

Elektrometal Energetyka SA®



e²ALPHA®-2S Medium Voltage Double Busbar Switchgear





We Create Ideas With Power!

e²ALPHA-2S double busbar switchgear is designed for use in primary and secondary electric energy distribution in key power facilities such as grid exits, main substations, distribution substations, mainly in switchrooms of mines and industrial plants, power plants and CHP stations, grid switching stations and traction power substations. Our R&D department in cooperation with users developed a switchgear tailored to needs of operational personnel. Our main focus when developing this product was accommodating ever increasing requirements for modern power stations equipped with double busbar MV switchgears.

Together with engineers responsible for daily operation of MV switchgears in power stations we have designed a product with a relatively small size (from the height 2.68 m), resistant to detrimental atmospheric conditions and suitable for operation in high temperature and humidity conditions. The switchgear features innovative design solutions such as effective ventilation, high cable terminals, free access to busbar disconnectors, integrated block system, a dedicated channel for control circuitry. Despite its small size the switchgear boasts high resistance for internal arc short-circuits. A line-up of disconnectors with 31.5 kA/3s short-circuit capacity was developed especially for the e²ALPHA-2S switchgear.

Due to constantly increasing requirements for short-circuit strength, current circuits have been thoroughly analysed using finite element method (FEM). This allowed selecting optimal busbar support location and cross-section. The switchgear is fully type-tested for compliance with applicable standards - certified by Institute of Power Engineering.



Jacek Jackiewicz
Main Switchgear Designer, Head of Mechanical Research Department
Elektrometal Energetyka SA



SWITCHGEAR CHARACTERISTICS

e²ALPHA-2S is a line of modern and fully compartmentalized indoor MV switchgears with double busbar system. Standard e²ALPHA-2S line-up includes 650, 800, 1100 and 1300 mm wide switchgear cubicles. The high degree of operational safety of e²ALPHA-2S switchgears is achieved by employing a comprehensive system of mechanical and electrical blocks as well as reinforced bay mechanical structure providing high level of arc resistance. The switchgear is available in IP4X, IP54 and SMA (State Mining Authority) certified versions.

APPLICATION

e²ALPHA-2S switchgear is designed for use in primary and secondary electric energy distribution in key power facilities such as grid exits, main substations, distribution substations, mainly in switchrooms of mines and industrial plants, power plants and CHP stations, grid switching stations which require high power supply reliability and availability of redundant second busbar system.

SWITCHGEAR ADVANTAGES



IE_n
Reliability and high quality
fully type tested

2680 mm
small size
from 2680 mm high, compact, rigid structure

easy adaptation to customer requirements

internal decompression channel
venting arc vapours to one location.

31,5 kA

busbar disconnectors' short-circuit strength at 31.5 kA/3s.

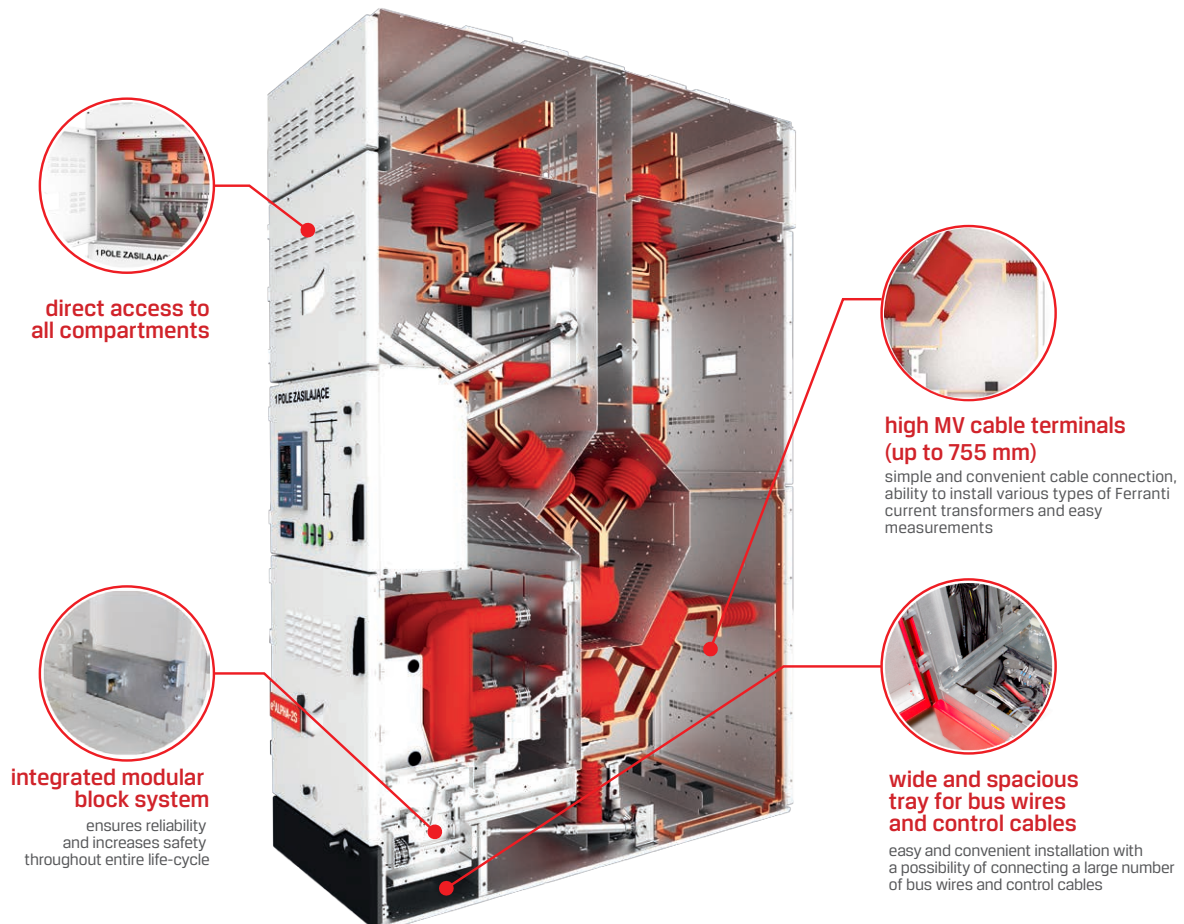
larger LV compartment
possibility of using protection devices of various sizes, easy commissioning and servicing as well as simple inspection and modification

efficient ventilation for up to 2500 A

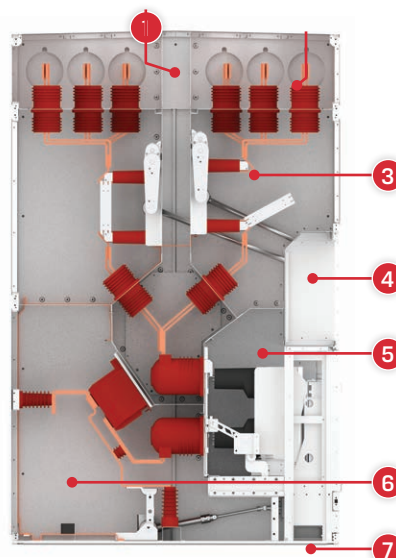
BAY DESIGN

Bay consists of six independent high-current compartments isolated with metal barriers (busbar I compartment, busbar II compartment, system I disconnecter compartment, system II disconnecter compartment, circuit-breaker compartment, connection/cable compartment). Additionally e²ALPHA-2S bays are equipped with one internal decompression channel through which in case of short-circuit in any of the compartments pressure and arc vapours are vented into one location. e²ALPHA-2S is designed in such a way so as to allow access to each of the switchgear compartments without interfering with other compartments, e.g. adjacent ones. This makes it convenient during regular operation but also during service and inspection activities. Maintenance on one of the compartments does not require interfering with other compartments.

A line-up of disconnectors with 31.5 kA/3s short-circuit capacity (confirmed in numerous trials in institutes and laboratories) was developed especially for the e²ALPHA-2S switchgear.



- 1 Wewnętrzny kanał dekompresyjny
- 2 Przedział szyn zbiorczych
- 3 Przedział odłącznikowy
- 4 Przedział obwodów sterowniczych
- 5 Przedział członu wysuwnego
- 6 Przedział przyłączowy
- 7 Kanał obwodów okrężnych



* dostępne rodzaje celek oraz blokady - patrz: tabele str. 18-19

TYPICAL CUBICLES

- incoming bay
- incoming-outgoing
- line bay
- measurement bay with voltage transformers for one busbar system
- measurement bay with voltage transformers for both busbar systems
- lateral coupling bay
- longitudinal coupling bay
- other - according to customer's needs

Presented types of cubicles are only examples of basic configurations used in power stations. Based on these configurations bays may be expanded with additional instruments and equipment in accordance with user requirements and standards.

BASIC DIMENSIONS OF CUBICLES



BLOCK SET

Standard blocks:

- Block preventing changing position of the withdrawable module to "OPERATION" when earthing switch is closed
- Block preventing opening the withdrawable module compartment door when the withdrawable module is in "OPERATION" or intermediate position
- Block preventing leaving earthing switch crank and withdrawable module crank simultaneously in operating sockets
- Block preventing changing position of the withdrawable module from "TEST" to "OPERATION" position when the circuit breaker is closed
- Block preventing closing the circuit breaker when withdrawable module carriage is in the intermediate position between "TEST" and "OPERATION"
- Block preventing closing of earthing switch when the withdrawable module is in "OPERATION" or intermediate position
- Block preventing inserting of lower rated current withdrawable module into higher rated current bay
- Block preventing closing of the earthing switch when earthed side is under voltage
- Block preventing moving the withdrawable module into "OPERATION" position when the compartment door is open
- Automatic block preventing unintended opening of shutters in withdrawable module compartment
- Block preventing simultaneous operation of busbar system I and II disconnectors
- Block of earthing switch hand operation mechanism preventing automatic earthing switch contact switching
- Block preventing closure of both disconnectors in one bay with open lateral coupling in a given section

- Block preventing closure of busbar system earthing switches in a given section when some of busbar system' disconnectors remain closed
- Block preventing closure of busbar system' disconnectors in a given section if earthing switches in that section are closed
- Block preventing closure of earthing switch in longitudinal coupling bay with disconnector module if withdrawable module in the longitudinal coupling bay with circuit breaker is not in „TEST" position
- Block preventing closure of earthing switch in longitudinal coupling bay with disconnector module if withdrawable module in the longitudinal coupling bay with circuit-breaker is not in "Test" position
- Block for circuit-breaker operation with open connection compartment

Optional blocks:

- Electromagnetic block preventing opening of cable compartment back door/cover
- Mechanical block preventing opening of cable compartment back door/cover
- Key block of earthing switch
- Block preventing closing of withdrawable module compartment door when the withdrawable module is not racked-in
- Electromagnetic block preventing unauthorised opening of doors
- Screw block of external door and covers which requires a special tool

BASIC e²ALPHA-2S TWO BUSBAR SWITCHGEAR TECHNICAL SPECIFICATION

Switchgear rated voltage	12 kV	17,5 kV	24 kV
Lighting impulse test voltage (1.2/50 µs)	75 kV	95 kV	125/145 kV
Power frequency test voltage (1 min)	28 kV	38 kV	50/60 kV
Rated frequency	50 Hz	50 Hz	50 Hz
Rated current of busbar, incoming and coupling bays	630-2500 A	630-2000 A	630-2500 A
Rated current of outgoing bays	630-2500 A	630-2000 A	630-2500 A
Rated short-time withstand current (3 s)	up to 31,5 kA	up to 31,5 kA	up to 25 kA
Internal arc resistance (1 s)	up to 31,5 kA	up to 31,5 kA	up to 25 kA
Rated peak withstand current	up to 80 kA	up to 80 kA	up to 63 kA
Switchgear protection rating	IP4X / IP54	IP4X / IP54	IP4X / IP41 / IP54
Accessibility of compartments	LSC2B	LSC2B	LSC2B
Classification of enclosures	PM	PM	PM
Internal arc resistance class	AFLR	AFLR	AFLR
Bay width	650/800/1100 mm	650/800/1100 mm	800/1100/1300 mm
Bay height	2680 mm	2680 mm	3400 mm
Bay depth	1750 mm	1750 mm	2500 mm
Max. operating altitude	1000 m n.p.m	1000 m n.p.m	1000 m n.p.m.
Max. relative humidity at 25°C	100%	100%	100%

STANDARDS

PN-EN 62271-1	High-voltage switchgear and controlgear - Part 1: Common specifications.
PN-EN 62271-100	Part 100: Alternating current circuit breakers.
PN-EN 62271-102	Part 102: High-voltage alternating current disconnectors and earthing switches.
PN-EN 62271-103	Part 103: Switches for rated voltages above 1 kV up to and including 52 kV.
PN-EN 60044-2	Inductive power transformers
PN-EN 62271-105	Part 105: Alternating current switch-fuse combinations.
PN-EN 62271-106	Part 106: Alternating current contactors, contactor-based controllers and motor-starters.
PN-EN 62271-200	Part 200: AC metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to and including 52 kV.
PN-IEC 60529	Degrees of protection provided by enclosures (IP code)
PN-EN 60044-1	Current transformers

CERTIFICATES & AWARDS



**IEEn compliance certificate
no 067/2020**



Masovian Quality Award



**The Minister of Energy Cup
ENERGETAB 2018 Fairs**

ELEKTROMETAL ENERGETYKA SA QUALITY

Implemented Integrated Management System according to:

- PN-EN ISO 9001 Quality management systems
- PN-EN ISO 14001 Environmental management systems
- PN-EN ISO 45001 Occupational health and safety management systems

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