



Elektrometal Energetyka SA

e²BRAVO[®] MV Vacuum Circuit Breaker

Manewrowanie
uziemniakiem

WE CREATE IDEAS WITH POWER!

ELEKTROMETAL ENERGETYKA SA provides solutions for electrical power engineering. Our services are carried out by a team of experienced professionals.

We employ professional engineers with vast practical knowledge who have many years of industry experience in power engineering. The synergy of their competences together with openness to non-standard ideas and the use of modern solutions are ensuring the highest quality of service and create foundation for harmonious, based on dialogue cooperation with our customers. We are winning the trust of our customers through reliability and immediate reaction to their specific needs.

Our activity focuses not only on production of modern MV switchgears, MV switching devices and digital protection terminals. We also provide a wide range of services which maximize operational capabilities and minimize cost. We offer our customers an innovative method in which we integrate the best and proven solutions for power engineering and adapt them to the specific individual needs.

We continually increase our potential and improve our offer. Our company is developing dynamically and is following industry trends.

Transparency of procedures and documents is a rule in Elektrometal Energetyka SA. Our priority is to satisfy customers through reliability, ease of use and intuitiveness of our devices. We believe that good energy in relationship helps both parties achieve a lot more, that's why we take care of fully team involvement in the course of cooperation. We are building our company with firm belief that our success depends on trust and satisfaction of our customers. Therefore, one of the most important distinguishing elements for ELEKTROMETAL ENERGETYKA SA is the highest quality of offered solutions.

We have implemented an Integrated Management System, which consists of: Quality Management System ISO 9001, Environmental Management System ISO 14001, Occupational Health and Safety Management Systems OHSAS 18001. Those implemented systems are consistent with the highest standards of management and they create daily practice in our company, which aims at professional customer service and maintaining the highest standards of health and environment protection. Our products have certificates confirming full type-examination. Those examinations have been conducted among others in laboratories of the Institute of Power Engineering and the Institute of Electrical Power Engineering in Warsaw.



Mariusz Maślany
Chairman of the Board
Elektrometal Energetyka SA

CHARACTERISTIC

e²BRAVO vacuum circuit breaker is a modern medium-voltage switching apparatus dedicated for use with two-segments medium-voltage switchgears as well as in fixed version as a replacement for old low-oil apparatus.

e²BRAVO is available in a wide range of rated voltages (7.2 - 24 kV) and in various configurations due to the horizontal and vertical scale and additional device equipment.

High quality vacuum interrupters and reliable operating mechanism ensure the achievement of high switching and high mechanical durability at the level of 30.000 on-off cycles.

APPLICATION

High reliability of the e²BRAVO circuit breakers family combined with their very good electrical parameters make them ideal for applications in the commercial-, industrial- and mining power companies, where above mentioned aspects are essential.

e²BRAVO circuit breakers can also be successfully used as a replacement of old low-oil equipment by using special retrofitting designs.

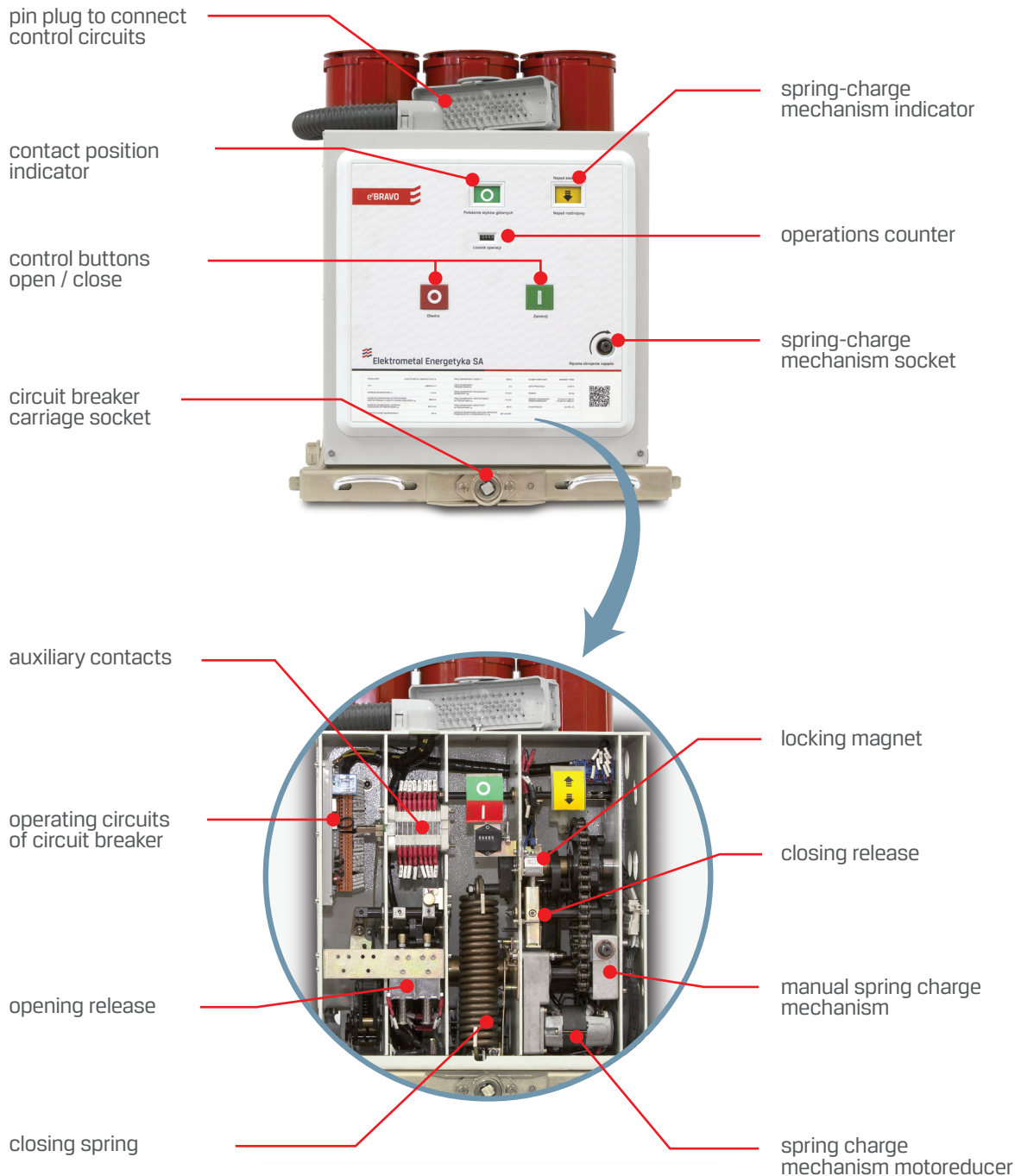
The design of retrofit kits ensures fully interchangeability with the previously used low-oil circuit breakers of the following types: SCI/ SCJ, WMPWZ, WMSWP and IO.

VACUUM CIRCUIT BREAKER ADVANTAGES



VACUUM CIRCUIT BREAKER DESIGN

e²BRAVO circuit breaker is a modern vacuum switching apparatus which has been equipped with a stored-energy spring operating mechanism. Operating system is placed in the middle of the front part of the circuit breaker body. Such an arrangement of the operating system provides very good access to its components and facilitates maintenance and service.



ADAPTATION SETS

Adaptation sets are additional equipment allowing the use of circuit breakers in the older generation devices. Thanks to them, there is the possibility of replacing the older generation switching apparatus with modern vacuum circuit breakers - e²BRAVO. Adaptation set in the form of the trolley allows the use of new circuit breakers in old-type switchgears such as: WRS, RSW, GIPO.

Circuit breaker e²BRAVO can be adapted as a movable module for switchgear type RD1. It is fully compatible with earlier solutions and maintains full functionality of its predecessors.



EQUIPMENT

Fixed version

Standard equipment:

- first shunt opening release
- second shunt opening release
- shunt closing release
- locking magnet
- spring charging motor of circuit breaker
- circuit-breaker's state auxiliary contact
- spring charging motor limit contact
- anti-pumping relay
- plug 58 pin
- spring charging hand crank

Auxiliary equipment:

- under-voltage release
- transient contact
- additional circuit-breaker's auxiliary contacts
- third shunt opening release
- plug 64 pin

Withdrawable version

Standard equipment:

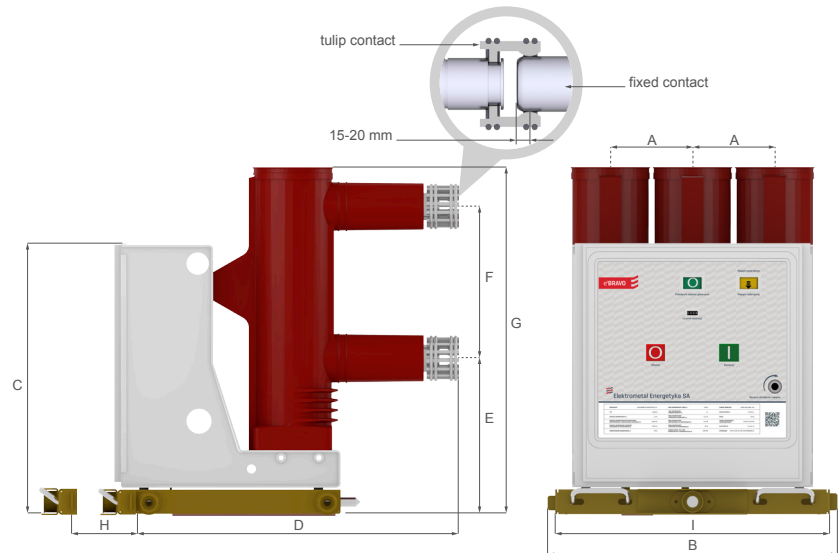
- first shunt opening release
- second shunt opening release
- shunt closing release
- locking magnet
- spring charging motor of circuit breaker
- circuit-breaker's state auxiliary contact
- spring charging motor limit contact
- anti-pumping relay
- location contacts of withdrawable module
- plug 58 pin.
- spring charging hand crank
- trolley manoeuvring hand crank.

Auxiliary equipment:

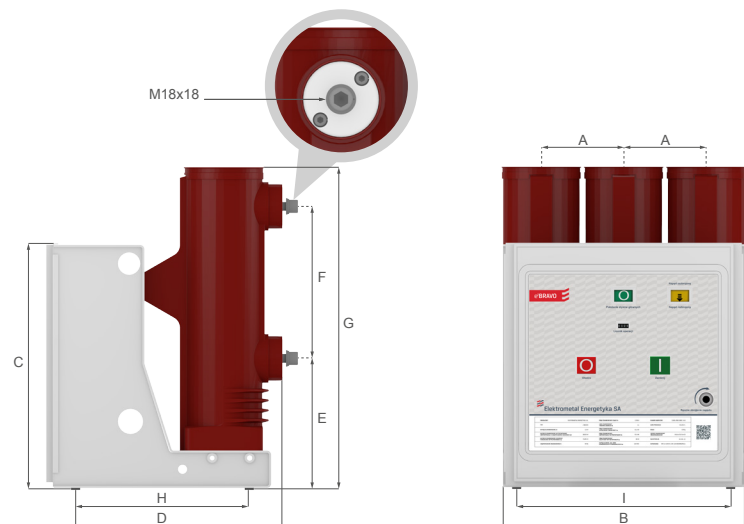
- under-voltage release
- transient contact
- motor for changing position of withdrawable module
- locking magnet for withdrawable module
- additional circuit-breaker's auxiliary contacts
- third shunt opening release
- plug 64 pin.

DIMENSIONS

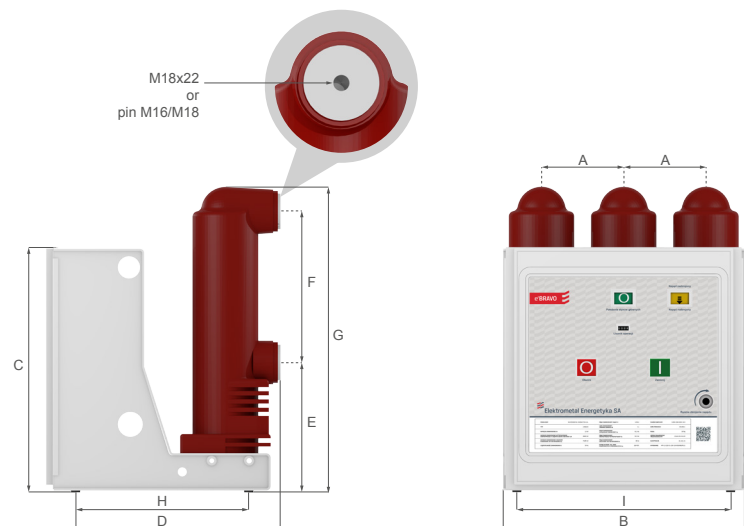
e ² BRAVO - WP		
	150 mm	210 mm
A	150	210
B	502	652
C	491	491
D	598	598
E	280	280
F	275	275
G	626	626
H	200	200
I	531	681



e ² BRAVO - SP			
	150 mm	210 mm	275 mm
A	150	210	275
B	448	588	770
C	445	445	445
D	318,5	318,5	318,5
E	237	237	237
F	275	275	275
G	580	582	582
H	255	275	275
I	390	520	720

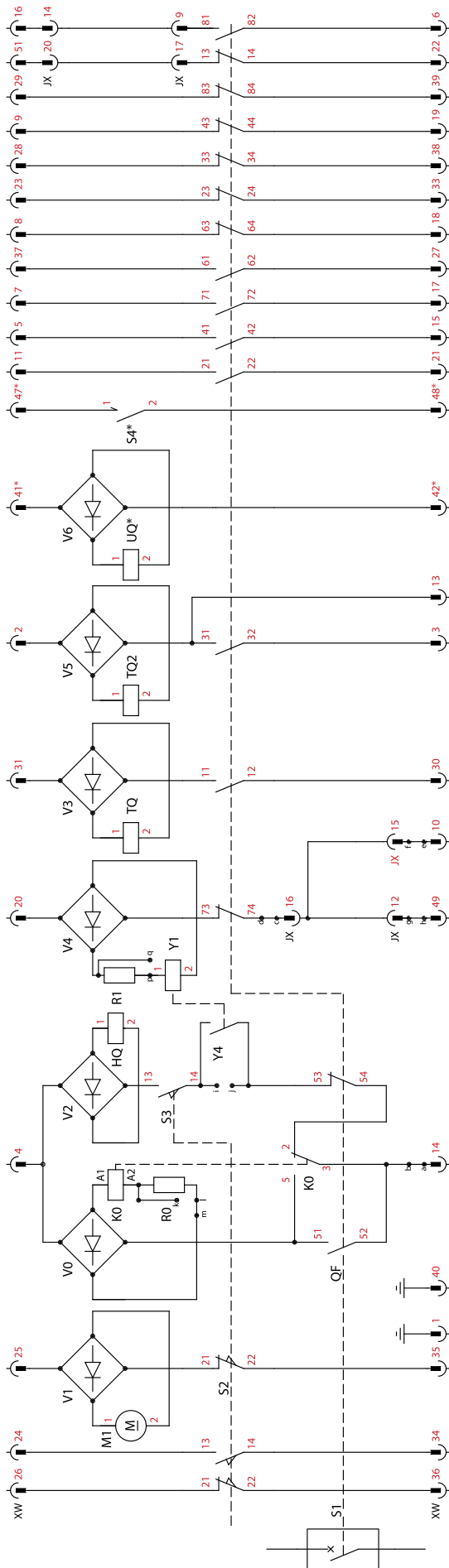


e ² BRAVO - SG	
	150 mm
A	150
B	440
C	445
D	321,5
E	237
F	275
G	557
H	275
I	390





EXAMPLE DIAGRAM



Fixed version

Standard equipment:

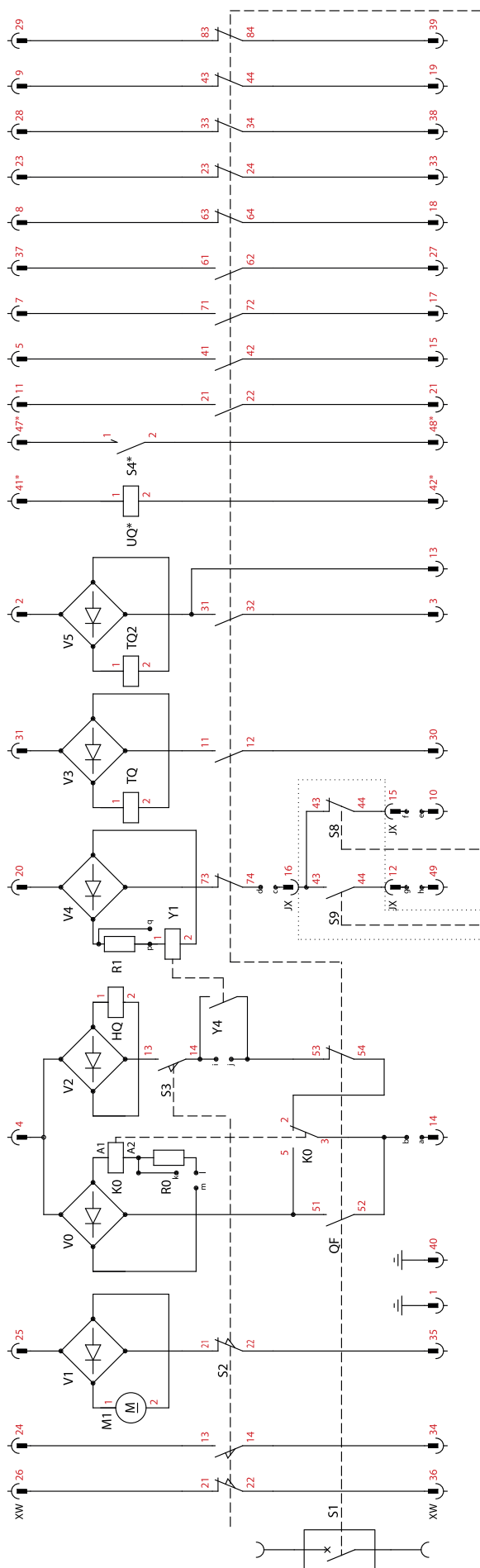
- V1...V5 – rectifying bridge
- TQ – first shunt opening release
- TQ2 – second shunt opening release
- HQ – shunt closing release
- M – spring charging motor of circuit breaker
- QF – additional circuit-breaker's state auxiliary contact
- S1...S3 – spring charging motor limit contact
- K0 – anti-pumping relay
- JX – application connectors
- X – 58 pin plug

Auxiliary equipment:

- UQ* – under-voltage release
- S4* – snap action contact (closing for 35 ms during circuit breaker opening)

ATTENTION:

Circuit breaker's diagram presented in OPEN, position, motor-drive DISCHARGE.



Withdrawable version

Standard equipment:

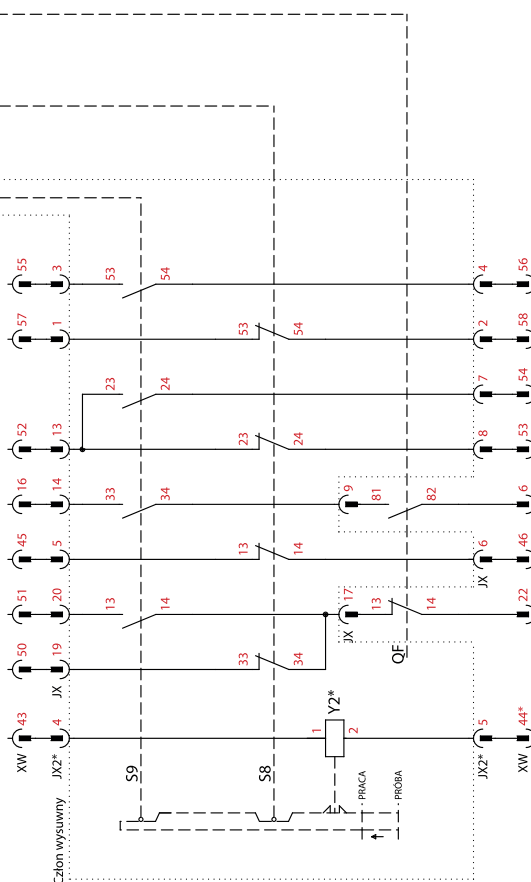
- V1...V5 – rectifying bridge
- TQ- first shunt opening release
- TQ2 – second shunt opening release
- HQ- shunt closing release
- Y1 - locking magnet
- M- spring charging motor of circuit breaker
- OF- circuit-breaker's state auxiliary contact
- S1...S3- spring charging motor limit contact
- KO- anti-pumping relay
- S8- circuit breaker's location auxiliary contact in "TEST" position
- S9- circuit breaker's location auxiliary contact in "OPERATION" position
- JX- application connectors
- X- 58 pin plug

Auxiliary equipment:

- UQ* – under-voltage release
- S4* – snap action contact
- Y2* – locking magnet preventing changing position of withdrawable module.

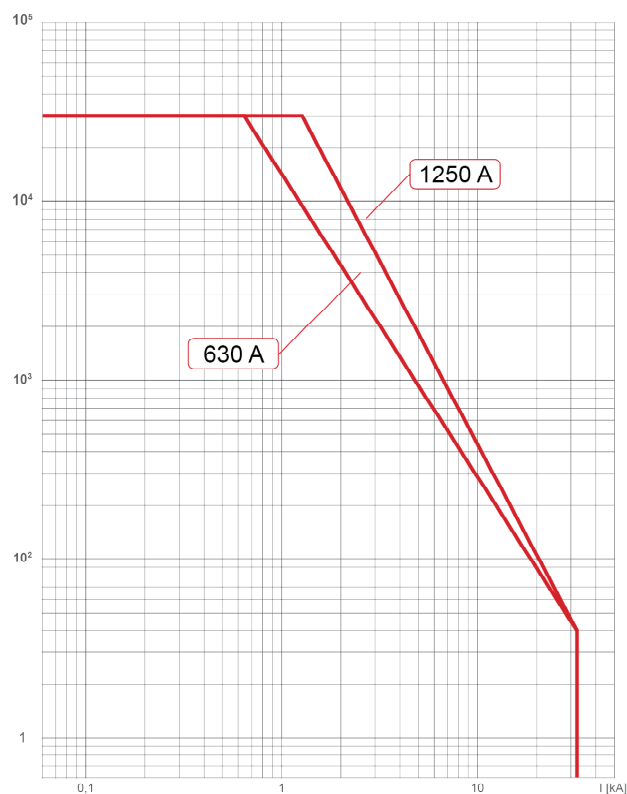
ATTENTION:

Circuit breaker's diagram presented in OPEN, TEST position, motor-driven.



TECHNICAL PARAMETERS

Rated voltage of circuit breaker	12kV	17,5kV	24kV	12kV
Lighting impulse test voltage (1,2/50μs)	75kV	95kV	125kV	75kV
Power frequency test voltage (1 min)	28kV	38kV	50kV	28kV
Rated frequency	50Hz	50Hz	50Hz	50Hz
Rated normal current	630-1250A	630-1250A		1600-2500A
Rated short-time withstand current (3s)	up to 31,5kA	up to 31,5kA	up to 25kA	up to 31,5kV
Rated peak current strength	up to 80kA	up to 80kA	up to 63kA	up to 80kA
Rated short-circuit breaking capacity	up to 31,5kA	up to 31,5kA	up to 25kA	up to 31,5kA
Rated short-circuit making capacity	up to 80kA	up to 80kA	up to 63kA	up to 80kA
Rated breaking capacity of idle cable line	31,5A	31,5A	31,5A	
Rated breaking capacity of single capacitor bank	400A	400A	400A	
Rated making capacity of single capacitor bank	12,5kA	12,5kA	20kA	20kA
Rated operated sequence	0-0,3-C0-15s(180s)-C0			
Classification	E2, M2, C2			
Control voltage	24V DC, 110V DC, 220V DC, 230V AC		220V DC	
Opening time	≤30ms			
Arcing time	≤15ms			
Closing time	≤45ms			
Total breaking time	≤45ms			
Resistance of each phase of main circuits	≤50 μΩ (630A); ≤45 μΩ (1250A)			
Switching endurance	30 000 operations			
Ambient temperature range	- 10° up to +60°C			
Humidity	95%			
Operation altitude	up to 1000 m.a.s.l.			



characteristics of switching endurance

STANDARISATION

PN-EN 62271-1	High-voltage switchgear and controlgear Part 1: Common specifications.
PN-EN 62271-100	High-voltage switchgear and controlgear Part 100: Alternating current circuit breakers

CERTIFICATES



Certificate of conformity

IEL - DN/371/2019

IEL - DN/262/2017

ORDER FORM

For ordering e²BRAVO circuit breaker, please follow instructions mentioned below.

STEP 1

Choose basic circuit breaker parameters from the table below.

① type	<input type="checkbox"/> WP - withdrawable	<input type="checkbox"/> SP - fixed	<input type="checkbox"/> SG - fixed for ROK type switchgear
② rated voltage Un	<input type="checkbox"/> 12 kV [12]	<input type="checkbox"/> 17,5 kV [17]	<input type="checkbox"/> 24 kV [24]
③ rated normal current In	<input type="checkbox"/> 630 A [0630]	<input type="checkbox"/> 1250 A [1250]	<input type="checkbox"/> 1600 A [1600] <input type="checkbox"/> 2000 A [2000] <input type="checkbox"/> 2500 A [2500]
④ rated current Ir	<input type="checkbox"/> 16 kA [16]	<input type="checkbox"/> 20 kA [20]	<input type="checkbox"/> 25 kA [25] <input type="checkbox"/> 31,5 kA [31]
⑤ pole distance	<input type="checkbox"/> 150 mm [150]	<input type="checkbox"/> 210 mm [210]	<input type="checkbox"/> 275 mm [275]

STEP 2

Choose circuit breaker equipment from the table below.

A under-voltage release	<input type="checkbox"/> no [0]	<input type="checkbox"/> yes [1]
B transient contact	<input type="checkbox"/> no [0]	<input type="checkbox"/> yes - TQ i TQ2 [1] <input type="checkbox"/> yes - od TQ2 [2]
C locking magnet	<input type="checkbox"/> no [0]	<input type="checkbox"/> yes [1]
D motor for changing position of withdrawable module	<input type="checkbox"/> no [0]	<input type="checkbox"/> yes [1]
E locking magnet for withdrawable module	<input type="checkbox"/> no [0]	<input type="checkbox"/> yes [1]
F secondary circuits	<input type="checkbox"/> standard [0]	<input type="checkbox"/> customer requirements [1]
G other	<input type="checkbox"/> none [0]	<input type="checkbox"/> customer requirements [1]

STEP 3

Choose circuit breaker electric diagram. Standard diagrams available on company website www.elektrometal-energetyka.pl

H diagram number	<input type="checkbox"/> 01	<input type="checkbox"/> 02	<input type="checkbox"/> 11	<input type="checkbox"/> 12	<input type="checkbox"/> 13
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Your code

e ² BRAVO	①	②	③	④	⑤	⑥	A	B	C	D	E	F	G	X	X	H
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