Elektrometal Energetyka SA®

e²ALPHA®-G Medium Voltage Switchgear

Data Sheet K-12.1.4


BAHCO

We Create Ideas With Power!

e²ALPHA-G switchgear is designed for use in hard coal and copper mines. Our R&D department in cooperation with users developed a switchgear tailored to the needs of operational personnel and applicable standards. The main goal when developing this product was meeting ever increasing requirements of modern underground excavation operations i.e. low ceiling, high temperature and humidity, atmosphere harmful to devices, dustiness.

Together with engineers responsible for daily operation of MV switchgears in underground excavations we have designed a product of a small size (max. height 1.8 m), resistant to atmospheric conditions and suitable for operation in high temperature and humidity conditions. The product features innovative design solutions such as efficient ventilation, rear connection to the switchgear without additional adapters (cable duct is optional), free access to busbar compartment, special construction of control circuitry ducts. Despite its small size the switchgear boasts high resistance for internal arc short-circuits. This switchgear is Institute of Power Engineering certified for full compliance with applicable standards, as well as SMA (State Mining Authority) approved for use in underground mining plants.

All these features allow us to offer our customers the most advanced solution available on the market, tailored to their needs and compliant with standards applicable to this type of switchgears. Many years of experience in operation of existing switchgears in underground excavations allowed us to significantly improve the design of this switchgear. Results of tests and commissioning of e²ALPHA-G switchgears makes us confident that this solution significantly reduces the negative impact of harmful conditions present in increasingly more challenging mining operations.

Jacek Jackiewicz

Main Switchgear Designer
Development and Mechanical Director
Elektrometal Energetyka SA

SWITCHGEAR CHARACTERISTICS

e²ALPHA-G is a line-up of modern four-compartment indoor MV switchgears suited to installation in hard coal and copper mines. High degree of operational safety for e²ALPHA-G switchgear was achieved by employing an extended system of mechanical and electrical interlocks as well as reinforced mechanical bay construction unique in its high level of arc resistance. The switchgear features a special high temperature and humidity resistant structure and allows connecting cables at its rear without erecting special cable ducts.

APPLICATION

e²ALPHA-G switchgear is a perfect solution for mining industry power needs. Advanced design, small size (including height of 1800 mm), makes it ideal for low ceiling hard coal and copper mines with difficult environmental conditions (high temperature and humidity).

SWITCHGEAR ADVANTAGES

high arc resistance

SMA

approved for use in mining operations

efficient ventilation

1800 mm

small size

1800 mm high, compact, rigid structure facilitating access to LV compartment and measurement readout

structure resistant to high temperature and humidity

easy adaptation to customer requirements

IEn

Reliability and high quality

fully type tested

BAY DESIGN

e²ALPHA-G bay is made of prefabricated steel and zinc-coated sheets 1 to 3 mm thick. Areas particularly exposed to internal arcing and pressure of arcing gases are made of powder-coated high quality 3 mm thick steel sheets. Additionally the switchgear features a number of technical solutions which minimise the impact of high temperature and humidity at installation site.

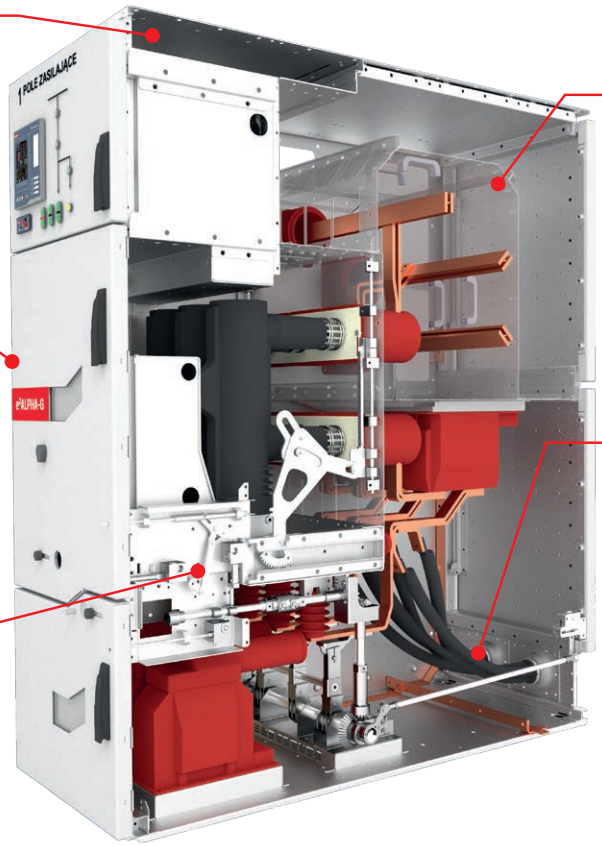
special construction of bus wires duct

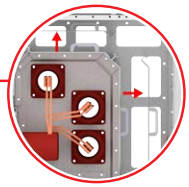
wide control cables duct

łeasy and convenient installation with possibility of connecting a large number of control cables

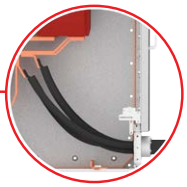
integrated modular interlocking system

ensures reliability and increases safety throughout entire life-cycle





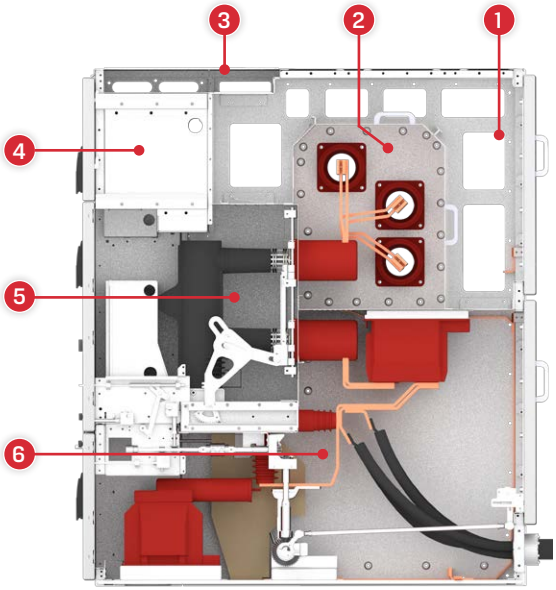
easy access to busbar compartment



rear switchgear connection

makes cable duct optional

1. Decompression compartment
2. Busbar compartment
3. By-pass circutry channel
4. Compartment of control circuits
5. Withdrawable module compartment
6. Connection compartment



BAY DESIGN - AUXILIARY/CONCENTRATOR/SEPARATION CIRCUIT BAY

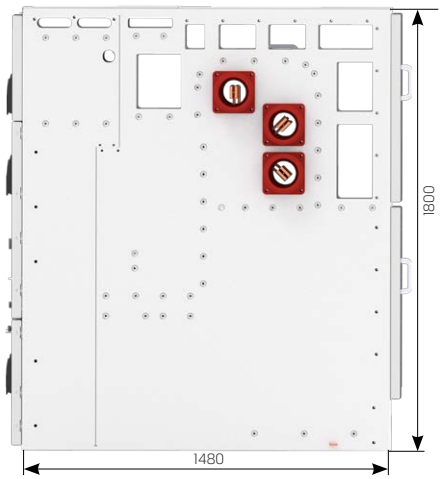
The e²ALPHA-G switchgear can also be equipped with an auxiliary circuit bay as well as concentrator or spearation circuit bay. At the customer's request we adjust access points on the front or side of the cubicle. There is also possibility to arrange the internal equipment according to the recommendations of the client.

TYPICAL CUBICLES

- incoming bay
- outgoing bay
- incoming-outgoing bay
- outgoing bay with disconnector
- coupling bay - with circuit-breaker
- coupling bay - with no-load switch
- capacitor bank bay
- voltage measurement bay
- bus riser bay
- motor bay
- motor bay with drying module
- motor bay x2 (1 outgoing supplying 2 motors)
- ferroresonance attenuation bay
- auxiliary/concentrator/separation circuit bay
- other - according to customer's needs

Presented types of cubicles are only examples of basic configurations used in mining industry. Based on this setup it is possible to expand bay technical infrastructure with additional switches, transformers, surge arresters and other elements according to Customer requirements.

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 closure 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 opening cable compartment door when earthing switch is open
- Block preventing moving the withdrawable module into "OPERATION" position when the compartment door is open
- Block preventing opening of an earthing switch when cable compartment door is open
- Block preventing unintended opening of shutters in withdrawable module compartment when the module is outside the bay

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 interlocking preventing unauthorised opening of doors
- Screw interlocking of external door and covers which requires a special tool
- Other according to contractor requirements

BASIC e²ALPHA-G SWITCHGEAR TECHNICAL SPECIFICATION

Switchgear rated voltage	12kV
Lighting impulse test voltage (1.2/50 μs)	75kV
Power frequency test voltage (1 min)	28 kV
Rated frequency	50 Hz
Rated current of busbar, incoming and coupling bays	up to 1250 A
Rated current of outgoing bays	up to 1250 A
Rated short-time withstand current (3 s)	up to 25kA
Internal arc resistance (0.1 s; min. 3 bays)	up to 25kA
Rated peak withstand current	up to 63kA
Switchgear protection rating	IP 4X / IP54
Accessibility of compartments	LSC2B
Classification of enclosures	PM
Internal arc resistance class	AFLR
Bay width	600 mm
Bay height	1800 mm
Bay depth	1480 mm
Max. operating altitude	1000 m asl
Max. relative humidity at 25°C	100%
Operation altitude	1000 m.a.s.l.
Maximum relative humidity	at 25 ° C

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 62271-105	Part 105: Alternating current fuse switch disconnector
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-EN 60044-1	Current Transformers
PN-EN 60044-1	Inductive Voltage Transformers
PN-G-42050:1997	Electrical power engineering in mines. Mine switchgear for alternating current at voltage in range above 1 kV up to 15 kV including. Requirements and tests
PN-G-50003:2003	Work protection in mining industry. Electrical mining equipment. Requirements and tests.
PN-IEC 60529	Degrees of protection provided by enclosures (IP Codes)

CERTIFICATES AND AWARDS

IEn compliance Certificate
No. 092/2017

SMA Certificate
No. GE-24/17

Masovian Quality Award

The Minister of Energy Cup
ENERGETAB 2018 Fairs

Business Gazelle 2020

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 Certificate of Health and Safety Management System

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