

Metal-clad type switchgear **USN** 170 series



Technical information

ELGA

CONTENTS

Main characteristics	4
Service conditions	6
Technical data	6
Diagrams of main circuits	7
Low voltage compartment	9
Cable compartment	10
Draw-out element compartment	12
Busbar compartment	14
Operating elements of cubicle	15
Cubicle design and equipment	16
Installation on the ground	19
Operating accessories	20
Interlock system	21
Order blank	22



MAIN CHARACTERISTICS

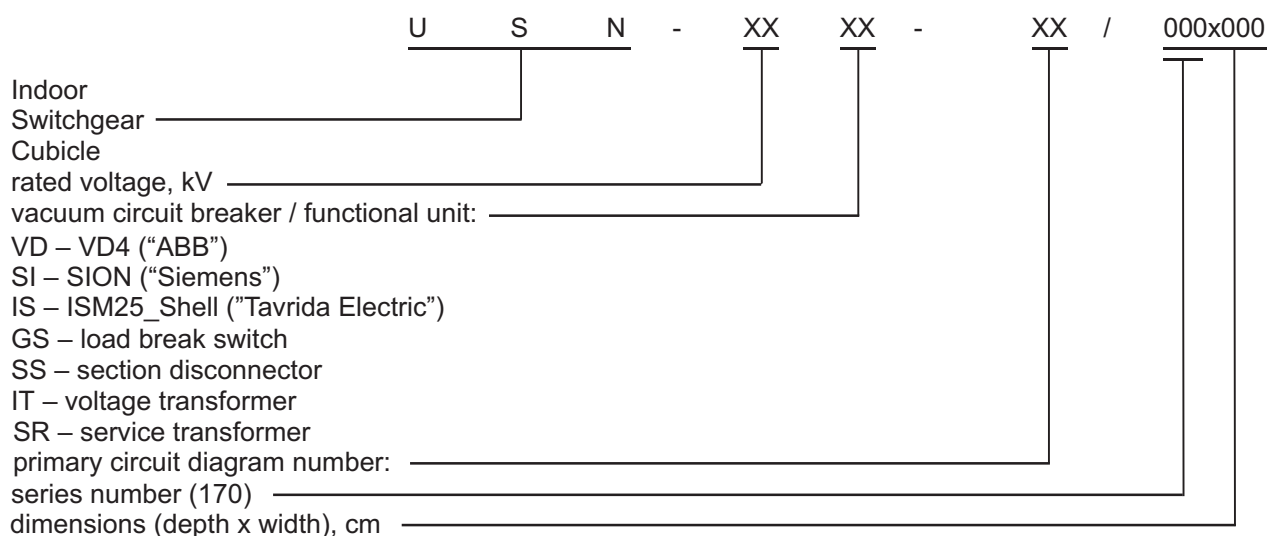
- Construction of three high voltage compartments with draw-out circuit breakers
- Fully metal-clad, type tested according IEC
- Make-type earthing switch
- One-sided maintenance
- Operation of all switching devices with front door closed
- Complete air insulation of all switchboard live parts
- IP3X degree of protection on the external housing
- Constructed to withstand the overpressures caused by the internal arc up to 25 kA/1s
- Busbar segregation shutters activated automatically by circuit breaker movement inside the compartment
- Mechanical outside door interlock ensures safe maintenance

APPLICATION

USN 170 series cubicles are used in indoor switchgears and distribution centers for 24 kV voltage 50/60 Hz frequency electrical power distribution, line overload and short circuit protection.

Cubicles are equipped with vacuum circuit breakers of various manufacturers.

ORDER NUMBER STRUCTURE



ELGA	
Type:	USN-20SI-13/170x080
Serial-No.:	84178-16 2012
Standards IEC:	62271-200
CT rate:	75-150/5/5/1 A
VT rate:	15-20/√3 0.1/√3/0.1/√3 kV
U _o =20kV U _r =24kV U _p =125kV U _d =50kV	
I _k =25kA I _k =3s I _p =63kA	
I _n =1250A I _n =50Hz I _p =3X	
T=+5...+40 °C	
Made in Lithuania	

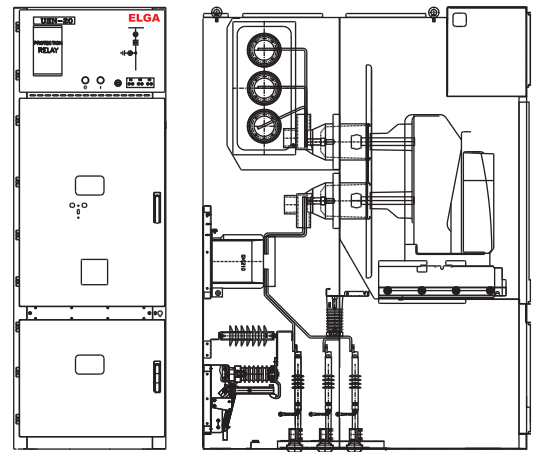
CUBICLE STRUCTURE

The torsionally rigid housings of the cubicles are made of 2.0...3.0 mm thickness galvanized steel sheets folded at the edges and bolted together.

With the selection of high quality materials, special surface treatment and powder painting, the conditions for high impact and corrosion resistance are fulfilled.

Special labyrinth construction of panel's side elements and doors ensure personnel safety against arc faults.

Switchboards can be fixed to the special foundation, using anchoring bolts above cable ducts.



PROTECTION AGAINST INTERNAL ARC

Switchboards are designed in compliance with the prescription of the IEC602271-200 standard and ensure maximum personnel safety even under internal arc conditions.

In fact, the switchboards are constructed to withstand the overpressures caused by the internal arc and are fitted with ducts to guide the exhaust gases so that there is no damage to operators or to the rooms.

On request, the UAB "ELGA" switchboards are fitted with an optical arc protection system with sensors in the various compartments.



Arc protection relay NOLA-03-M



Internal arc test at 25kA/1s



Seismic test

TYPE TESTS

Sophisticated tests are performed at accredited European power laboratories (IPH, CESI, IEL).



SERVICE CONDITIONS

Cubicles are designed for indoor use (on stationary premises or prefabricated substation buildings) and must be operating under normal conditions in accordance with the IEC 60694 standard.

The lower limit of operating ambient air temperature shall be not less - 20° C.

The upper limit of operating ambient air temperature shall not exceed + 40° C.

Cubicles can be used up to an altitude of 1000m. Beyond that (altitude up to 3000 m) it's necessary to take into account of a decrease in the dielectric strength.

There must be no dust particles, fumes or smoke, corrosive or flammable gases, vapours or salts.

Seismic resistance of cubicles is up to 7 on Richter scale and up to 9 on MSK scale (according to IEC 60068-3-3).

When commissioning and operating the switchgear under normal conditions, the general electrical safety instructions, as well as operation handling instructions should be respected.

The operational safety of the switchboard is dependent on professional installation and assembly, as well as appropriate handling and diligent servicing.

Failure to comply with the instructions contained in this operating manual can result in the guarantee becoming invalid.

TECHNICAL DATA

Rated voltage, kV	20
Maximum operating voltage, kV	24
Frequency, Hz	50/60
Test voltage (50-60 Hz, 1 min), kV	65
Impulse withstand voltage (1,2-50 µs), kV	125
Rated feeder connection current, A	630; 1000; 1250; 1600; 2000; 2500
Rated main busbar current, A	630 ... 2500
Circuit breaker's making current, kA	16; 20; 25
Rated short-time withstand current (3 s), kA	16; 20; 25
Rated peak withstand current, kA	40; 50; 63
Rated low voltage circuit connection voltage, V	
DC	48; 110; 220
AC	110; 230
Circuit breaker	VD4 - "ABB", SION - "Siemens", ISM25_Shell - "Tavrida Electric"
Insulation level	Normal insulation
Insulation type	Air
Classification according internal arc withstand (IEC62271-200)	AFLR 25 kA/1s
Loss of service continuity category (IEC62271-200)	LSC2B
Partition class (IEC62271-200)	PM
Degree of protection (with the cubicle door closed)	IP4X
Busbar insulation	Insulated
Outgoing line connection	Cables
Maintenance version	One-sided
Height (with arcing channels)	2325 (2600)
Width	800mm: 630A...1250A / 24kV 1000mm: 1600A, 2000A, 2500A / 24kV
Depth	1700mm: 630A...2500A / 24kV

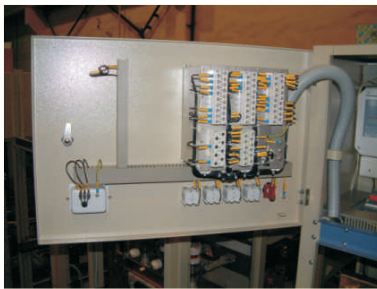
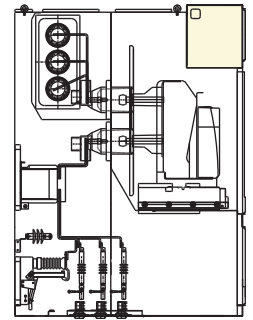
PRIMARY CIRCUIT DIAGRAM TABLE (FOR 24 KV CUBICLES)

Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 1600 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2000 A Width: 800 and 1000 mm	Current: up to 2000 A Width: 800 and 1000 mm
Current: up to 1600 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 1600 A Width: 800 and 1000 mm	Current: up to 1600 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 1600 A Width: 800 and 1000 mm	Current: up to 1600 A Width: 800 and 1000 mm
Current: up to 2000 A Width: 800 and 1000 mm	Current: up to 1600 A Width: 800 and 1000 mm	Current: up to 1250 A Width: 800 mm	Current: up to 1250 A Width: 800 mm	Current: up to 1250 A Width: 800 mm	Current: up to 1250 A Width: 800 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm
Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2500 A Width: 800 and 1000 mm	Current: up to 2000 A Width: 800 and 1000 mm	Current: up to 2000 A Width: 800 and 1000 mm	Current: up to 2000 A Width: 800 and 1000 mm	Current: up to 2000 A Width: 800 and 1000 mm	Width: 800 and 1000 mm	Current: up to 2000 A Width: 800 and 1000 mm

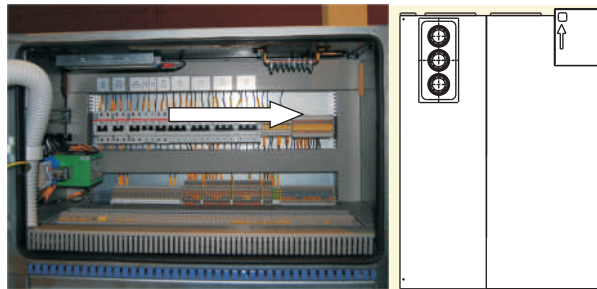
48 Current: up to 2000 A Width: 800 and 1000 mm	48a Current: up to 2000 A Width: 800 and 1000 mm	49 Current: up to 2000 A Width: 800 and 1000 mm	50 Current: up to 2000 A Width: 800 and 1000 mm	51 Current: up to 2000 A Width: 800 and 1000 mm	52 Current: up to 2000 A Width: 800 and 1000 mm	53 Current: up to 2000 A Width: 800 and 1000 mm	54 Current: up to 2000 A Width: 800 and 1000 mm
55 Current: up to 2500 A Width: 800 and 1000 mm	56 Current: up to 2500 A Width: 800 and 1000 mm	57 Current: up to 2500 A Width: 800 and 1000 mm	58 Current: up to 2500 A Width: 800 and 1000 mm	59 Current: up to 2500 A Width: 800 and 1000 mm	60 Current: up to 2500 A Width: 800 and 1000 mm	61 Current: up to 2500 A Width: 800 and 1000 mm	61a Current: up to 2000 A Width: 800 and 1000 mm
62 Current: up to 2500 A Width: 800 and 1000 mm	63 Current: up to 2000 A Width: 800 and 1000 mm	64 Current: up to 2000 A Width: 800 and 1000 mm	65 Current: up to 2000 A Width: 800 and 1000 mm	66 Current: up to 2000 A Width: 800 and 1000 mm	76 Current: up to 1250 A (400 A - with fuses) Width: 800 mm	77 Current: up to 1250 A (400 A - with fuses) Width: 800 mm	78 Current: up to 1250 A (400 A - with fuses) Width: 800 mm

LOW VOLTAGE COMPARTMENT

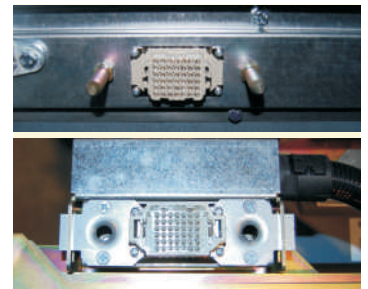
Low voltage compartment is manufactured in double steel plate system to have low voltage instruments well protected against the effects of short circuit currents from the primary compartments. The auxiliary circuits of the circuit breaker are automatically connected by means of a specially designed multi-pole connector, which is automatically connected during circuit breaker sliding-in.



LV compartment door



The low voltage circuit connection between cubicles



The auxiliary circuits of the circuit breaker are automatically connected

Relay-protection devices



VAMP



AREVA



ABB



SIEMENS



SCHNEIDER ELECTRIC

USN cubicles can be equipped with various digital protection and automation devices, electronic and multifunctional microprocessor-based energy meters. Typical diagrams realized using digital protection and automation devices, namely SEPAM, REF, SPAC, MiCOM, SIPROTEC, F 650, VAMP. Other digital devices can be utilized on request.

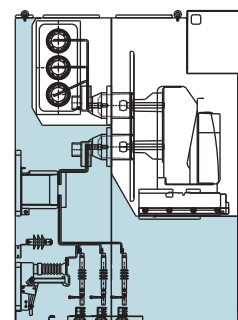
Diagrams of auxiliary circuits

Principal and secondary wiring diagrams for auxiliary circuits are the part of USN switchgear documentation. Diagrams are realized with DC or AC auxiliary voltage. AC/DC panels can be offered on request. A complete set of diagrams is available for all typical USN switchgear cubicles: incoming, outgoing, section disconnector, metering, load break switch, voltage transformer, service transformer and etc. Diagrams of auxiliary circuits for USN switchgears are realized through a range of typical schemes using various microprocessor-based protection, control, automation and signaling devices. Diagrams of an energy metering can be realized using electronic or multifunctional microprocessor-based energy meters.

CABLE COMPARTMENT

Access to the cable compartment is from the front side. It is very easy to reach cable area, due to the compact design of busbar and circuit breaker compartments. Up to 45% of switchgear panel volume can be used as the cable termination compartment. A connection of 4 parallel cables up to 500 mm² per phase does not provide any problem, since two partitions between cable and draw-out element compartments can be removed.

USN switchboards are fitted with a fault making earthing switch mounted in the cable compartment to connect the busbar, incoming or outgoing cables to earth. The earthing switch is controlled from the front of the switchboard by means of manual or motor (on request) operation. Electromechanical interlocks can link switch operation to other switching device in the substation or to lack of voltage in the cable.



In	Width, mm	Rated short-time withstand current	Max. number of cables per phase	The height of the cable connection point from the ground, mm
630 A	800	up to 25 kA	2	700
1000 A	800	up to 25 kA	2	700
1250 A	800	up to 25 kA	3	500
1600 A	1000	up to 25 kA	3	500
2000 A	1000	up to 25 kA	4	500
2500 A	1000	up to 25 kA	4	500



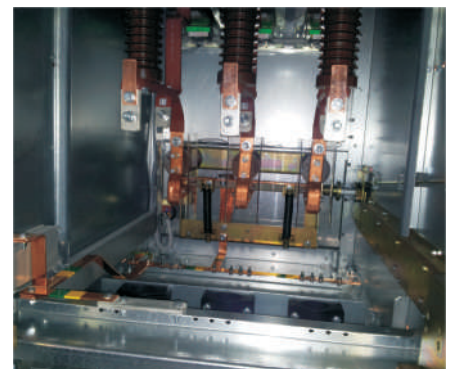
Bottom of cubicle hermetically sealed with cable entry sealing inserts



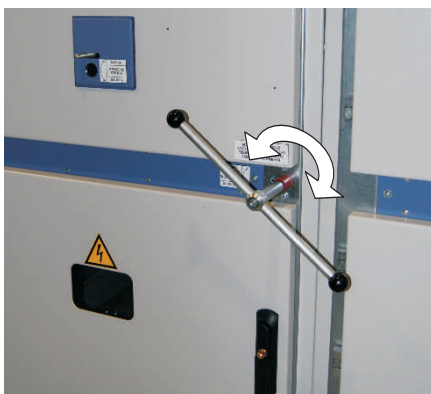
Locking earthing switch mechanism



Opening cable compartment door



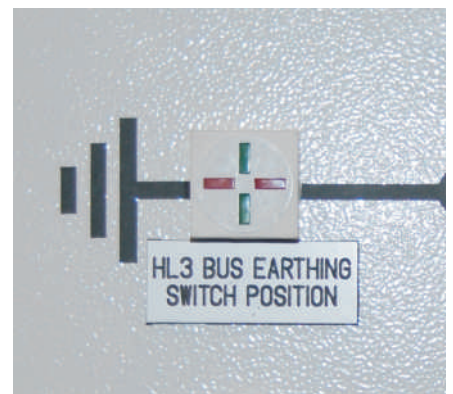
Earthing switch



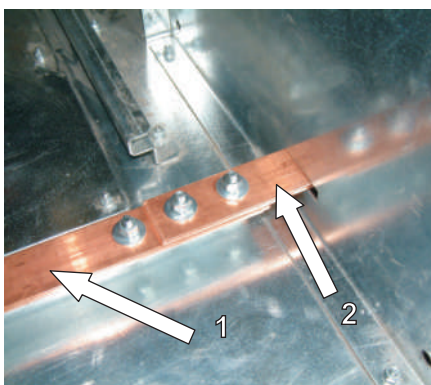
Earthing switch operation



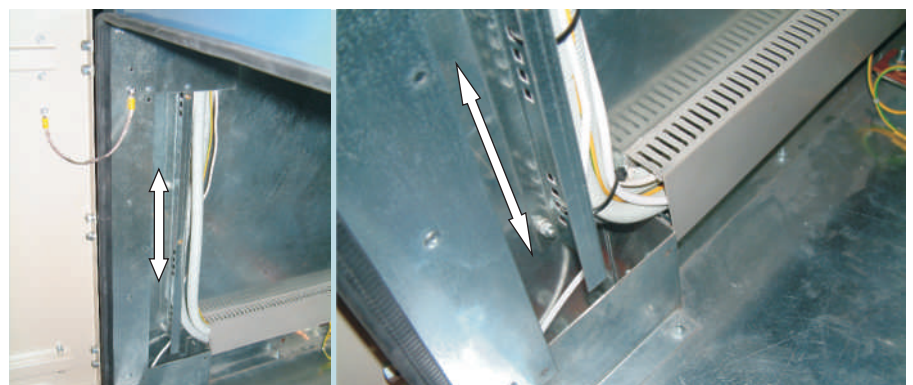
Mechanical indicator of earthing switch status



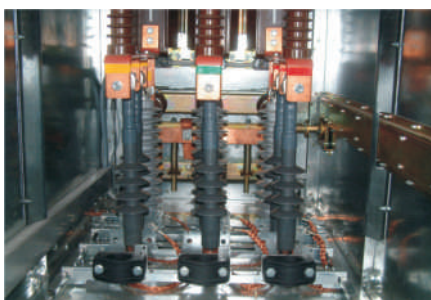
Electronic indicator of earthing switch status



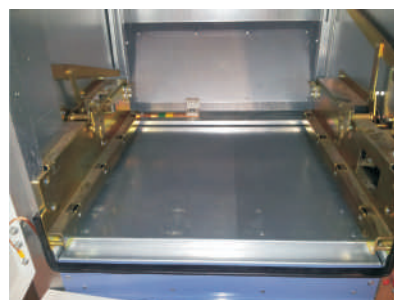
Earthing busbar connection between cubicles (connecting up the earthing circuit)



Passage of the LV cables in the cable compartment



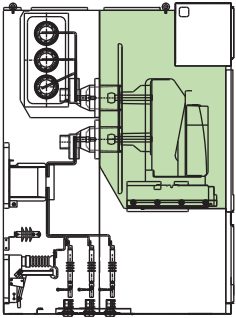
Fixing the cables and connecting cable earthing braid



Segregation of cable and draw-out element compartments

DRAW-OUT ELEMENT COMPARTMENT

Standardized construction of truck allows integration of voltage transformers, contactors, section disconnectors and vacuum circuit breakers from major worldwide suppliers.



SION
Siemens



VD4
ABB



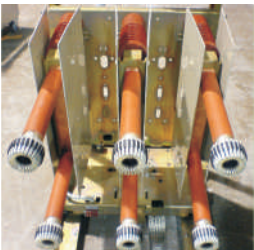
LBSkit
Schneider Electric



ISM25_Shell
Tavrida Electric



Voltage transformer
on truck



Section disconnector
on truck



Opening draw-out element compartment door



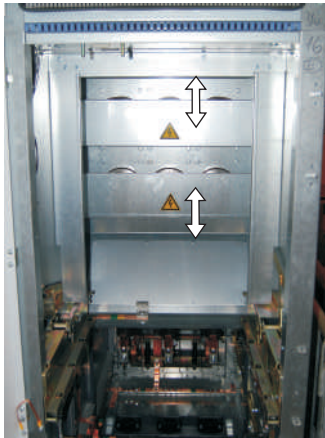
Operating truck



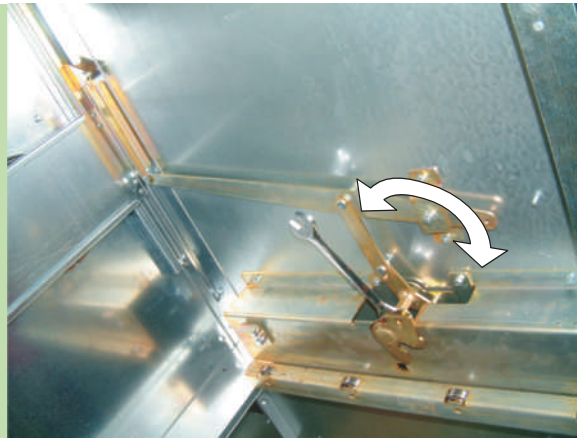
Electronic indicator of truck position



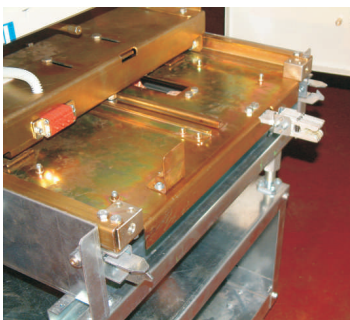
Removing partition between draw-out element and cable compartments



Operating segregation shutters



Locking shutter operating mechanism



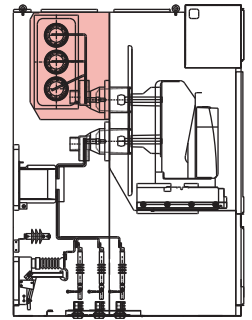
Earthing contact of truck



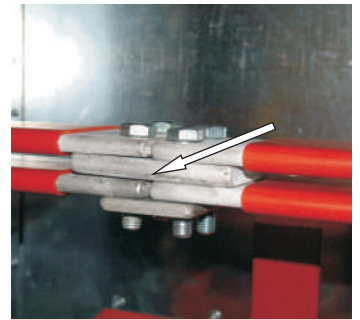
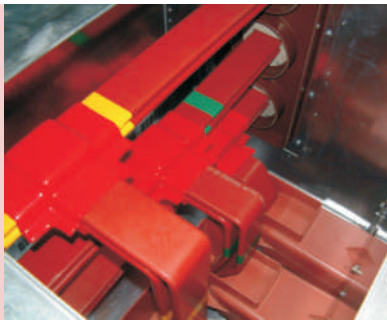
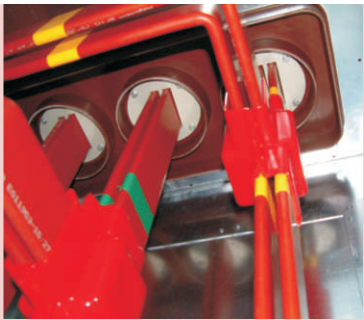
Removable access panel to busbar compartment

BUSBAR COMPARTMENT

The busbar system is made of flat copper or aluminum bars connected by bolted connection. Busbars are additionally covered with insulating material. Busbar compartment, as well as draw-out element and cable compartments, has an exhaust channel to let out overpressured hot gases in the case of a fault. Busbar compartments between two adjacent cubicles are separated by special cast resin bushings.



Busbar with special cast resin bushings



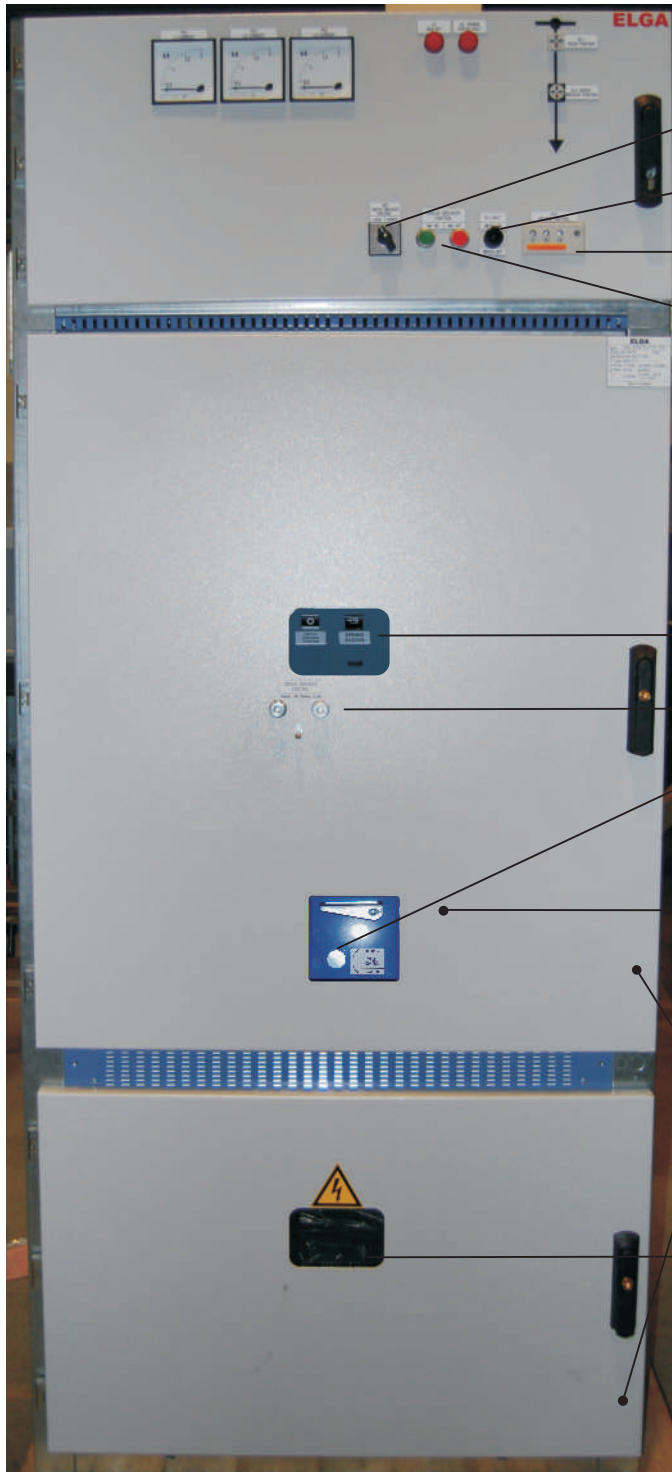
Busbar connection



Removable access panel to busbars in circuit breaker compartment

OPERATING ELEMENTS OF CUBICLE WITH “SION” (SIEMENS) CIRCUIT BREAKER

“SION” circuit breaker is mounted on truck.

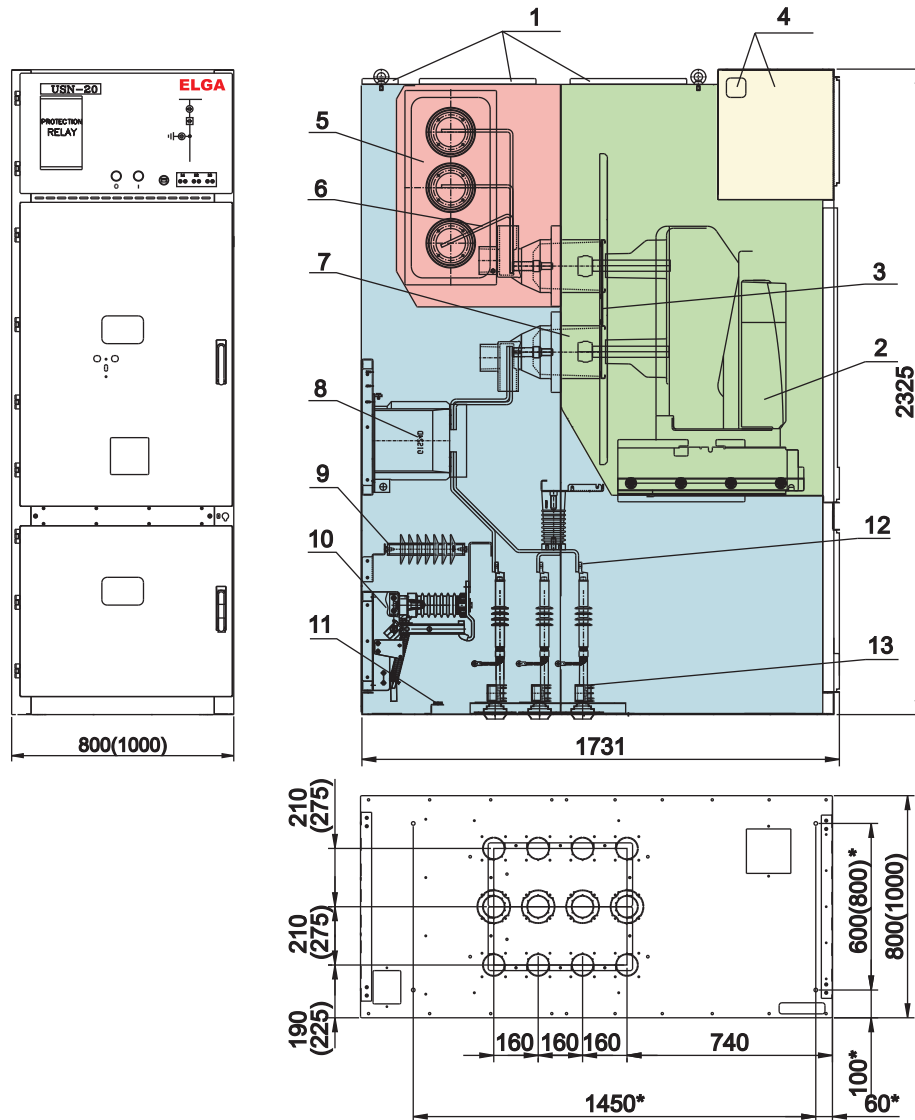


1. Local/remote control switch
2. Low voltage and cable compartment lighting switch
3. Voltage indicator
4. Circuit breaker's switch ON/OFF buttons
5. Mechanical indicator of circuit breaker's position (CLOSED/OPEN), operating cycle counter and spring state indicator
6. Openings for circuit breaker's mechanical switch on/off handle
7. Opening for truck control handle
8. Opening for overriding truck's electromechanical interlock (using special handle)
9. Opening for overriding circuit breaker and cable compartment door mechanical interlock (using special handle)
10. Window for cable connection and earthing switch's position inspection

CUBICLE DESIGN AND EQUIPMENT

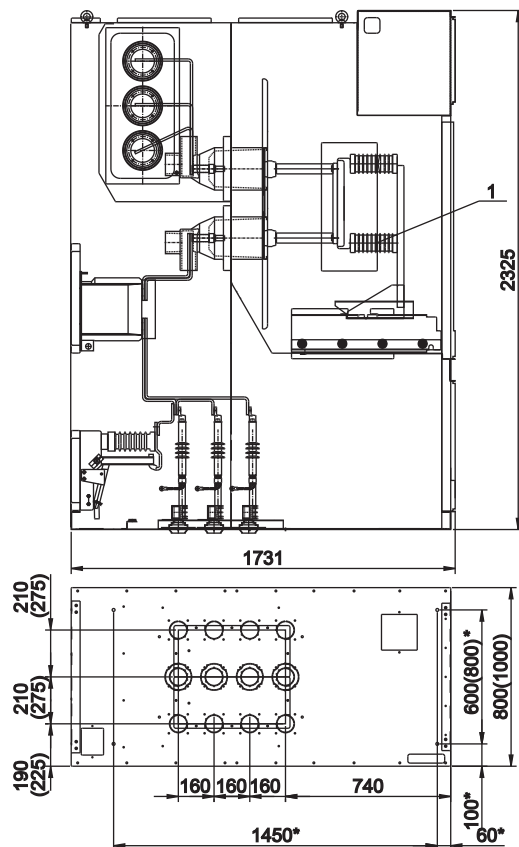
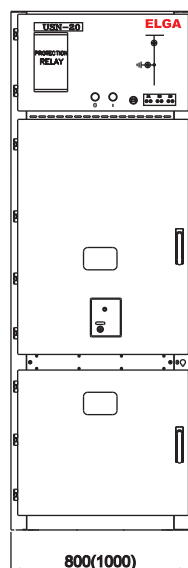
Indoor switchgear consists of USN cubicles with different functional units, control and protection relays, signaling and metering devices and other auxiliary equipment, which are interconnected electrically.

Design layouts of USN switchgear cubicles are given below.



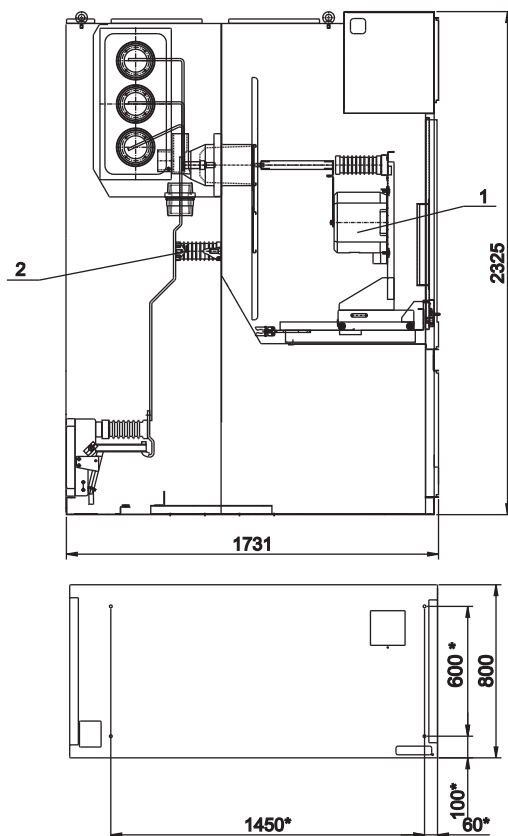
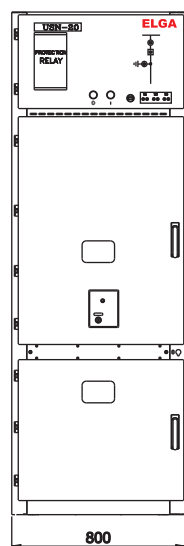
Circuit breaker cubicle USN-20SI-01

- | | | |
|---|---|--|
| 1 Internal arc pressure relief flap for cable, busbar and draw-out element compartments | Low voltage compartment | Cable compartment |
| Draw-out element compartment | 4 Control cable passage | 8 Current transformer |
| 2 Circuit breaker on truck | Busbar compartment | 9 Surge arrester |
| 3 Segregation shutters | 5 Busbar bushing insulators | 10 Earthing switch |
| 7 Bushing insulator | 6 Busbars | 11 Earthing bar (neutral) |
| | | 12 Cable connection lugs |
| | | 13 Cable clamping parts |



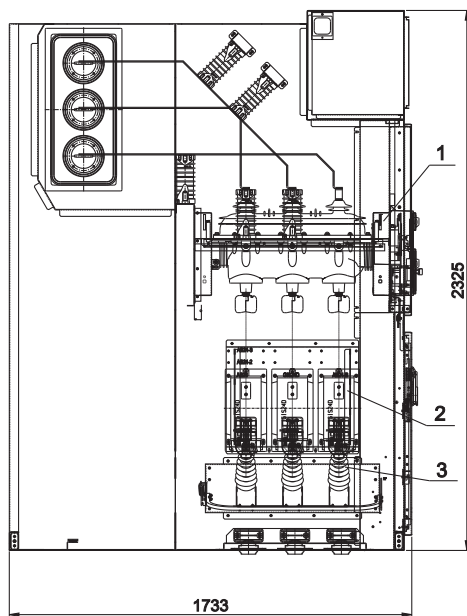
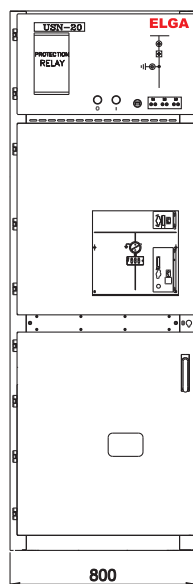
- 1 Section disconnector
on truck

Section disconnector cubicle USN-20SS-59

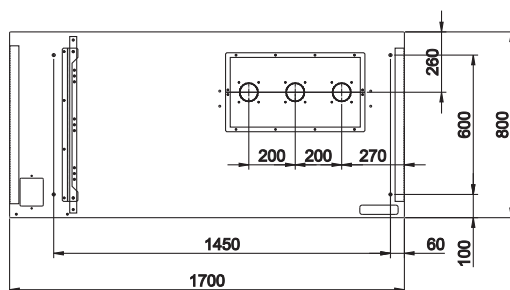


- 1 Voltage transformer
on truck
- 2 Post insulator

Voltage transformer cubicle USN-20IT-46



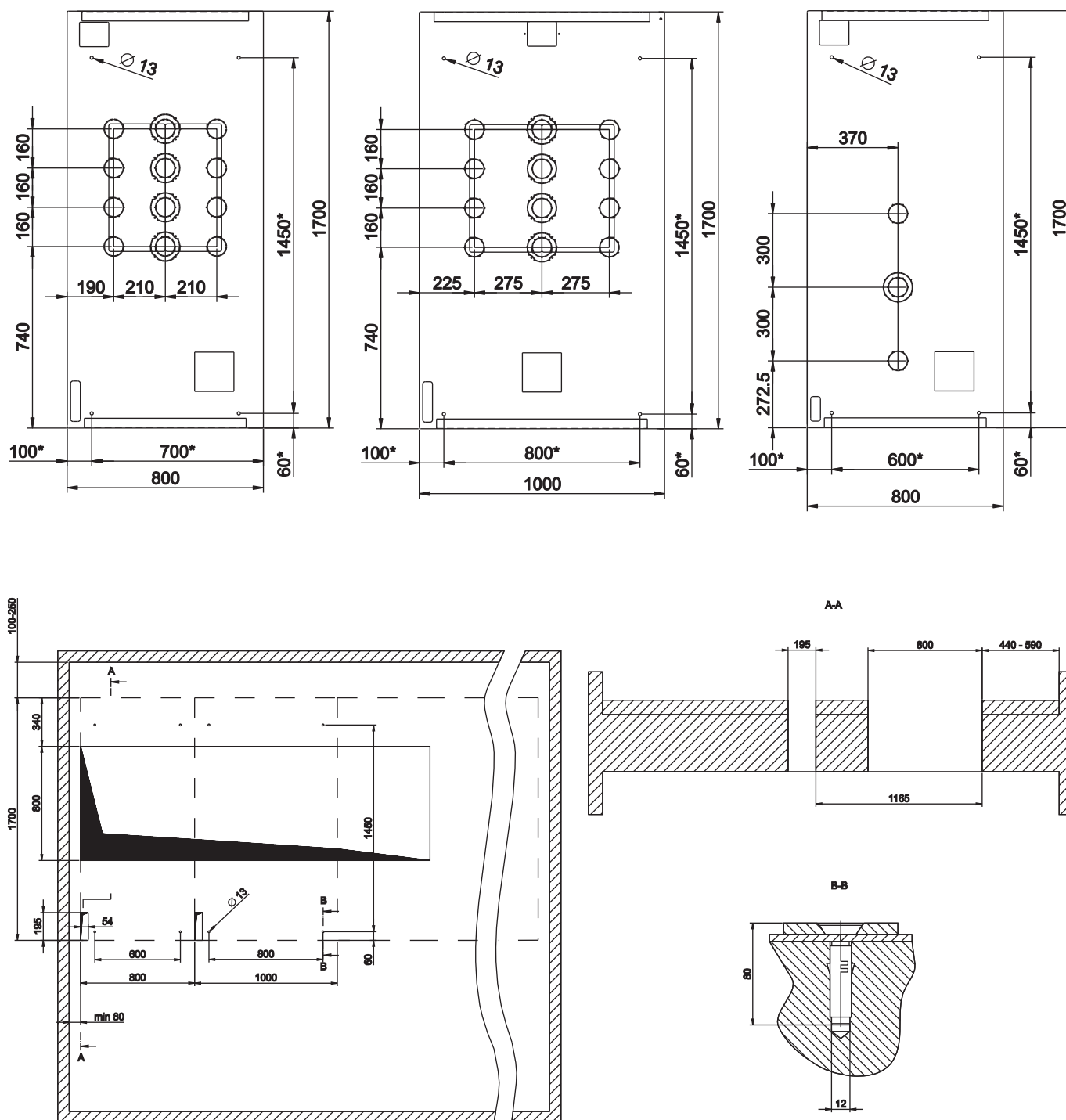
- 1 Load break switch
- 2 Current transformers
- 3 Earthing switch



Load break switch cubicle USN-20GS-76

INSTALLATION ON THE GROUND

Cubicles must be positioned on installation site in accordance with certified project and electrical diagram. There must be duct or opening for cable passing in the floor. Cubicles are fixed to the ground with anchor bolts M12.



Installation of a back-to-wall switchboard (top view)

Positioning cubicles in switchgear

Cubicles must be positioned in the order of priority in accordance with the single-line diagram.

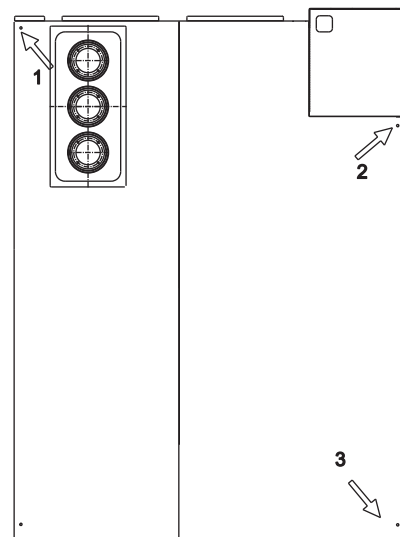
For a switchboard composed of 1 to 10 cubicles, it is recommended to begin installation from the first to the last cubicle on the side opposite the access to the premises. For a switchboard with more than 10 units, begin the installation of the equipment by the middle of the switchboard.

Connecting cubicles

Check the perpendicularity of each of them in relation to the ground. Align up the front facing panels.

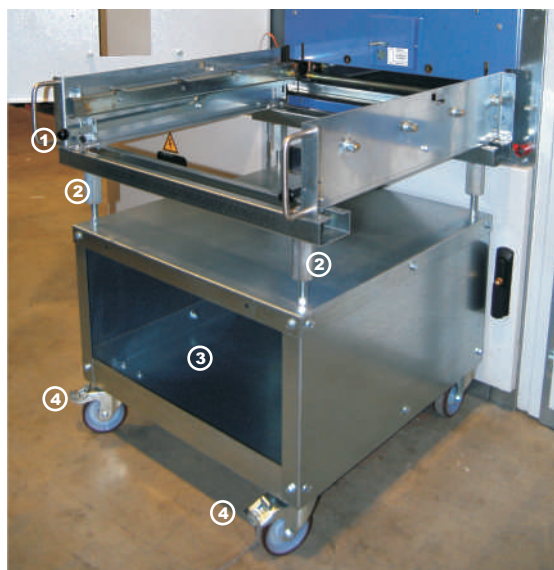
Proceed with the layout of the other cubicles by repeating the same checks each time.

Cubicles interconnected by M8 bolts in 3 fixing points (in accordance with the diagram).



OPERATING ACCESSORIES

Equipment handling table for the draw out element



1. Handle for locking/unlocking the draw out element from its compartment
2. Adjusting the table height
3. Area for storing the accessories (operating handles, keys)
4. Locking/unlocking the wheels

Operating handles and keys



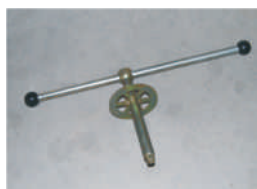
Locking and unlocking key for the doors of the cubicle



The handle for circuit breaker mechanical switch on/off



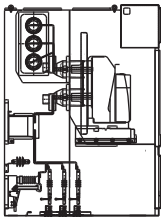
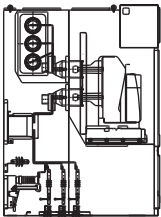
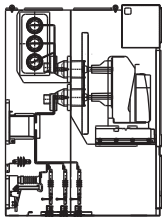
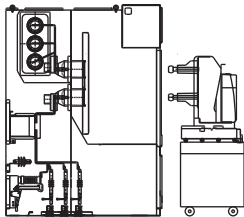
The crank-handle for the draw out element control



The handles for earthing switch control



POSITION OF COMMUTATION DEVICES AND ITS OPERATION POSSIBILITY SUBJECT TO DRAW-OUT ELEMENT POSITION AND COMPARTMENT DOOR INTERLOCKS

		Draw-out element position			
					
		Operation	Intermediate	Isolated	Service
Circuit breaker	Operation possibility	YES	NO	YES	YES
	Position	ON/OFF	OFF	ON/OFF	ON/OFF
	Movement possibility (possibility to put in control handle)	NO (if circuit breaker is switched on); YES (if circuit breaker is switched off)	YES	YES (if earthing switch is opened); NO (if earthing switch is closed)	YES
CB compartment door	Interlock	Blocks the door from opening	Blocks the door from opening	Allows to open the door (if earthing switch is opened); Blocks the door from opening (if earthing switch is closed)	Allows to open the door
Earthing switch	Possibility to put in control handle	NO	NO	YES	YES
	Position	OFF	OFF	ON/OFF	ON/OFF
Cable compartment door	Interlock	Blocks the door from opening	Blocks the door from opening	Allows to open the door (if earthing switch is opened); Blocks the door from opening (if earthing switch is closed)	Allows to open the door (if earthing switch is opened); Blocks the door from opening (if earthing switch is closed)

ORDER TABLE

1	Project name							
2	Name and address of the customer							
4	Main circuit rated voltage, kV							
5	Main busbar rated current, A							
6	Rated short-time withstand current, kA							
7	Serial number of the cubicle according to plan							
8	Primary circuit diagram number							
9	Cubicle type (incoming, outgoing, voltage transformer, service transformer, circuit breaker, load break switch and etc.)							
10	Main circuit rated current, A (630, 1000, 1250, 1600, 2000, 2500)							
11	Circuit breaker (load break switch, contactor)	type						
		rated current, A						
		breaking current, kA						
12	Fuse-link rated current							
13	Current transformers	ratio						
		quantity						
		accuracy class						
		burden, VA						
14	Voltage transformers	1st winding	burden, VA					
			accuracy class					
		2nd winding	burden, VA					
			accuracy class					
		3rd winding	burden, VA					
			accuracy class					
15	Zero sequence current transformer, quantity							
16	Surge arresters, type							
17	Microprocessor-based protection device	type						
		protection functions						
18	Energy meters	active						
		reactive						
19	Amperemeter							
20	Voltmeter							
21	Cubicle heating							
22	Motor drive for draw-out element							
23	Motor drive for earthing switch							
24	Internal arc channel for directing arc outside the building							
25	Tin or silver plated busbars (option)							
26	Insulated busbars							
27	Other color							
28	Two-sided maintenance							
29	Options (NOLA, KAMP)							

Annex to the order blank:

1. Single line diagram with specified types of protection.
Automatic Load Transfer (ALT) algorithm.
2. Layout plan of cubicles in switchgear and dimensions of available installation place.
3. Other additional requirements.

Customer:

title

signature

date

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