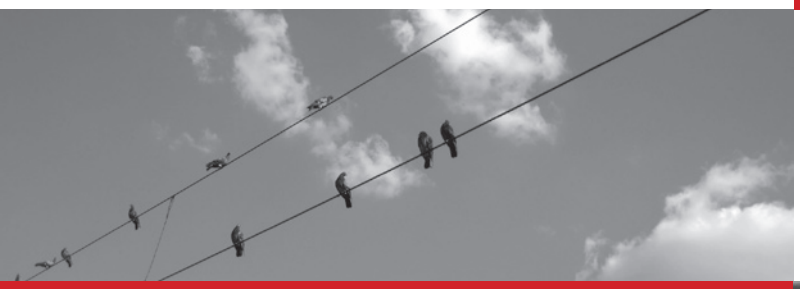


Elektrometal Energetyka SA®

e²BRAVO®
MV Vacuum Circuit Breaker

K-2.4.2 Catalogue EN


e³BRAVO
Elektrometal Energetyka SA
Pomysły z energią
Położenie styków głównych
Zamknij
Otwórz
Napęd zazbrojony
ZAZBROJONY
Napęd rozbrojony
Licznik operacji
Y01. 3
M
OTWARCIE
0

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 ISO 45001. 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

easy acces
very easy access
to control elements
such as auxiliary contacts,
engine, coils

excellent quality
top quality vacuum chambers
high switching parameters
confirmed by type examinations

modern interface
allows fast access
to the technical
documentation

unified operating system
for all types of circuit breakers

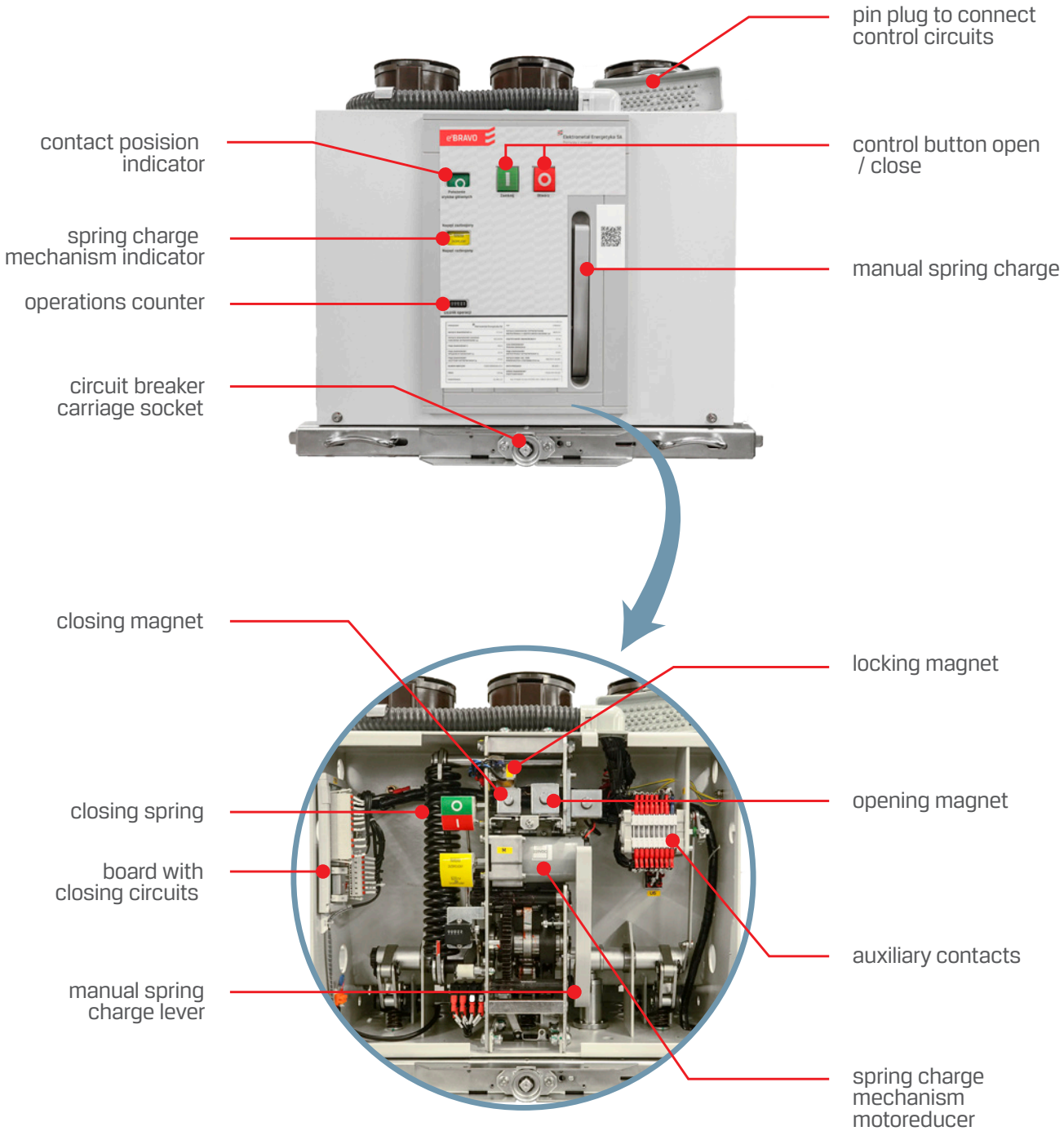
easy maintainance
specially designed construction
simplifies interm reviews
and service

circuit breaker control system compatibility
circuit breaker is
designet to be controlled
by protection relays
from various manufacturers

full interchangeability and adaptability
easy adaptation for
other switchgear types

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.

Circuit breaker on retroft carriage

Circuit breaker embedded in a rack for RD1 type switchgears

Circuit breaker embedded in a rack for D20 type switchgears

Circuit breaker embedded in a rack for RSW10 type switchgears

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
- manual drive arming lever

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

Withdrawable version

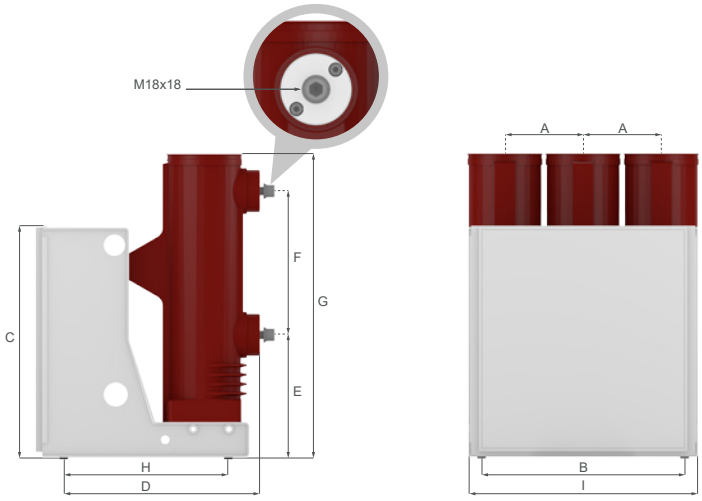
Standard equipment:
- first shunt opening release
- second shunt opening release
- shunt closing release
- locking magnet
- spring charging motor of circuit breaker
- circuit-breaker's state auxiliary contact
- spring charging motor limit contact
- anti-pumping relay
- location contacts of withdrawable module
- plug 58 pin.
- manual drive arming lever
- 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

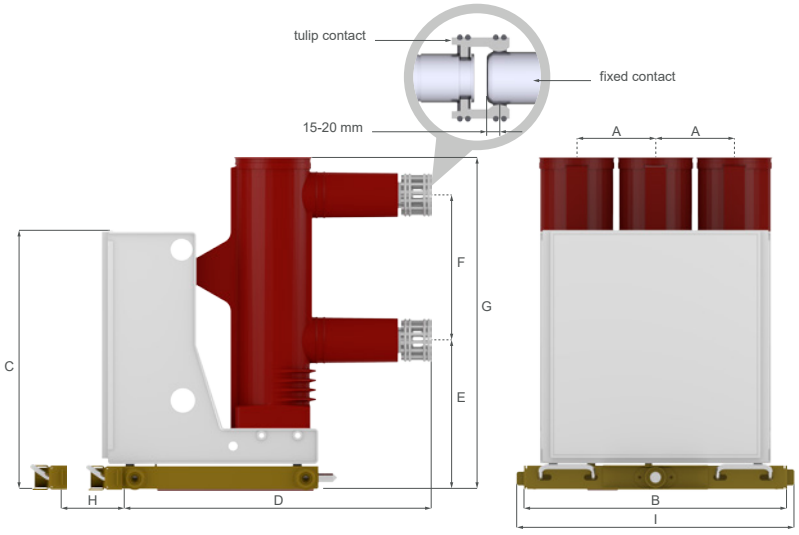
Fixed version

Parameters	12 kV	17.5 kV	24 kV
A	150-275	150-275	210-275
B	440-770	448-770	588-770
C	445	445	445
D	318-348	318	350
E	237-252	237-267	282-298
F	275-310	275-310	310
G	557-698	557-607	668-722
H	275	275	275
I	490-720	490	520-720
Diagram	**01**	**02**	**03**



Withdrawable version

Parameters	12 kV	17.5 kV	24 kV
A	150-275	150-275	210-275
B	502-852	502-852	652-852
C	491	491	491
D	585-602	598-650	720-740
E	260-295	280-345	325-345
F	205-310	275-310	310
G	507-724	626-764	710-764
H	200	200	280-300
I	531-882	531-882	681-881
Diagram	**11; 12; 21; 22**	**11, 12, 31, 32**	**21; 22**



* other dimensions available on client's request

ELECTRIC DIAGRAM

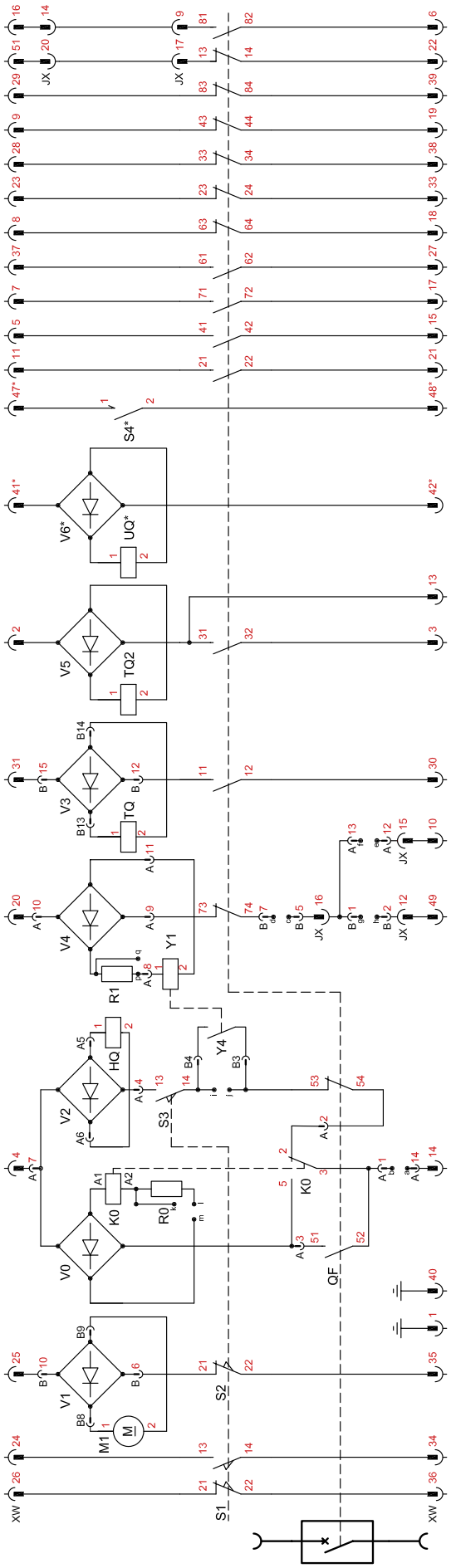


Diagram no 1

Fixed version 12 kV 630 A-1250 A,
17.5 kV 630 A- 1250 A

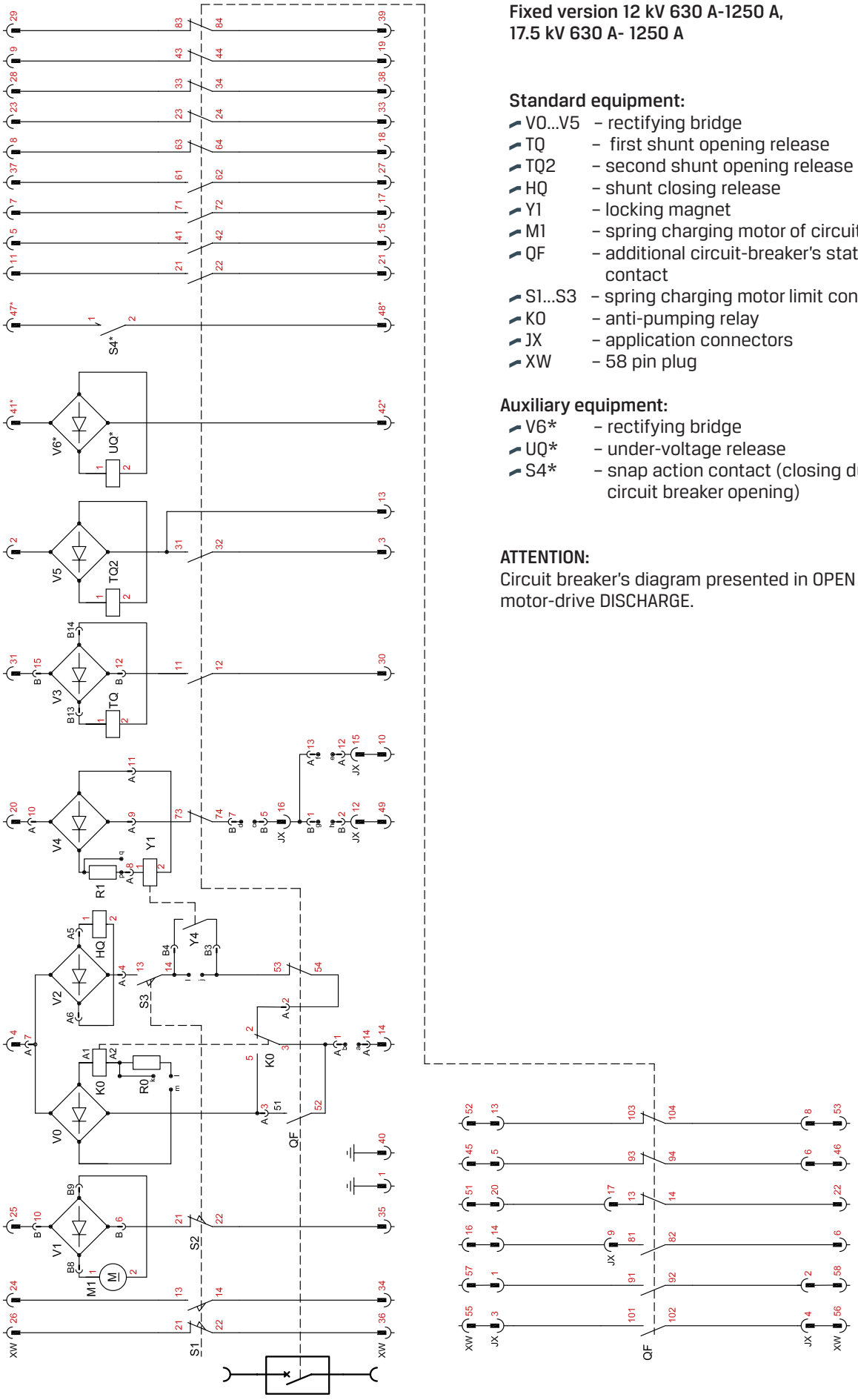
Standard equipment:

- V0...V5 – rectifying bridge
- TQ – first shunt opening release
- TQ2 – second shunt opening release
- HQ – shunt closing release
- Y1 – locking magnet
- M1 – 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
- XW – 58 pin plug

Auxiliary equipment:

- V6* – rectifying bridge
- 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.



Fixed version 12 kV 630 A-1250 A,
17.5 kV 630 A- 1250 A

Standard equipment:

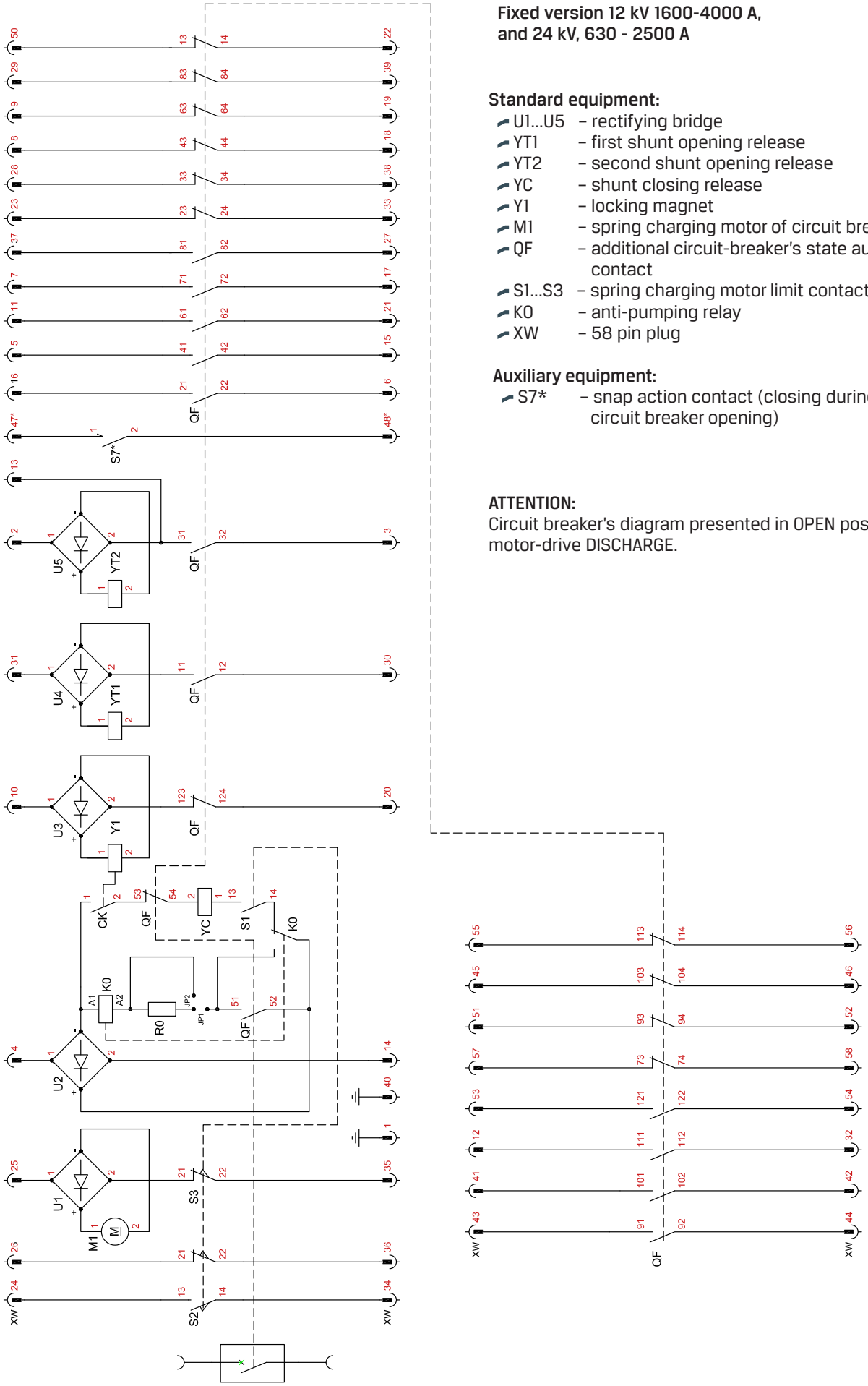
- V0...V5 – rectifying bridge
- TQ – first shunt opening release
- TQ2 – second shunt opening release
- HQ – shunt closing release
- Y1 – locking magnet
- M1 – spring charging motor of circuit breaker
- QF – additional circuit-breaker's state auxiliary contact
- S1...S3 – spring charging motor limit contact
- K0 – anti-pumping relay
- JX – application connectors
- XW – 58 pin plug

Auxiliary equipment:

- V6* – rectifying bridge
- UQ* – under-voltage release
- S4* – snap action contact (closing during circuit breaker opening)

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

Diagram no 02



Fixed version 12 kV 1600-4000 A, and 24 kV, 630 - 2500 A

Standard equipment:

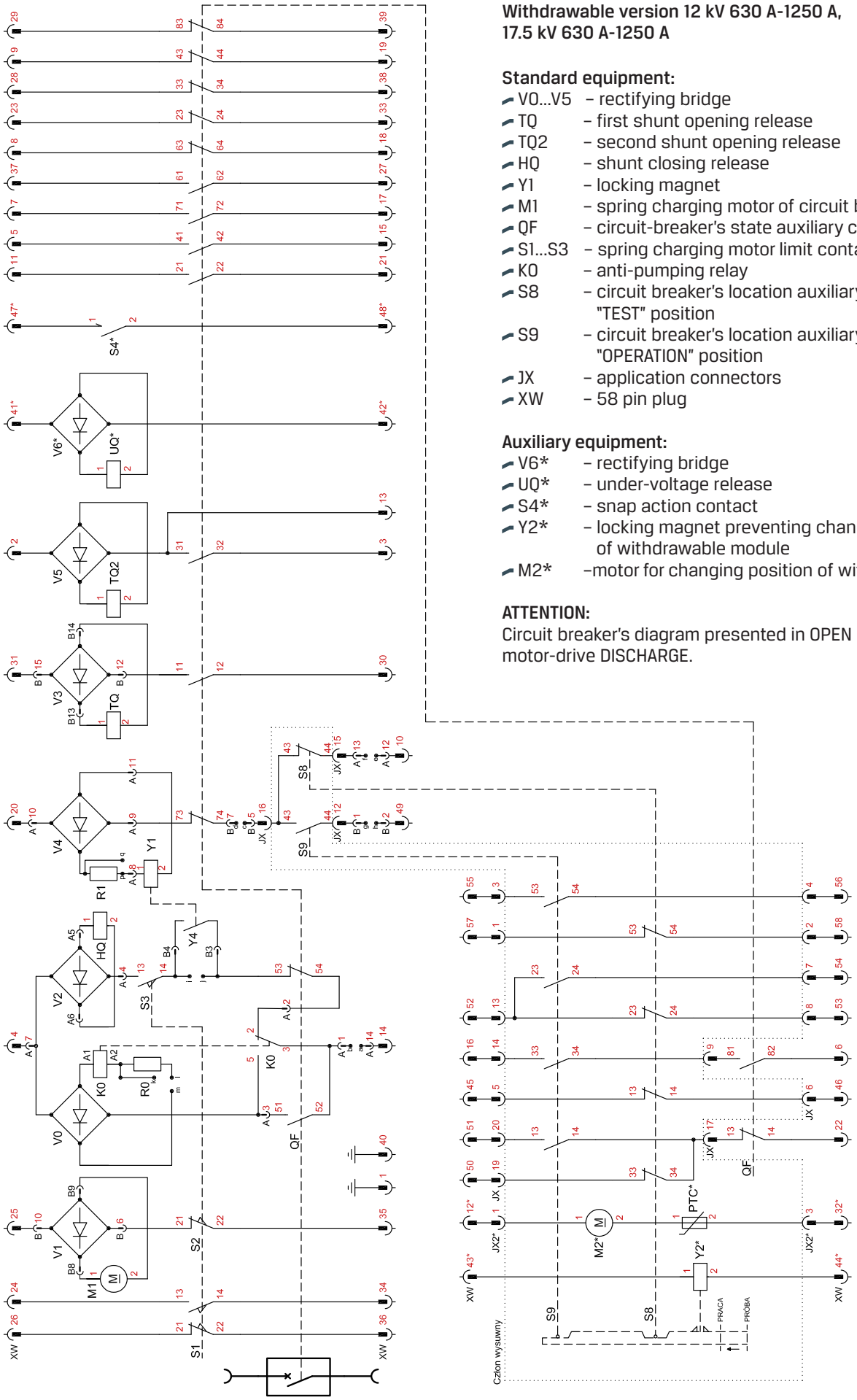
- U1...U5 – rectifying bridge
- YT1 – first shunt opening release
- YT2 – second shunt opening release
- YC – shunt closing release
- Y1 – locking magnet
- M1 – spring charging motor of circuit breaker
- QF – additional circuit-breaker's state auxiliary contact
- S1...S3 – spring charging motor limit contact
- K0 – anti-pumping relay
- XW – 58 pin plug

Auxiliary equipment:

- S7* – snap action contact (closing during circuit breaker opening)

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

Diagram no 03



Withdrawable version 12 kV 630 A-1250 A,
17.5 kV 630 A-1250 A

Standard equipment:

- V0...V5 – rectifying bridge
- TQ – first shunt opening release
- TQ2 – second shunt opening release
- HQ – shunt closing release
- Y1 – locking magnet
- M1 – spring charging motor of circuit breaker
- QF – circuit-breaker's state auxiliary contact
- S1...S3 – spring charging motor limit contact
- K0 – 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
- XW – 58 pin plug

Auxiliary equipment:

- V6* – rectifying bridge
- UQ* – under-voltage release
- S4* – snap action contact
- Y2* – locking magnet preventing changing position of withdrawable module
- M2* –motor for changing position of withdrawable module

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

Diagram no 11

Withdrawable version 12 kV 630 A-1250 A,
17.5 kV 630 A-1250 A

Standard equipment:

- V0...V6 – rectifying bridge
- TQ – first shunt opening release
- TQ2 – second shunt opening release
- HQ – shunt closing release
- Y1 – locking magnet
- M1 – spring charging motor of circuit breaker
- M2 –motor for changing position of withdrawable module
- QF – circuit-breaker's state auxiliary contact
- S1...S3 – spring charging motor limit contact
- K0 – 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
- JX2 – application connectors
- XW – 58 pin plug

Auxiliary equipment:

- V6* – rectifying bridge
- 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 position, motor-drive DISCHARGE. Contacts S8:13-14 and S9:51-52 to switch off motor-drive movable module.

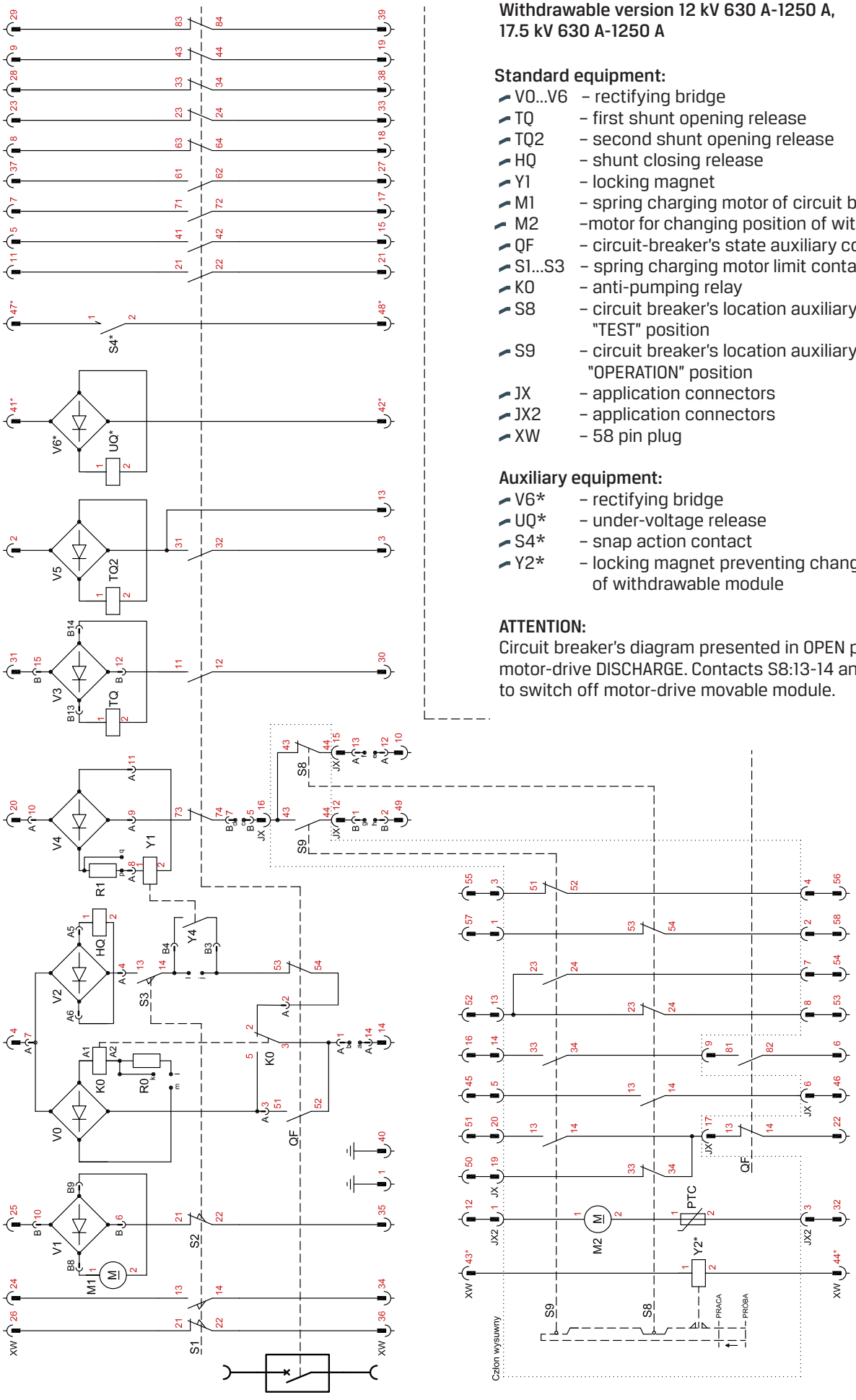
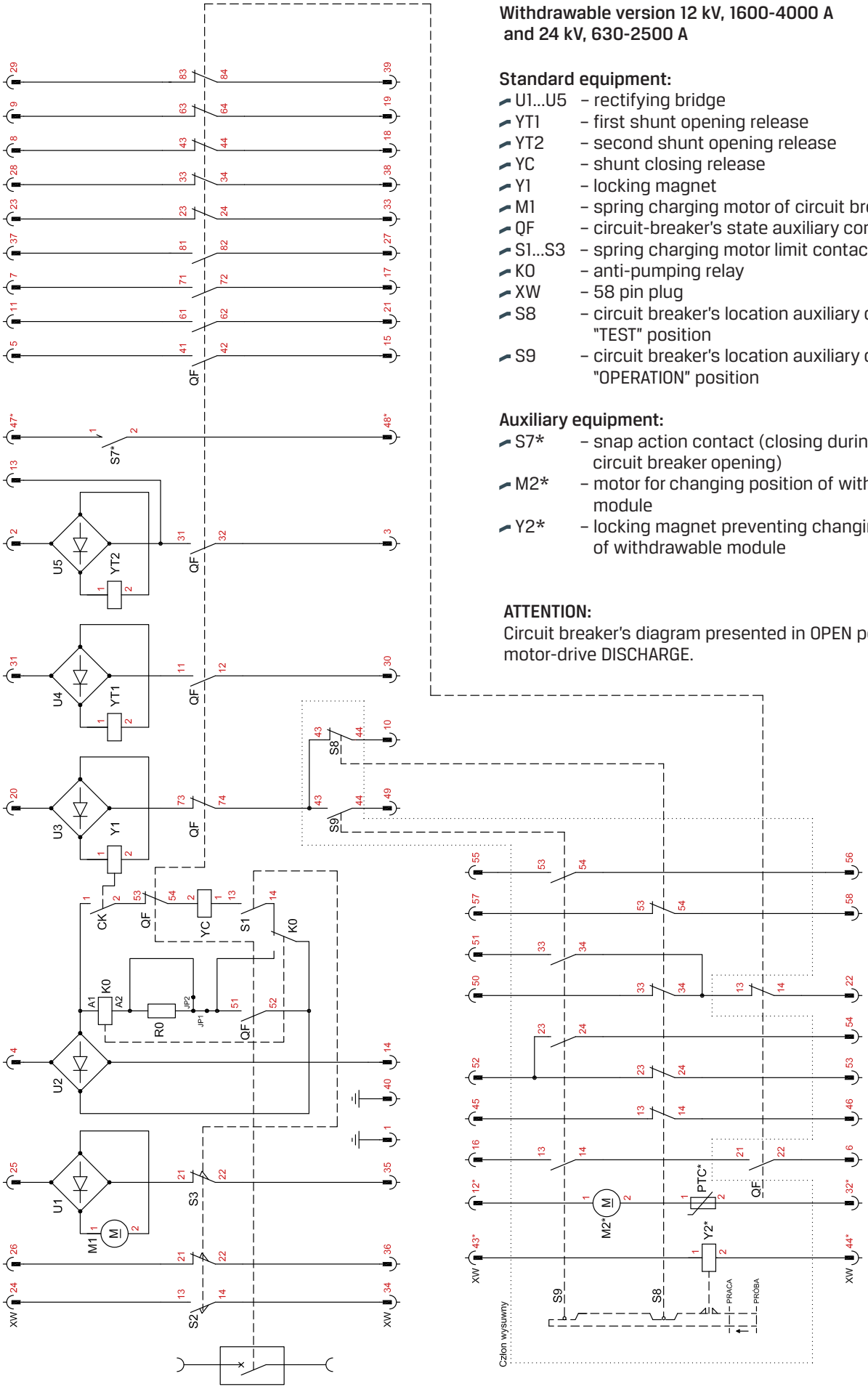


Diagram no 12



Withdrawable version 12 kV, 1600-4000 A and 24 kV, 630-2500 A

Standard equipment:

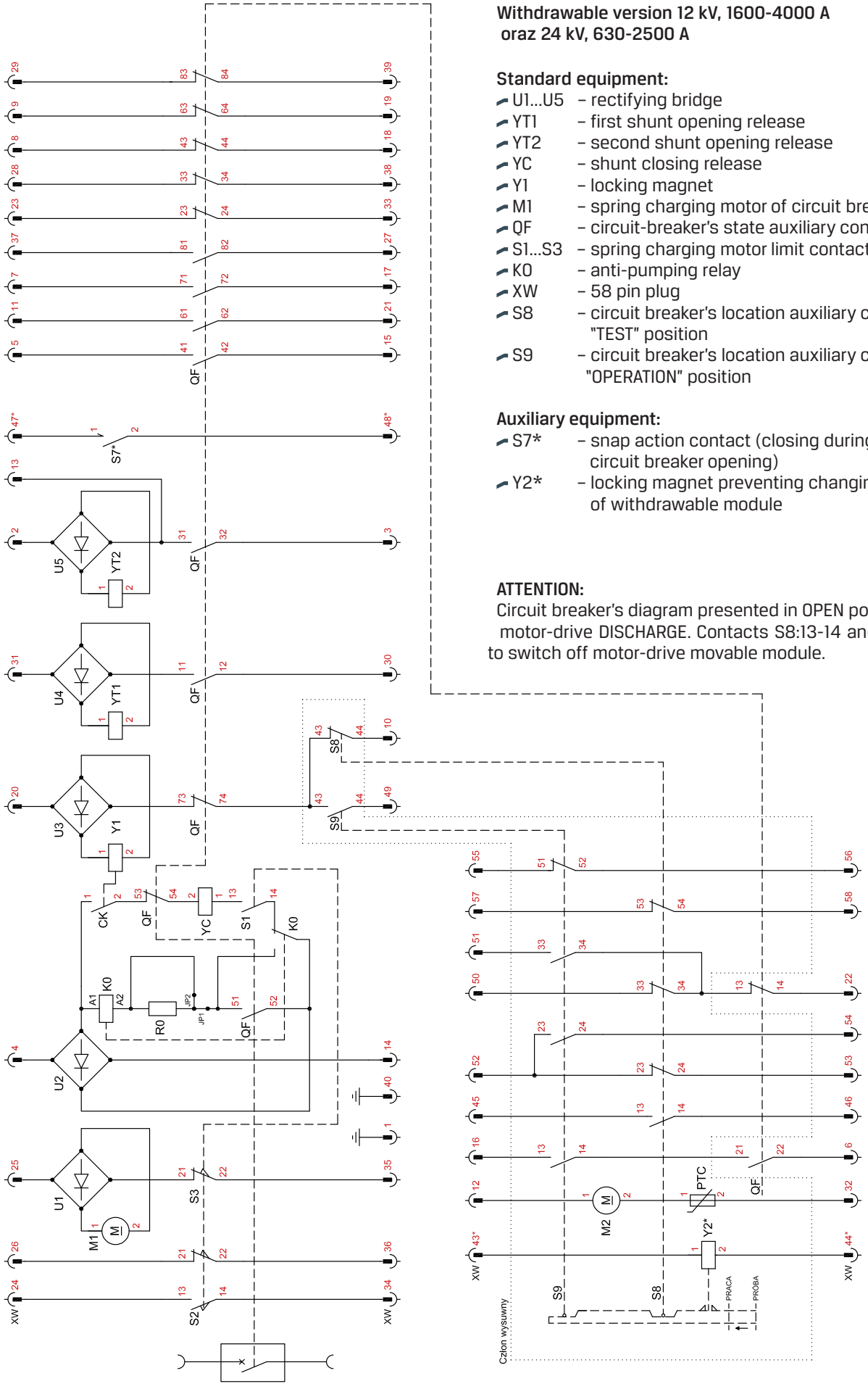
- U1...U5 – rectifying bridge
- YT1 – first shunt opening release
- YT2 – second shunt opening release
- YC – shunt closing release
- Y1 – locking magnet
- M1 – spring charging motor of circuit breaker
- QF – circuit-breaker's state auxiliary contact
- S1...S3 – spring charging motor limit contact
- K0 – anti-pumping relay
- XW – 58 pin plug
- S8 – circuit breaker's location auxiliary contact in "TEST" position
- S9 – circuit breaker's location auxiliary contact in "OPERATION" position

Auxiliary equipment:

- S7* – snap action contact (closing during circuit breaker opening)
- M2* – motor for changing position of withdrawable module
- Y2* – locking magnet preventing changing position of withdrawable module

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

Diagram no 21



Withdrawable version 12 kV, 1600-4000 A
oraz 24 kV, 630-2500 A

Standard equipment:

- U1...U5 – rectifying bridge
- YT1 – first shunt opening release
- YT2 – second shunt opening release
- YC – shunt closing release
- Y1 – locking magnet
- M1 – spring charging motor of circuit breaker
- QF – circuit-breaker's state auxiliary contact
- S1...S3 – spring charging motor limit contact
- K0 – anti-pumping relay
- XW – 58 pin plug
- S8 – circuit breaker's location auxiliary contact in "TEST" position
- S9 – circuit breaker's location auxiliary contact in "OPERATION" position

Auxiliary equipment:

- S7* – snap action contact (closing during circuit breaker opening)
- Y2* – locking magnet preventing changing position of withdrawable module

ATTENTION:
Circuit breaker's diagram presented in OPEN position, motor-drive DISCHARGE. Contacts S8:13-14 and S9:51-52 to switch off motor-drive movable module.

Diagram no 22

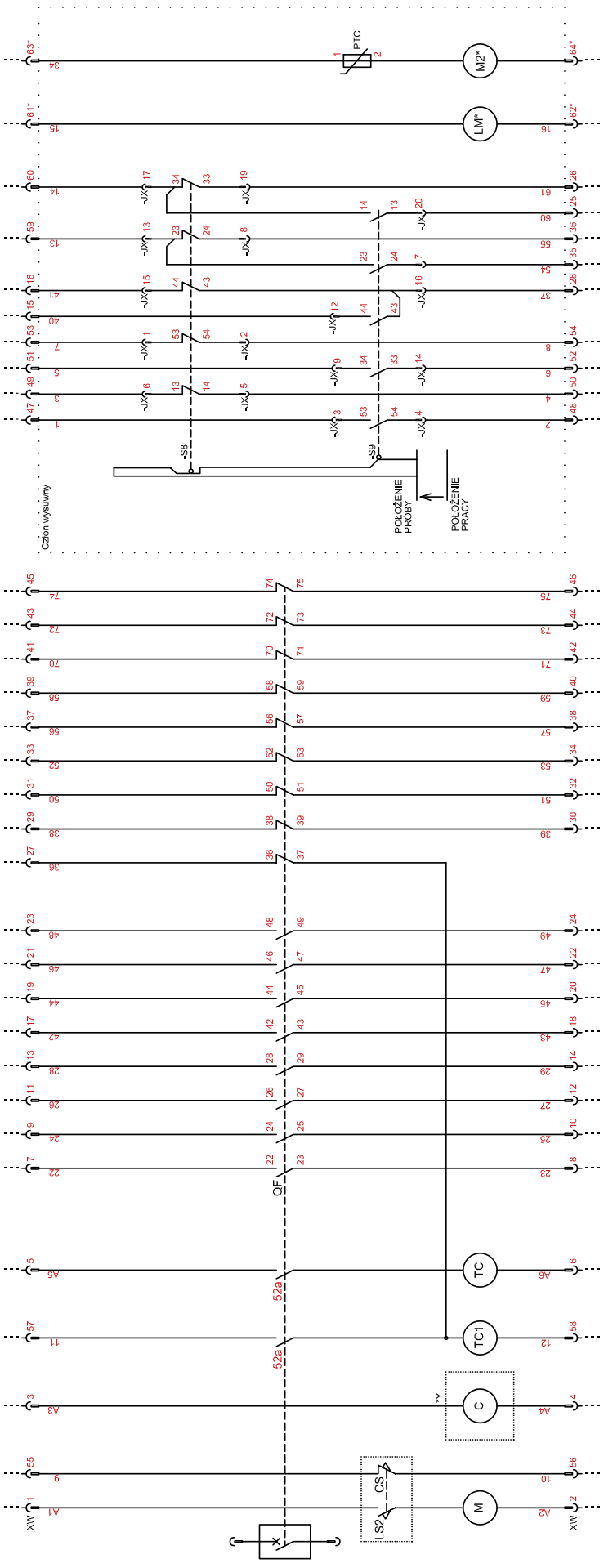


Diagram no 31

Withdrawable version 17.5 kV, 1600-2000 A

Standard equipment:

- M – spring charging motor of circuit breaker
- C – wyzwalacz zamykający napięciowy
- Y – układ antypompujący
- TC – first shunt opening release
- TC1 – second shunt opening release
- 52a – łącznik pomocniczy stanu wyłącznika (NO)
- QF – łącznik pomocniczy stanu wyłącznika
- LS2 – łącznik krańcowy silnika zbrojenia
- CS – łącznik krańcowy sygnalizacji zazbrojenia silnika
- S8 – circuit breaker's location auxiliary contact in "TEST" position
- S9 – circuit breaker's location auxiliary contact in "OPERATION" position
- JX – application connectors
- XW – 64 pin plug

Auxiliary equipment:

- LM* – locking magnet preventing changing position of withdrawable module
- M2* – motor for changing position of withdrawable module

ATTENTION:
Circuit breaker's diagram presented in OPEN position,
Motor-drive CHARGED.

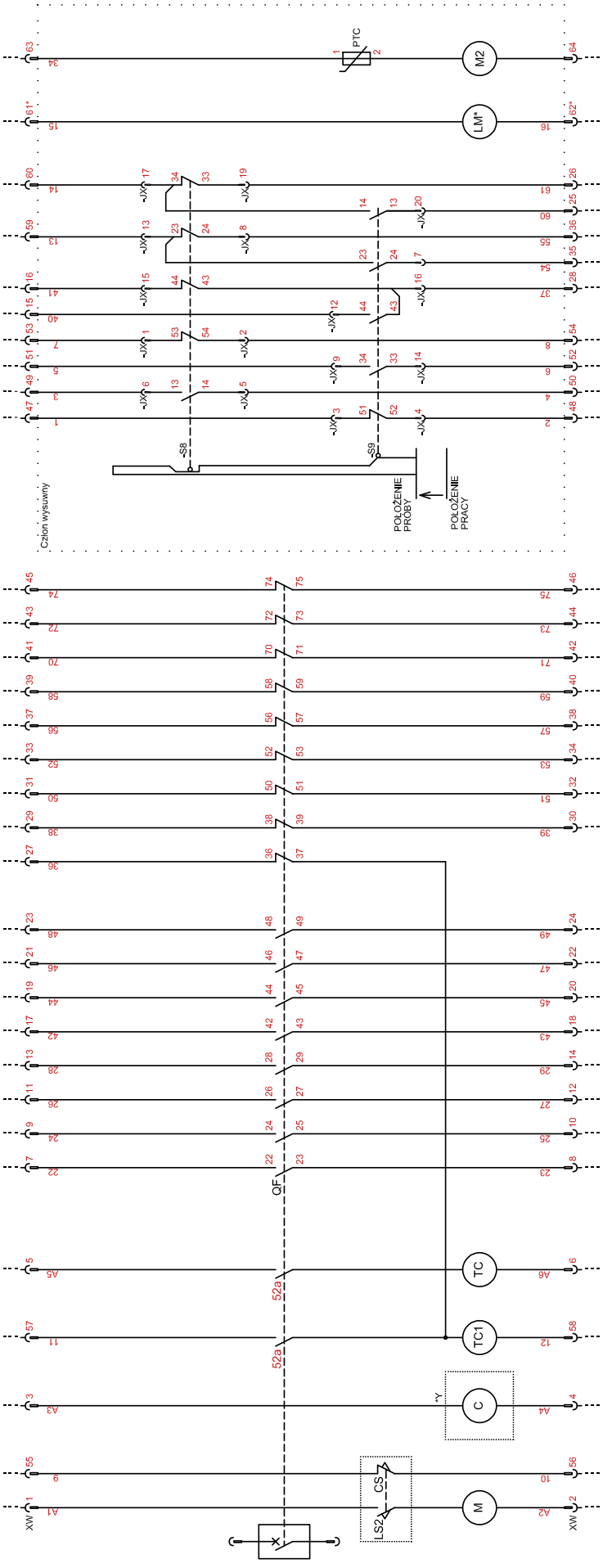


Diagram no 32

Withdrawable version 17.5 kV, 1600-2000 A

Standard equipment:

- M – spring charging motor of circuit breaker
- M2 – motor for changing position of withdrawable module

- C – shunt closing release
- Y – anti-pumping relay
- TC –first shunt opening release
- TC1 – second shunt opening release
- 52a – circuit-breaker's state auxiliary contact (NO)
- QF – circuit-breaker's state auxiliary contact
- LS2 – spring charging motor limit contact
- CS – spring charging motor signalization limit contact
- S8 – circuit breaker's location auxiliary contact in "TEST" position
- S9 – circuit breaker's location auxiliary contact in "OPERATION" position
- JX – application connectors
- XW – 64 pin plug

Auxiliary equipment:

- LM* – locking magnet preventing changing position of withdrawable module.

ATTENTION:
Contacts S8:13-14 and S9:51-52 to switch on motor for spring charge of the movable module.

TECHNICAL PARAMETERS

Rated voltage	7,2 - 12 kV	17.5 kV	24 kV
Rated lightning impulse withstand voltage (1.2/50 μs)	75 kV	95 kV	125 kV
Rated short-duration power-frequency withstand voltage (1 min.)	28 kV	38 kV	50 kV
Rated frequency	50 Hz	50 Hz	50 Hz
Rated normal current	630-4000 A	630-2000 A	630-2500 A
Rated short-time withstand current (3 s)	up to 40 kA	up to 31,5 kA	up to 25 kA
Rated peak withstand current	up to 100 kA	up to 80 kA	up to 63 kA
Rated short-circuit breaking current	up to 40 kA	up to 31,5 kA	up to 25 kA
Rated short-circuit making current	up to 100 kA	up to 80 kA	up to 63 kA
Rated cable-charging breaking current	31,5 A	31,5 A	31,5 A
Rated single capacitor bank breaking current	400 A	400 A	400 A
Rated single capacitor bank making current	12,5 kA	12,5 kA	20 kA
Rated operating sequence	0-0,3-C0-15s(180s)-C0		
Classification	E2, M2, C2 (E1, C1, M1 for 4000 A		
Rated supply voltage of closing and opening devices and of auxiliary circuits	24 V DC, 110 V DC, 220 V DC, 230 V AC		
Opening time	≤50 ms		
Arcing time	≤15 ms		
Closing time	≤60 ms		
Break time	≤60 ms		
Resistance of each phase of main circuits	≤50 μΩ (630A); ≤45 μΩ (1250A); ≤ 35 μΩ (1600 A, 2000 A); ≤ 25 μΩ (2500 A, 3150 A); ≤ 20 μΩ (4000 A)		
Mechanical endurance	up to 30 000 operations		
Ambient temperature range	- 10° up to +60°C		
Humidity	95%		
Operation altitude	1000 m n.p.m.		

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.
PN-EN 62271-1	High-voltage switchgear and controlgear - Part 1: Common specifications.

CERTIFICATES

Certificate of conformity
JSHP/7/CZ/2022

Certificate of conformity
JSHP/64/CZ/2021

Certificate of conformity
JSHP/80/CZ/2021

Minister of Energy Cup
ENERGETAB 2018 Fair

GAZELE BIZNESU 2020

Gazelles of Business 2020

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	☐ WA - withdrawable	☐ WX - withdrawable for client's switchgear	☐ SR - fixed on retroft carriage	☐ SG - fixed for ROK type switchgear			
② rated voltage Un	☐ 12 kV [12]	☐ 17.5 kV [17]	☐ 24 kV [24]				
③ rated current Ir	☐ 630 A [0630]	☐ 1250 A [1250]	☐ 1600 A [1600]	☐ 2000 A [2000]	☐ 2500 A [2500]	☐ 3150 A [3150]	☐ 4000 A [4000]
④ rated current Isc	☐ 16 kA [16]	☐ 20 kA [20]	☐ 25 kA [25]	☐ 31,5 kA [31]	☐ 40 kA [40]		
⑤ pole distance	☐ 150 mm [150]	☐ 210 mm [210]	☐ 275 mm [275]				
⑥ vertical scale	☐ 205 mm [205]*	☐ 275 mm [275]**	☐ 310 mm [310]***				

* according to technical consultation
** for circuit breakers up to 17.5 kV up to 1250 A
*** for circuit breakers up to 12 kV from 1600 A and 24 kV

STEP 2

Choose circuit breaker equipment from the table below.

A motor for circuit breaker spring charge	☐ 220 V AC/DC [220]	☐ 110 V AC/DC [110]	☐ 48 V AC/DC [048]		
B opening and closing coils	☐ 220 V AC/DC [220]	☐ 110 V AC/DC [110]	☐ 48 V AC/DC [048]	☐ 24 V AC/DC [024]	
C locking coil	☐ none [0]	☐ yes [1]			
D undervoltage coil	☐ 220 V AC/DC [220]	☐ 110 V AC/DC [110]	☐ 100 V AC/DC [100]	☐ none [000]	
E transient contact	☐ none [0]	☐ from the first coil opening [1]	☐ from the second coil opening [2]	☐ from both coils [3]	
F motor for changing position of withdrawable module	☐ 220 V DC [220]	☐ 110 V DC [110]	☐ 48 V DC [048]	☐ none [000]	
G coil blocking withdrawable module	☐ no [0]	☐ yes [1]			
H special version of secondary circuits	☐ standard [0]	☐ customer requirements [1]			
I other	☐ none [00]	☐ customer requirements [01]			

STEP 3

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

J diagram number	☐ 01 - fixed in a ROK type of switchgear	☐ 11 - withdrawable manual/motor, contact not inverted up to 17.5 kV / 630-1250 A	☐ 22 - withdrawable motor, contact inverted 24kV 630, 1250, 2000, 2500 A / 12kV 1600-4000A
	☐ 02 - fixed 210 mm/275 mm up to 17.5kV / do 1250 A	☐ 12 - withdrawable motor, contact inverted up to 17.5 kV / 630-1250 A	☐ 31 - withdrawable manual/motor, contact not inverted up to 17.5 kV / 1600-2000A
	☐ 03 - fixed 210mm /275 mm up to 24kV, 630-2000, 2500 A / 12kV 1600-4000 A	☐ 21 - withdrawable manual/motor, contact not inverted 24 kV 630, 1250, 2000, 2500 A / 12kV 1600-4000A	☐ 32 - withdrawable motor, contact inverted up to 17.5 kV / 1600-2000A

Your code:

e²BRAVO	①	②	③	④	⑤	⑥	A	B	C	D	E	F	G	H	I	J

ELEKTROMETAL ENERGETYKA SA
67 Dzialkowa Street
02-234 Warsaw, Poland
T: (+48) 22 350 75 50
F: (+48) 22 350 75 51
export@elektrometal-energetyka.pl
www.elektrometal-energetyka.pl