SIEMENS

Customer:	DSG	Offer for medium-voltage switchgear NXAIR
Project:	ORDER DSG NXAIR 3 CB	
Reference:	9501319884	NXAIR-126832

NXAIR

Air-Insulated, Metal-Enclosed, Medium-Voltage Switchgear

Loss of Service Continuity Category:	**LSC 2B**
Partition Class:	**PM**
Internal Arc Classification:	**IAC A FLR**

General Technical Description

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Contents

1 Switchgear Description

1.1 Switchgear Type

The offered switchgear is an air-insulated, type-tested, metal-enclosed medium-voltage switchgear for indoor installation. This switchgear complies with IEC 62271-200 and therefore fulfils the following classifications:

Loss of service continuity category: LSC2B [1)] (separate partitions for busbar, switching device and connection compartments)

Partition class PM [2)] (metallic partition)

Internal arc classification: IAC A FLR

In connection with the vacuum circuit-breaker SION, the switchgear offers the following customer benefits:

- Peace of mind
- Saves lives
- Increases productivity
- Saves money
- Conserves the environment

Air-insulated switchgear has been successfully in operation for decades; air as insulating medium is always available; all switchgear components are always accessible considering the safety regulations.

1.2 Panel Design in Modular Construction, Partitions

An NXAIR panel consists of the following compartments:

- Busbar compartment
- Switching device compartment
- Connection compartment
- Low-voltage compartment

The individual sheet-steel compartments are bolted together to one switchgear panel. Separation walls to the adjacent panels are always double. Doors and lateral switchgear end walls are powder-coated with resistant epoxy resin, all other walls are galvanized.

The complete enclosure and the partitions between the individual compartments and covers are metallic [2)] and earthed. This guarantees the highest possible service continuity category LSC2B [1)] of the switchgear and the highest possible personal safety with partition class PM 2) according to IEC 62271-200. This offers the benefits “saves lives", "peace of mind” and “increases productivity”.

The loss of service continuity category LSC2B [1)] allows access to compartments while other adjacent compartments remain in operation. For example, it is possible to maintain the busbar compartment of one panel, as well as all compartments of the adjacent panels, in operation while the switching device compartment and connection compartment are open. In this way, the category LSC2B [1)] provides the highest possible service continuity. This feature offers the

customer benefit “increases productivity”.

The individual compartments are pressure-resistant, so that - in case of an internal fault (arc fault<= 31,5 kA 1s) no burn through of partitions and no re-ignition in adjacent compartments occur. This offers the benefits “peace of mind” and “increases productivity”.

In case of an arc fault, pressure is generally relieved upwards in all three compartments. NXAIR switchgear is tested for resistance to internal faults according to IEC 62271-200 and fulfils all criteria of the internal arc classification IAC A FLR according to IEC 62271-200. It is therefore adequate for universal installation and access from all sides. This feature offers the customer benefit “saves lives”.

The partition class PM [2)] ensures that only earthed steel sheets can be touched during access to the individual compartments. This guarantees the highest possible personal safety during maintenance work. This feature offers the customer benefit “saves lives”.

1.3 Busbar compartment

The busbar compartment contains the three-phase busbars made of round-edge standard profile copper, the panel bars and the bushing-type insulators with the fixed contacts.

The shutter for visual inspection of the fixed contacts can be opened and closed individually in the switching device compartment. Busbars are bolted from panel to panel.

Accessibility of busbar is possible after removing of partitions. In this way, access to the busbar compartment is “tool-based” according to IEC 62271-200.

Possible additional components (voltage transformers, earthing switch, bus riser) are mounted in a separate additional compartment.

1.4 Switching Device Compartment

The switching-device compartment can be equipped with the following devices:

- Vacuum circuit-breaker withdrawable
- Vacuum contactor withdrawable
- Disconnecting link withdrawable
- Metering device withdrawable

The mechanical position indicators and control elements of the respective switching devices are visibly integrated in a mimic diagram in the door of the switching device compartment. In connection with the logical mechanical interlocking system, this avoids any maloperation and guarantees the customer benefit “peace of mind”.

While racking from the service to the test position or vice versa, the withdrawable part opens or closes the metal shutters (positively driven) covering the fixed contacts in the connection and busbar compartments.

The connection of the low-voltage wiring between the withdrawable part and the fixed part of the panel is done via a 64-pole plug connection.

Generally, the low-voltage wiring is laid in metallic ducts with removable covers.

In connection with the door interlock, access to the switching device compartment is “interlock-

based” according to IEC 62271-200.

The application of maintenance-free vacuum circuit-breakers reduces the maintenance and shutdown times. In comparison with other switching technologies, this increases the switchgear availability and reduces the maintenance costs. Using the vacuum technology as quenching medium, arc quenching in the circuit-breaker does not produce any highly toxic decomposition products. These features offer the benefit “saves lives", "peace of mind", "increases productivity", "saves money” and "conserves the environment".

1.5 Interlocks

Following interlocking conditions specified according to IEC 62271-200 / VDE 0671-200 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 feeder earthing switch OPEN
- Switching device can only be operated in interlocked disconnected or service position
- Switching of switching device in ON position only possible with plugged low voltage connection
- Beyond the specification of standards:
- Moving of withdrawable part only possible with closed high voltage door
- Coding prevents insertion of switching device with a lower rated normal current into panels with higher rated normal current
- optionally electromagnetic interlocks, mechanical key interlocking systems or padlocks

Operator safety is guaranteed by the a.m. interlocks and operations. This feature offers the customer benefit “saves lives”.

The circuit-breaker and make-proof earthing switch are type-tested in the panel according to IEC 62271-200. This guarantees reliable operation in the panel. This feature offers the customer benefit “peace of mind“.

1.6 Connection Compartment

The connection compartment can contain the following components:

- cable sealing ends resp. bar connection
- Current transformers or bushing type insulators
- Make-proof earthing switch
- Voltage transformers
- Surge arresters or limiters
- Earthing busbar
- Zero-sequence current transformers

The shutter for visual inspection of the fixed contacts can be opened and closed individually in the switching device compartment.

The lower partition is bolted and offers access to the connection compartment from the front during installation.

Cable connection is optionally possible from the front or the rear. With cable connection from the front, the connection compartment is an “interlock-based and tool-based accessible compartment” according to IEC 62271-200. With cable connection from the rear, access is “tool-based”.

Cable testing equipment resp. cable testing adapters can be easily connected without detaching the cables. For this purpose, the shutters can be opened and locked separately. To guarantee personal safety, the shutters of the busbar compartment are optionally equipped with a padlock.

1.7 Low-Voltage Compartment

The low-voltage compartment is located at the front. It is completely partitioned off the rest of the panel and can be removed from the panel.

Electrical connections between the withdrawable part and the fixed part of the panel are performed with flexible wires and a 64-pole low-voltage plug connection.

Current transformer leads are wired to terminals in the low-voltage compartment. All other panel-internal circuits are wired to 10-pole connectors and plugged in the low-voltage compartment.

Bus wires are laid from panel to panel in the upper part of the low-voltage compartment and are pluggable.

Secondary devices are installed in the door of the low-voltage compartment and on a mounting plate with a top-hat rail system. The wires are laid in wiring ducts with a sufficient cross-section.

[1)] LSC2 for Load break switch panels with HH fuses

LSC1 for busbar connecting panels

According to IEC-62271-200 a loss of service continuity category can't assigned to panels which do not have a cable connection compartment.

[2)] PI (partitions non-metallic) for switch disconnector panels with HH fuses

2 Features and Customer Benefits

	Customer Benefits	Features
1	Peace of Mind	● insulation medium AIR always available, monitoring of pressure of insulation medium not needed, components of switchgear always accessible ● Platform concept worldwide ● Factory-assembled, type-tested switchgear according to IEC 62271-200 ● Flexibility in low-voltage equipment (different compartment sizes, pluggable wiring, low-voltage compartment removable) ● pressure tied partitions (<= 31.5 kA 1s), focussed pressure release via channel and absorbers or with channel to outside ● Use of maintenance-free vacuum circuit-breakers ● use of standardized block type current trans-formers resp. bushing type insulators ● more than 560.000 air-insulated switchgear panels from Siemens in operation world-wide ● Type testing of vacuum circuit-breaker and make-proof earthing switch in the panel ● Use of standard components available worldwide ● Quality assurance according to DIN EN ISO 9001

2	Saves Lives	● Loss of service continuity category LSC2B [1)] (separate partitions for busbar, connection and switching device compartments) ● Partition class PM [2)] (metallic partition) in pressure-resistant design ● Positively driven shutters ● Internal arc classified switchgear according to IAC A FLR for arc duration 1 s, optionally 0.1 s (front, lateral, rear accessibility) ● Metallic enclosure, earthed shutters and partitions ● All switching operations with high-voltage door closed ● Position indicators and control elements on high-voltage door ● Interlocks of high-voltage door ● Logical mechanical interlocking system ● Use of maintenance-free vacuum circuit-breakers ● Standard degree of protection IP 3XD, optionally IP40, IP50, IP51. For Marine certification / design: IP31, IP32, IP41, IP42.

3	Increases Productivity	• Loss of service continuity category LSC2B [1)] (separate partitions for busbar, connection and switching device compartments) • Partition class PM [2)] • Positively driven shutters • Pressure resistant partitions (<= 31,5 kA 1s), pressure release via absorbers resp. channel to outside • Block-type current transformer principle; standardized design • Degree of protection IP3XD, optionally IP4X, IP50, IP51. For Marine certification / design: IP31, IP32, IP41, IP42. • Cable testing without isolating the busbar • Use of maintenance-free vacuum circuit-breakers • More than 560.000 air-insulated switchgear panels from Siemens in operation worldwide • Control cables in metallic wiring ducts
4	Saves Money	• Maintenance-free vacuum circuit-breaker, maintenance intervals of switchgear > 10 years • Compact switchgear design, width 435 mm, 600 mm, 800 mm resp. 1000 mm, type-tested height of switchgear room >2500 mm (building investments) • Interruption of operation reduced to a minimum by logical mechanical interlocking system • Flexible cable connection options enable small building dimensions
5	Conserves the environment	• Insulation medium air is always available • Local production presence in all regions, minimized energy consumption regarding transport • Service life >30 years optimizes the energy balance additionally • Used material is fully recyclable without special knowledge

3 Standards

IEC-Standards	Name
IEC 62271-200	A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV
IEC 62271-1	Common clauses for high-voltage switchgear and controlgear standards
IEC 62271-100	High-voltage alternating current circuit-breakers
IEC 60529	Degree of protection provided by enclosures (IP-code)
IEC 62271-102	High-voltage alternating current disconnectors and earthing switches
IEC 60470	High-voltage alternating current contactors and contactor-based motor-starters
IEC 62271-105	High-voltage alternating current switch-fuse combinations
IEC 60071 - 1	Insulation co-ordination for equipment in three-phase systems above 1 kV
IEC 60282 - 1	Current limiting fuses
IEC 62271-213	Voltage detecting and indicating systems
IEC 61869-1	Instrument transformers - Part 1: General requirements
IEC 61869-2	Instrument transformers - Part 2: Additional requirements for inductive current transformers / Applies in conjunction with IEC 61869-1 (2007-10)
IEC 61869-3	Instrument transformers - Part 3: Additional requirements for inductive voltage transformers / Applies in conjunction with IEC 61869-1 (2007-10)
IEC 60721-3-3	Classification of environmental conditions

4 Switchgear Data

Installation ..... Indoor
Number of phases 3
Busbar system ..... Single busbar

Rated voltage ..... 7.2 kV
Operating voltage ..... 6.3 kV
Rated frequency ..... 50 Hz
System neutral earthing ..... Solidly earthed
Rated short-duration power-freq. withstand voltage ..... 20 kV
Rated lightning impulse withstand voltage ..... 60 kV
Ambient air temperature ..... 35 °C
Rated normal current of busbar ..... 2500 A
Max permissible busbar current at 35 °C ..... 2580 A
Busbar insulation ..... without
Bus bar transverse partition ..... without

Rated short-time withstand current ..... 31.5 kA
Rated duration of short-circuit ..... 1 s
Rated peak withstand current ..... 80 kA
Rated short-circuit breaking current ..... 31.5 kA
Rated short-circuit making current ..... 80 kA
Rated short-time phase-to-earth withstand current (I_{ke}) ..... Ike = 31.5 kA
Rated duration of phase-to-earth short-circuit (t_{ke}) ..... tke <= 3s
Rated peak phase-to-earth withstand current (I_{pe}) ..... Ipe <= 82 kA

Degree of protection for enclosure IP3XD
Degree of protection for partitions IP2X
Loss of service continuity category ..... LSC2B [1)]
Partition class ..... PM [2)]
Internal arc classification ..... IAC
Type of accessibility front / lateral / rear ..... A FLR
Type of Installation ..... Freestanding
Design ..... Withdrawable design
Internal arc fault current ..... 31.5 kA
Arc-fault duration ..... 1,0 s

Cable access from ..... front (wallstanding) or front/rear (freestanding)
Panel width ..... see drawing
Panel depth ..... see drawing
Panel height ..... 2350 mm
Height of switchgear room (min.) ..... 2500 mm
The distance between the wall and the switchgear on the side where the evacuation duct is assembled must be 500 mm as a minimum.
Color of switchgear ..... RAL 7035

[1)] LSC2 for Load break switch panels with HH fuses

LSC1 for busbar connecting panels

According to IEC-62271-200 a loss of service continuity category can't assigned to panels which do not have a cable connection compartment.

[2)] PI (partitions non-metallic) for switch disconnector panels with HH fuses

Other details as per scope of supply, single-line diagram and/or constructional data.

5 Scope of Supply

The switchgear is designed as single-busbar switchgear according to the enclosed single-line diagram.

Item No.	Quantity	Typical No.	Description
5.1	1	=LZ02	Switching device panel 1250 A
5.2	1	=LZ03	Switching device panel 2000 A (non-ventilated for 40kA)
5.3	1	=LZ04	Switching device panel 1250 A
5.4	1	=LZ00	Switchgear accessories

In case of customer-specific designs, some points of the switchgear description might not be valid anymore.

The offered scope of supply is equipped in detail as follows:

Item No.	Quantity	Description	Typical No.: =LZ02
5.1	**1**	**Switching device panel 1250 A** Max permissible feeder current at 35 °C: 1330 A	
5.1.1	**1**	**Busbar Compartment** Busbar cross-section Cu 2x100x10 mm	
	3	**Busbar voltage transformer** Voltage transformer, fixed-mounted 3 x 1-pole with earth-fault winding and damping resistor Primary voltage 6.3 / v3 kV Voltage of secondary winding 100 / v3 V Rating and class of secondary winding 20 VA / Cl. 0.2 Voltage of earth-fault winding 100 / 3 V Rating and class of earth-fault winding 90 VA / 6P	
5.1.2	**1**	**Switching Device Compartment**	
	1	**Circuit breaker withdrawable part** Withdrawable part for the circuit breaker Operating mechanism withdrawable part: Hand operated Auxiliary switch withdrawable part: 6NC + 6NO Electromagnetic interlocking: AC 230 V Mechanical padlocking facility with padlock Vacuum circuit breaker, Type SION Technical data: 12.0 kV / 31.5 kA / 1600 A Operating mechanism circuit breaker: motor Voltage of motor operating mechanism: AC 230 V Voltage of closing solenoid: AC 230 V Release combination: 1 shunt release Voltage 1st tripping coil: AC 230 V Auxiliary switch circuit breaker: 12 NC + 12 NO	

5.1.3 **1** **Connection Compartment**

1 **Panel connection**

Cable connection from bottom

Number of cable per phase

3 cables

Single-core cable max. 300 mm2

3 **Current transformer in the connection compartment**

Designed as block type current transformer,

assembled in the connection compartment

3 x 1 core in L1/L2/L3

Primary current: 1250 A

Secondary current: 1 A

Core 1: 5 VA / Cl. 5P / 20

1 **Voltage Detecting and Indicating System on the connection side**

Capdis S1+

1 **Earthing switch on the cable connection**

Earthing switch with short-circuit making capability

Short-circuit current and duration:

Rated short-time phase-to-earth withstand current (Ike): I_{ke} = 31.5 kA

Rated duration of phase-to-earth short-circuit (tke): $t_{ke} \leq 3s$

Rated peak phase-to-earth withstand current (Ipe): $I_{pe} \leq 82$ kA

Auxiliary switch: 4 NO + 4 NC (only in Vacuum-Contactor-Panel: 2NO+2NC)

Operating mechanism:

Hand operated

Electromagnetic interlocking: AC 230 V

Mechanical padlocking facility with padlock

5.1.4 **1** **Low Voltage Compartment**

Height 630 mm
equipped as follows:

1	CIRCUIT BREAKER UC10KA 4P C6
1	AUXILIARY SWITCH 1S1OE
1	test socket for current flush mounting
1	test socket for voltage flush mounting
1	overcurrent relay 7SJ80
1	Installation costs
1	Basic wiring costs
1	Wiring options
1	Terminal costs

Mounting and Wiring

5.1.5 Customer-specific designs

1	Cable Conn. Bottom 3 cb/ph (3 core up to 300mm2) w DIN 46235

Cable Lugs...

Item No.	Quantity	Description	Typical No.: =LZ03
5.2	**1**	**Switching device panel 2000 A (non-ventilated for 40kA)** Max permissible feeder current at 35 °C: 2145 A Ventilation with poke-protected slots	
5.2.1	**1**	**Busbar Compartment** Busbar cross-section Cu 2x100x10 mm	
5.2.2	**1**	**Switching Device Compartment**	
	1	**Circuit breaker withdrawable part** Withdrawable part for the circuit breaker Operating mechanism withdrawable part: Hand operated Auxiliary switch withdrawable part: 6NC + 6NO Electromagnetic interlocking: AC 230 V Mechanical padlocking facility with padlock Vacuum circuit breaker, Type SION Technical data: 12.0 kV / 31.5 kA / 2500 A Operating mechanism circuit breaker: motor Voltage of motor operating mechanism: AC 230 V Voltage of closing solenoid: AC 230 V Release combination: 1 shunt release Voltage 1st tripping coil: AC 230 V Auxiliary switch circuit breaker: 12 NC + 12 NO	
5.2.3	**1**	**Connection Compartment**	
	1	**Panel connection** Cable connection from bottom Number of cable per phase 5 cables Single-core cable max. 630 mm2	

3 **Current transformer in the connection compartment**

Designed as block type current transformer,

assembled in the connection compartment

3 x 2 cores in L1/L2/L3

Primary current: 2000 A

Secondary current: 1 A / 1 A

Core 1: 5 VA / Cl. 5P / 20

Core 2: 5 VA / Cl. 0.2 / FS5

1 **Earthing switch on the cable connection**

Earthing switch with short-circuit making capability

Short-circuit current and duration:

Rated short-time phase-to-earth withstand current (Ike): I_{ke} = 31.5 kA

Rated duration of phase-to-earth short-circuit (tke): t_{ke} ≤ 3s

Rated peak phase-to-earth withstand current (Ipe): I_{pe} ≤ 82 kA

Auxiliary switch: 4 NO + 4 NC (only in Vacuum-Contactor-Panel: 2NO+2NC)

Operating mechanism:

Hand operated

Electromagnetic interlocking: AC 230 V

5.2.4 **1** **Low Voltage Compartment**

Height 630 mm

equipped as follows:

1 CIRCUIT BREAKER UC10KA 4P C6

1 AUXILIARY SWITCH 1S1OE

1 test socket for current flush mounting

1 test socket for voltage flush mounting

1 overcurrent relay 7SJ80

1 Installation costs

1 Basic wiring costs

1 Wiring options

1 Terminal costs

Mounting and Wiring

5.2.5 Customer-specific designs

1 Cable Conn. Bottom 5 cb/ph (630mm2) w DIN 46235 Cable Lugs 7.2kV <=31.5kA...

Item No.	Quantity	Description	Typical No.: =LZ04
5.3	**1**	**Switching device panel 1250 A** Max permissible feeder current at 35 °C: 1330 A	
5.3.1	**1**	**Busbar Compartment** Busbar cross-section Cu 2x100x10 mm	
5.3.2	**1**	**Switching Device Compartment**	
	1	**Circuit breaker withdrawable part** Withdrawable part for the circuit breaker Operating mechanism withdrawable part: Hand operated Auxiliary switch withdrawable part: 6NC + 6NO Electromagnetic interlocking: AC 230 V Mechanical padlocking facility with padlock Vacuum circuit breaker, Type SION Technical data: 12.0 kV / 31.5 kA / 1600 A Operating mechanism circuit breaker: motor Voltage of motor operating mechanism: AC 230 V Voltage of closing solenoid: AC 230 V Release combination: 1 shunt release Voltage 1st tripping coil: AC 230 V Auxiliary switch circuit breaker: 12 NC + 12 NO	
5.3.3	**1**	**Connection Compartment**	
	1	**Panel connection** Cable connection from bottom Number of cable per phase 3 cables Single-core cable max. 300 mm2	
	3	**Current transformer in the connection compartment**	

Designed as block type current transformer,
assembled in the connection compartment
3 x 1 core in L1/L2/L3
Primary current: 1250 A
Secondary current: 1 A
Core 1: 5 VA / Cl. 5P / 20

1 **Voltage Detecting and Indicating System on the connection side**
Capdis S1+

1 **Earthing switch on the cable connection**
Earthing switch with short-circuit making capability
Short-circuit current and duration:
Rated short-time phase-to-earth withstand current (Ike): I_{ke} = 31.5 kA
Rated duration of phase-to-earth short-circuit (tke): t_{ke} ≤ 3s
Rated peak phase-to-earth withstand current (Ipe): I_{pe} ≤ 82 kA
Auxiliary switch: 4 NO + 4 NC (only in Vacuum-Contactor-Panel: 2NO+2NC)
Operating mechanism:
Hand operated
Electromagnetic interlocking: AC 230 V
Mechanical padlocking facility with padlock

5.3.4 **1** **Low Voltage Compartment**
Height 630 mm
equipped as follows:
1 CIRCUIT BREAKER UC10KA 4P C6
1 AUXILIARY SWITCH 1S1OE
1 test socket for current flush mounting
1 test socket for voltage flush mounting
1 overcurrent relay 7SJ80
1 Installation costs
1 Basic wiring costs

	1	Wiring options
	1	Terminal costs
		Mounting and Wiring
5.3.5		**Customer-specific designs**
	1	Cable Conn. Bottom 3 cb/ph (3 core up to 300mm2) w DIN 46235
		Cable Lugs...

Item No.	Quantity	Description	Typical No.: =LZ00

5.4 Switchgear accessories

1	Standard accessory set consisting of: 1 Hand crank for charging spring of circuit breaker 1 Push rod for actuating the ON/OFF push buttons 1 Hand lever for moving withdrawable part 1 Set shutter levers right/left 1 Socket spanner for high voltage door 1 Socket for low voltage door 1 Wall panel for accessories 1 Set (4 pieces per panel) lifting bolts for panel width 435 mm, 600 mm and 800 mm 1 Set (4 pieces per panel) lifting bolts for panel width 1000 mm 1 Operation-, 1 installation manual and 1 set supplement drawings in English
2	One end wall
1	Spare assembly parts for wiring on site to Phoenix Standard terminals, consisting of: Type UPCV3K: 12 Bus wiring terminals 4 plugs PCC4/6-ST-7.62 50 contacts STG-MTN 1.5-2.5 Type VBST4-FS: 12 Terminals 4 Modul plugs with sockets 50 contact sockets (single pins) 50 insulating coverings
1	Wall outgoing box 370 mm
1	Channel lenght 500 mm
1	Channel extendable 595 mm to 760 mm in steps 20 mm
8	Fixing ledges
8	Fixing angles
1	Service truck for 800mm/1000mm panel with instruction notes, english
1	Channel lenght 800 mm
1	Channel lenght 600 mm
1	Hand lever for earthing switch (NXAIR, NXAIR SEC, NXAIR M)
1	Terminal lug (copper bars) for connection of earthing bar to station earth for 600/800/1000mm panels
1	Plug for test socket
1	Voltage Test Plug

1	Channel for IP3XD, length 260 mm
1	Wall outgoing box 224 mm

6 Documentation

6.1	Single-Line Diagram	Annex 1
6.2	Panel Arrangement Diagram	Annex 2
6.3	Constructional Data	Annex 3