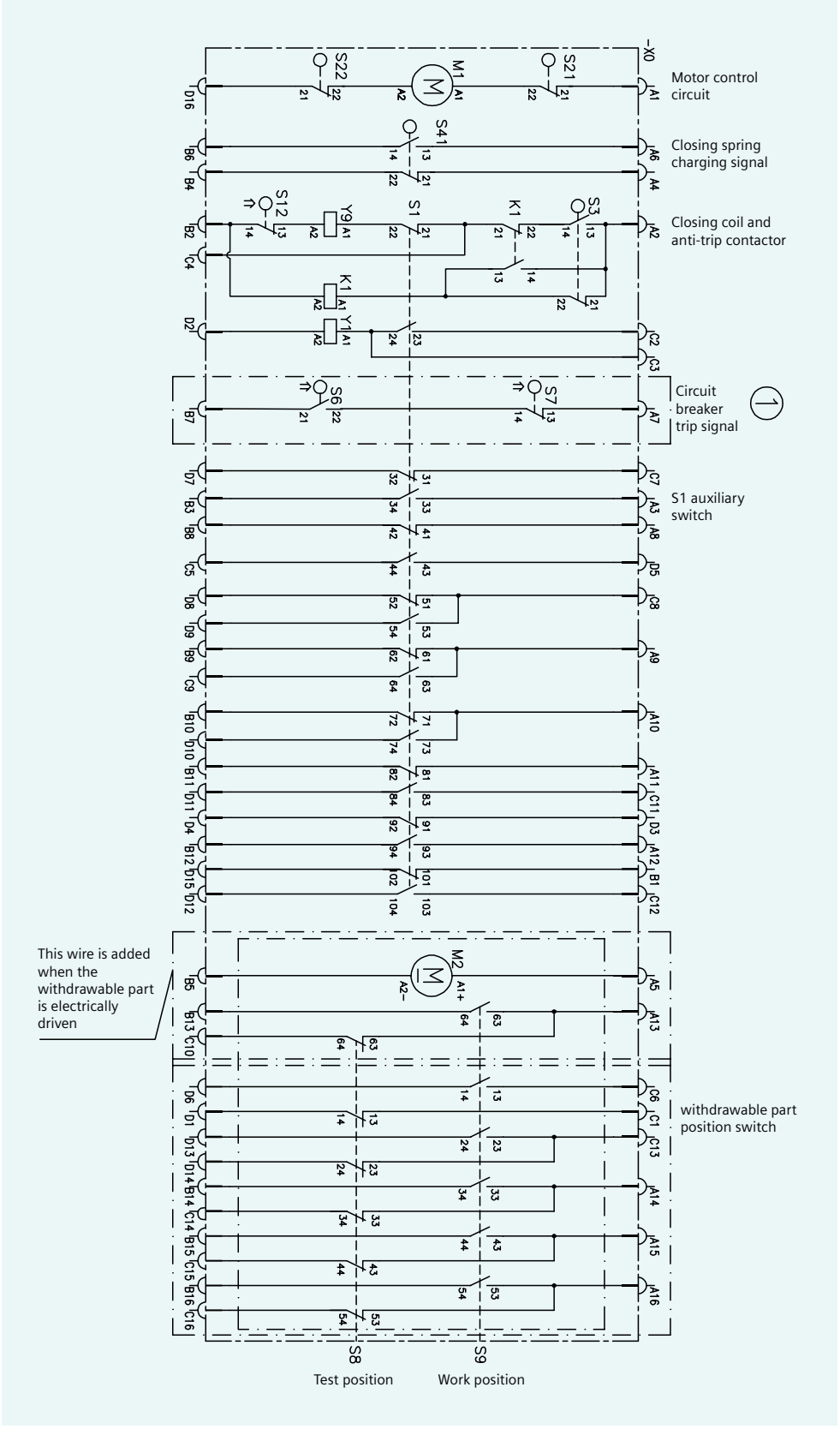
- 3AE embedded pole circuit breaker
- in compliance with IEC 62 271 - 100 and GB 1984 - 2003 standards
- ideal contact material and shape could ensure small chopping current and lifetime stable contact resistance
- all parts meet Siemens German quality standards
- complete type testing
- high electromechanical life
  Maintenance free within 10,000 operating times under normal conditions
- reasonable and compact structure, ensure more reliable operation, more safe and ideal breaking characteristic of inductive and capacitive loads
- 64 - pole low - voltage plug connector between circuit - breaker and fixed part

3AE vacuum circuit breaker

Components

Switch elements

Secondary wiring diagram of the vacuum circuit breaker



S1 auxiliary switch
K1 anti - pumping relay module
Y1, Y9 opening coil, closing coil
M1 universal motor
S3, S6, S7, S12 position switch
S21, S22, S42 position switch

Note:

1) circuit breaker is in, test position, opening, uncharged state.
2) mark ① is optional part, please indicate your requirements in the order if it is required.
3) wire of withdrawable part position switch is led out of the circuit breaker to 1.5m
4) for detailed terminal connection diagram, please consult Siemens AG

Switch elements

Electrical and mechanical data of vacuum circuit breaker *

Type	Unit	3AE
Rated voltage	kV	40.5
1 minute power frequency withstand voltage	kV	95
Lightning impulse withstand voltage	kV	190
Rated operation sequence		0 - 0.3s - co - 180s - co
Phase - to - phase center distance	mm	300
Rated current	max. A	3150
Rated short circuit breaking current	max. kA	31.5
Rated short time withstand current/time	max. kA/s	31.5/4
Rated mechanical life	C-O operations	30000
Maximum making current	kA	80
Rated peak withstand current	kA	80
Closing time	ms	<75
Opening time (Y1)	ms	<60
Opening time (secondary release)	ms	<55
Breaking time	ms	<80
Arcing time	ms	<15
Closing/opening asynchronism	ms	⩽3
Dead time	ms	<300
Breaking time	ms	<80
Operating mechanism charging time	s	⩽15

* : refer to the catalogue of 3AE circuit breaker

Standards

Standards, criteria and guidelines

Standards

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

		IEC standard	GB standard
Switchgear	NXAirS, 40.5kV	IEC 62271-1	GB/T 11022
		IEC 62271-200	GB 3906
Devices	Circuit-breaker	IEC 62271-100	GB 1984
	Vacuum contactors	IEC 62271-106	GB 14808
	Disconnectors and earthing switches	IEC 62271-102	GB 1985
	Switch-disconnectors	IEC 60265-1	GB 3804
	Switch-disconnector/fuse combination	IEC 62271-105	GB 16926
	HV HRC fuses	IEC 60282-1	GB/T 15166.2
	Voltage detecting systems	IEC 61243-5	GB 12325
Degree of protection	-	IEC 60529	GB/T 4208
Insulation	-	IEC 60071	GB 311.1
Instrument transformers	-	IEC 61869-1	GB 20840.1
	Current transformer	IEC 61869-2	GB 1208
	Voltage transformer	IEC 61869-3	GB 1207
Installation, erection	-	IEC 61936-1	GB/T 11024.1

Type of service location

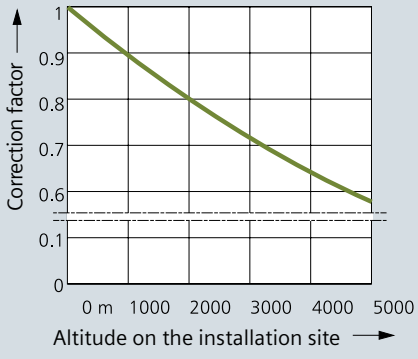
The switchgear can be used as indoor installation according to IEC 61936 (Power installations exceeding AC 1 kV) and VDE 0101

- 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.

Table — insulating strength

Rated voltage (effective value)	kV	40.5
Rated short time power frequency withstand voltage (r. m. s.)		
- isolating distance	kV	118
- phase - to - phase, to ground and circuit breaker breaks	kV	95
Rated lightning impulse withstand voltage (peak value)		
- isolating distance	kV	215
- phase - to - phase, to ground and circuit breaker breaks	kV	190

Altitude correction factor ka



Power frequency test voltage ⩾ $\frac{\text{Rated power frequency withstand voltage}}{1.1 \times Ka}$

Impact test voltage ⩾ $\frac{\text{Rated lightning impulse withstand voltage}}{1.1 \times Ka}$

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.
- The rated values are referred to sea level and to normal atmospheric conditions (1013 hPa, 20 ℃, 11 g/m3 humidity according to IEC 60071).
- 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

– The dielectric strength of air insulation decreases with increasing altitude due to low air density. This reduction is permitted up to a site altitude of 1000 m according to IEC.

– 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, criteria and guidelines

Current carrying capacity

- According to IEC 62271-1 and IEC 62271-200, the rated normal current refers to the following ambient air temperatures:

– Maximum of 24-hour mean + 35 ° C
– Maximum + 40 ° C

- The rated normal current of the panels and busbars depends on the ambient air temperature outside the enclosure.

Protection against solid foreign objects, electric shock and water

Switchgear fulfills according to the standards
– IEC 62271-200
– IEC 60529
– GB 11022
– GB 3906-2006
the following degrees of protection:

Switchgear panel	
Degree of protection for the enclosure	IP4X
Degree of protection for the enclosure with ventilation	IP4X
Degree of protection for the partitions	IP2X

Climate and environmental influences

Switchgear is suitable for application in indoor installations under normal operating conditions as defined in standard IEC 62271-1 as follows:

- Max. value of ambient air temperature: + 40 ℃, average value over period of 24 h: + 35 ℃
- Minimum ambient air temperature: – 5 ℃
  – 25 ℃ (on request)
- Altitude of installation ⩽ 1000 m
- Average value of relative humidity over period of 24 h: ⩽ 95%, over period of one month: ⩽ 90%
- Ambient air not significanted polluted by dust, corrosive gases, vapours or salt.

The switchgear may be used, subject to possible additional measures, under the following environmental influences:
– Natural foreign materials
– Chemically active pollutants
– Small animals

and the climate classes:
– 3K3
– 3K5.
The climate classes are defined according to IEC 60721-3-3.

Internal arc classification

- Protection of operating personnel by means of tests for verifying the internal arc classi. cation
- Internal arcing tests must be performed in accordance with IEC 62271-200
- The switchgear complies with all criteria speci.ed in the a.m. standards for the basic version up to 31.5 kA
- Comply with the internal arc classi. cation: IAC A FLR up to 31.5 kA, 1 s. This provides maximum personal safety of switchgear accessible from all sides
- De.nition 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

Terms

“Make-proof earthing switches” are earthing switches with short-circuit making capacity according to
– IEC 62271-102

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