



VACUUM CIRCUIT-BREAKERS OF BP SERIES

Technical Information

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Version 12

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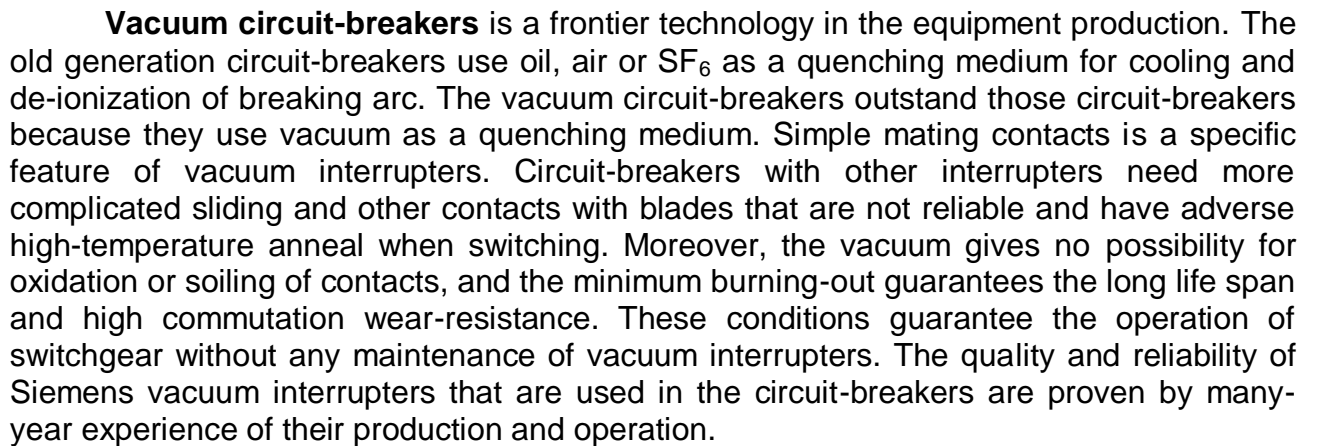
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This technical information is aimed first of all for the specialists of institutes, design and operation organizations dealing with design and upgrading of 6-35 kV switchgear. We deliberately ignored the traditional catalogue approach and presented wider range of specifications and details of circuit-breakers.

1 General Information

The BP circuit-breakers are available in seismic design and may be used for operation in facilities at 0...10 m altitude with maximum design earthquake of 9 degrees of Medvedev–Sponheuer–Karnik scale.

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Orig. Inv. No.	Sign. & date	Repl. inv. No.	Copy Inv. No.	Sign. & date	<p>old generation circuit-breakers use oil, air or SF₆ as a quenching medium for cooling and de-ionization of breaking arc. The vacuum circuit-breakers outstand those circuit-breakers because they use vacuum as a quenching medium. Simple mating contacts is a specific feature of vacuum interrupters. Circuit-breakers with other interrupters need more complicated sliding and other contacts with blades that are not reliable and have adverse high-temperature anneal when switching. Moreover, the vacuum gives no possibility for oxidation or soiling of contacts, and the minimum burning-out guarantees the long life span and high commutation wear-resistance. These conditions guarantee the operation of switchgear without any maintenance of vacuum interrupters. The quality and reliability of Siemens vacuum interrupters that are used in the circuit-breakers are proven by many-year experience of their production and operation.</p>
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The new series of cast poles of BP vacuum circuit-breakers gives another range of advantages to the circuit-breakers. Vacuum interrupters filled with cast epoxy compound are safely protected from mechanical and electrical damage. Chimney-like structure of pole insulation ensures the optimal distribution of electric field so that the distance between the poles as well as to the grounded parts of circuit-breakers and switchgear may be minimal. Good structure of poles prevents dust accumulation on the insulation surface.

New multi-function electromagnetic drive of BP vacuum circuit-breakers has the following functions:

- reliable and stable closing under rated parameters;
- reliable and stable opening under rated parameters;
- reliable fixation of circuit-breaker with magnetic latch in both end points "Closed" and "Open";
- manual normal opening of BP0 and BP1 circuit-breakers by the stop push button, and of other circuit-breakers by manual opening lever;
- possibility of disconnection of BP0 and BP1 circuit-breakers from current transformers in layouts with bridging (without control voltage in control circuits).

Multi-functionality and simple design of electromagnetic drive allowed to increase significantly the unfailing performance and electrical lifetime of circuit-breakers. Moreover, it ensured the following advantages:

- low power consumption when closing and opening;
- control both in AC and DC control circuits;
- small size and weight;
- no buffers, no regulation;
- no need for repair during the whole service life.

The electromagnetic drive is produced in the unified range of versions depending on the performance, so that each version of the vast line of BP circuit-breakers would perform as required for each of such circuit-breakers to ensure the normal switching.

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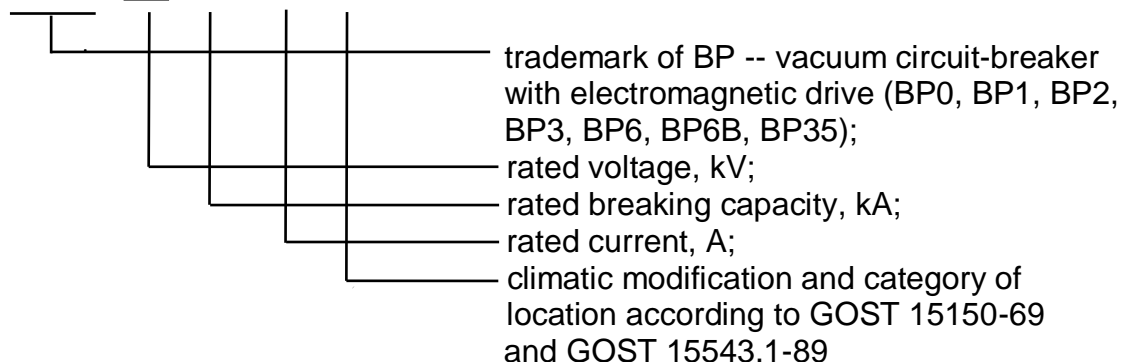
Closing unit is intended for the «cold» (first) closing when there is no voltage in circuit-breaker control circuits.

For manual closing this option is ensured by manual closing device NKAI.301445.012 with generator, and for 12V low-voltage source closing this option is ensured by means of NKAI.301445.005 routine closing cubicle with 12/220V voltage converter. Block diagrams of both closing units are set in Annex B. And the manual closing device NKAI.301445.012 with generator can be ordered for circuit-breakers of BP0, BP1 and BP2 only, while the NKAI.301445.005 routine closing cubicle with 12/220V voltage converter may be ordered for circuit-breakers of all series BP0, BP1, BP2, BP3, BP6, BP6B, BP6K and BP35.

Table 1

Version of schematic circuit diagram	Used in circuit-breakers series	Fig. of Annex B	Kind of current of electromagnet circuits and breakers control
4	BP0, BP1	B.1	AC, DC
5		B.2	DC
1	BP2, BP3	B.3	AC, DC
	BP6, BP6B		DC
3	BP2, BP3, BP6, BP6B	B.4	DC
4	BP2, BP3	B.11	AC, DC
	BP6, BP6B	B.5	DC
5	BP2, BP3, BP6, BP6B	B.6	DC
6	BP6K	B.7	DC
1	withdrawable BP35	B.8	AC, DC
2		B.9	
	unit mount BP35	B.10	AC, DC

2 Explanation of circuit-breakers identification

BP --/

Example of identification of BP0 circuit-breaker for 10 kV rated voltage, 12.5 kA rated breaking capacity, 630 A rated current, U2 climatic modification and category of location:

BP0-10-12.5/630 U2 TU U 22588376.008-98

Example of identification of BP1 circuit-breaker for 10 kV rated voltage, 20 kA rated breaking capacity, 630 A rated current, U2 climatic modification and category of location:

BP1-10-20/630 U2 TU U 22588376.008-98

Example of identification of BP2 circuit-breaker for 10 kV rated voltage, 31.5 kA rated breaking capacity, 1600 A rated current, U2 climatic modification and category of location:

BP2-10-31.5/1600 U2 TU U 22588376.010-2000

Example of identification of BP3 circuit-breaker for 10 kV rated voltage, 40 kA rated breaking capacity, 2000 A rated current, U2 climatic modification and category of location:

BP3-10-40 /2000 U2 TU U 22588376.011-2000

Example of identification of BP6 circuit-breaker for 6 kV rated voltage, 40 kA rated breaking capacity, 1600 A rated current, U2 climatic modification and category of location:

BP6-6-40/1600 U2 TU U 22588376.011-2000

Example of identification of BP6B circuit-breaker for 6 kV rated voltage, 40 kA rated breaking capacity, 2000 A rated current, U2 climatic modification and category of location:

BP6B-6-40/2000 U2 TU U 22588376.011-2000

Sign. & date	Example of identification of BP2 circuit-breaker for 10 kV rated voltage, 31.5 kA rated breaking capacity, 1600 A rated current, U2 climatic modification and category of location: BP2-10-31.5/1600 U2 TU U 22588376.010-2000						
Copy Inv. No.	Example of identification of BP3 circuit-breaker for 10 kV rated voltage, 40 kA rated breaking capacity, 2000 A rated current, U2 climatic modification and category of location: BP3-10-40 /2000 U2 TU U 22588376.011-2000						
Repl. inv. No.	Example of identification of BP6 circuit-breaker for 6 kV rated voltage, 40 kA rated breaking capacity, 1600 A rated current, U2 climatic modification and category of location: BP6-6-40/1600 U2 TU U 22588376.011-2000						
Sign. & date	Example of identification of BP6B circuit-breaker for 6 kV rated voltage, 40 kA rated breaking capacity, 2000 A rated current, U2 climatic modification and category of location: BP6B-6-40/2000 U2 TU U 22588376.011-2000						
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BP6K-6-40/3150 U2 TU U 22588376.011-2000

BP35-35-20/630 U2 TU U 31.2-22588376-020-2003.

3 Basic Technical Characteristics

a) absolute altitude max. 1 000 m:

c) lower operating temperature air around the circuit-breaker is – minus 25°C*. At lower temperatures, heating of air is required according to GOST 14693-90.

d) explosion-proof environment, II atmosphere type according to GOST 15150-69;
e) for seismic BP circuit-breakers, the maximum design earthquake is 8 degrees of Medvedev–Sponheuer–Karnik scale at 0...10 m altitude according to GOST 17516.1-90;
f) for seismic BP6, BP6B, BP6K circuit-breakers, the maximum design earthquake is 9 degrees of Medvedev–Sponheuer–Karnik scale at 0...20.4 m altitude according to GOST 17516.1-90.

BP0, BP1, BP2, BP35 circuit breakers are designed for "Open" and "Closed" operations in cycles O-0,3s-CO-180s-CO, O-0.3s-CO-20s-CO and O-180s-CO-180s-CO.

BP6, BP6B, BP6K circuit breakers are designed for "Open" and "Closed" operations in cycle O-180s-CO-180s-CO.

BP3 circuit breakers are designed for "Open" and "Closed" operations in cycle O-180s-CO-180s-CO, and with 31.5 kA rated breaking current and 80 kA peak making current in cycles O-0.3s-CO-180s-CO, O-0.3s-CO-20s-CO.

Basic technical parameters of BP vacuum circuit-breakers are described in table 2.

Basic parameters of drives are set in tables 3 and 4.

* Subject to agreement with the manufacturer, there is a possibility of supply of BP1 circuit-breakers for operation at lower air temperature of minus 40°C.

Table 2

Parameter	Standard values for model																				
	BP0-10-12.5/630 U2	BP0-10-12.5/630 T3	BP0-10-12.5/800 U2	BP0-10-12.5/800 T3	BP1-10-20/630 U2	BP1-10-20/630 T3	BP1-10-20/1000 U2	BP1-10-20/1000 T3	BP1-10-20/1250 U2	BP2-10-20/1600 U2	BP2-10-20/1600 T3	BP2-10-31.5/630 U2	BP2-10-31.5/1000 U2	BP2-10-31.5/800 T3	BP2-10-31.5/1250 U2	BP2-10-31.5/1600 U2	BP2-10-31.5/2000 U2	BP2-10-31.5/1600 T3	BP3-10-40/2000 U2	BP3-10-40/3150 U2	BP3-10-40/2500 T3
1 Rated voltage, kV	10	11	10	11	10	11	10	11	10	11	10	11	10	11	10	11	10	11	10	11	10
2 Maximum operating voltage, kV	12																				
3 Rated current, A, at 50 and 60 Hz	630	800	630	1000	1250	1600	630	1000	800	1250	1600	2000	1600	2000	3150	2500	2000	2500	2000	2500	2500
4 Rated breaking capacity, kA	12.5	20	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5
a) initial effective value of periodic component	12.5	20	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5
b) highest peak	32	52	80	102	80	102	80	102	80	102	80	102	80	102	80	102	80	102	80	102	80
a) highest peak (peak withstand current)	32	52	80	102	80	102	80	102	80	102	80	102	80	102	80	102	80	102	80	102	80
b) RMS voltage over the current flow time (conventional thermal current for 3 s)	12.5	20	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5
b) initial effective value of periodic component	12.5	20	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5	40	31.5
7 Permissible value of breaking capacitive current, A, not more than:																					
8 Standardized percentage of DC component, %, not more than	40										35						35		40		
9 Closing time, ms, not more than	90										120						120		35-55		
10 Opening time, ms, not more than	≤42										35-50						35-55		70		
11 Total opening time, ms, not more than	57										65						70		0.3		
12 Make-break time, s, not more than	0.3										0.3*						0.3		0.3		
13 Mechanical lifetime, CO cycles	100 000										30 000						30 000				
- rated current	50 000										30 000										
- rated breaking current	350										100						40		50		
15 Circuit-breaker weight, not more than	68										136						96		136		

* BP3 circuit-breakers are designed for automatic reclosing operation only at 31.5 kA rated breaking current and 80 kA peak making current.

Table 2 (continued)

Parameter	Standard values for model																										
	BP6-6-40/1600 U2	BP6-6-40/2000 U2	BP6-6-40/1600 T3	BP6-6-40/2000 T3	BP6B-6-40/3150 U2	BP6B-6-40/2500 T3	BP6B-6-40/1600 U2	BP6B-6-40/2000 U2	BP6B-6-40/1600 T3	BP6B-6-40/2000 T3	BP6K-6-40/1600 U2	BP6K-6-40/2000 U2	BP6K-6-40/3150 U2	BP6K-6-40/1600 T3	BP6K-6-40/2000 T3	BP35-35-20/630 U2	BP35-35-20/1000 U2	BP35-35-20/1250 U2	BP35-35-20/1600 U2	BP35-35-20/2000 U2	BP35-35-20/800 T3	BP35-35-20/1250 T3	BP35-35-20/1600 T3				
1 Rated voltage, kV	6		6.6		6	6.6	6		6.6		6			6.6		35								33			
2 Maximum operating voltage, kV	7.2																							40.5			
3 Rated current, A, at 50 Hz and 60 Hz	1600	2000	1600	2000	3150	2500	1600	2000	1600	2000	1600	2000	3150	1600	2000	630	1000	1250	1600	2000	800	1250	1600				
4 Rated breaking capacity, kA	40															20											
5 Standardized parameters of making current, kA:																											
a) initial effective value of periodic component	40															20											
b) highest peak	128															52											
6 Standardized parameters of through short circuit current, kA:																											
a) highest peak (peak withstand current)	128															52											
b) RMS voltage over the current flow time (conventional thermal current for 3 s)	40															20											
b) initial effective value of periodic component	40															20											
7 Permissible value of breaking capacitive current, A, not more than:	630																										
8 Standardized percentage of DC component, %, not more than	35				40		35						40		35		40										
9 Closing time, ms, not more than	120															100											
10 Opening time, ms, not more than	35-55															35-50											
11 Total opening time, ms, not more than	70															65											
12 Make-break time, s, not more than	-															0.3											
13 Mechanical lifetime, CO cycles	30 000				30 000		25 000					30 000															
14 Commutation life, CO cycles																											
- rated current	30 000				30 000		25 000					30 000															
- rated breaking current	40				50		40						50		40		55										
15 Circuit-breaker weight, not more than	162				326		287					450		710		450		310*/250**									

* for withdrawable circuit-breakers

* for unit mount circuit-breakers

Table 3

Parameter	Rate for BP0 and BP1 circuit-breakers
1 Rated voltage of close coil circuit (YAC), W - DC - AC	110, 220 220
2 Rated voltage of close circuit (KM), W - DC - AC	110, 220 220
3 Rated voltage of trip circuit (YAT) and trip circuit from stand-alone supply (YAV), W - DC - AC	110, 220 220
4 Useful current of electromagnet close coil circuit (YAC) (impulse duration max. 0.065s) -- average / peak, A not more than - 220 V DC and AC volts - 110 V DC	14.7/ 16 29.4/ 32
5 Useful current of of trip circuits (KM), A, not more than - 220 V DC and AC volts - 110 V DC	1.2* 2.4*
6 Useful current of trip circuit (YAT) and trip circuit from stand-alone supply (YAV), A, not more than - 220 V DC and AC volts - 110 V DC	1.2 2.4
7 Trip current of trip circuits for layouts with bridging (YAA1, YAA2), A	3; 5
8 Operating voltage range, as percentage of rated voltage: - electromagnet close coil circuits (YAC); - close circuits (KM); - trip circuits (YAT) and trip circuits from stand-alone supply (YAV) AC DC	85-110 85-110 65-120 70-110
<p>* useful current value at R3 ballast resistance of 200 Ω and with the use of circuit-breaker in switchgear with electromechanical protection.</p> <p>If the circuit-breaker is installed in a switchgear with microprocessing protection, the R3 ballast resistance should be 620 Ω.</p> <p>At customer's request, the value of ballast resistance may be modified to decrease or increase of useful current.</p>	

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Table 4

Parameter	Rate for circuit-breakers of series				
	BP2	BP3	BP6K	BP6, BP6B	BP35
1 Rated voltage of electromagnet circuit (YA1), W - DC; - AC	110; 220 220	220 220	220 -		220 220
2 Rated voltage of close circuit (KCC), trip circuit (KCT) and trip circuit from stand-alone supply (KCV), W: - DC; - AC	110; 220 220		220 -		220 220
3 Useful current of electromagnet circuit (YA1) (impulse duration max. 0.075s) -- average / peak, A, not more than: - switching-on: 220 V DC and AC volts; 110 V DC - switching-off: 220 V DC and AC; 110 V DC	13.6/ 24 27.2/ 60 9.8/ 17 18.5/ 32	14.4/ 35 - 11.5/ 20 -	14.4/ 35 - 11.5/ 20 -	15/ 42 - 11.5/ 20 -	6/ 10 - 10.4/ 18 -
4 Trip current of trip circuits for layouts with bridging (KCA), A	3; 5				
5 Useful current of close circuits (KCC), trip circuits (KCT) and trip circuits from stand-alone supply (KCV), A, not more than, at: - 110 V DC - 220 V DC and AC	2* 1.5*		- 1.5*		
6 Operating voltage range of electromagnet circuit (YA1), as percentage of rated voltage: - when closing: - when tripping: AC DC	85-110 65-120 70-110				
7 Operating voltage range, as a percentage of rated voltage: - close circuits (KCC) - trip circuits (KCT) and trip circuits from stand-alone supply (KCV): AC DC	85-110 65-120 70-110				
* useful current value at R1, R7, R9 ballast resistance of 200 Ω and with the use of circuit-breaker in switchgear with electromechanical protection. If the circuit-breaker is installed in a switchgear with microprocessing protection, the R1, R7, R9 ballast resistance should be 620 Ω. At customer's request, the value of ballast resistances may be modified to decrease or increase of useful current.					

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Parameters of interlocks are set in tables 5 and 6.

Rated voltage, V	$\cong 220$
Test voltage, kV	2.2
Short-time withstand current within 2 sec, A	10
Resistance, m Ω	3

Rated voltage and time constant	Rated current, A	Max. switching current, A
220 V AC $\cos \varphi = 0.7$	2.5	25
110 V DC		
with time constant 1 msec	6	8
15 msec	4	5
50 msec	2	4.6
200 msec	1	2.2
220 V DC		
with time constant 1 msec	1.5	2.0
15 msec	1.0	2.0
50 msec	0.75	1.7
200 msec	0.5	1.0

1. 5 normally-open and 6 normally-closed contacts in circuit-breakers:

- BP2, BP3, BP6, BP6B in the version 1 layout;
 - BP0, BP1, BP2, BP3, BP6, BP6B in the version 4 layout;
 - BP35 in the layout according to figures B.8, B.9 or B.10.
2. 6 normally-open and 6 normally-closed contacts in circuit
- BP2, BP3, BP6, BP6B in the version 3 layout;
 - BP0, BP1, BP2, BP3, BP6, BP6B in the version 5 layout;
 - BP6K in the version 6 layout.

The overall, mounting and connection dimensions of circuit-breakers are set in figures of annex A.

Note: it may be agreed to produce the circuit-breakers following the customer's climatic, mechanical and electrical requirements that may be different from the mentioned above.

4 Design and Operating Principle

The first and basic circuit-breaker of BP series was BP1 circuit-breaker (initially, – VM1S-10).

All circuit-breakers of BP series described in this technical information consist of three poles with cast vacuum interrupters mounted on the circuit-breaker frame. Only in circuit-breakers series BP3 and BP6B rated for 2500 A and 3150A currents, vacuum interrupters and terminals are mounted on insulating supports. The circuit-breaker electromagnetic drive fixing circuit-breakers in C and O positions on magnetic latches is housed in the circuit-breaker frame. Almost all of the circuit-breakers described above have the electromagnetic drive core connected with the circuit-breaker shaft via connecting links. The circuit-breaker shaft is connected via insulating tie-rods with vacuum interrupters and when turning, it controls the circuit-breaker position contacts for external auxiliary circuits. Almost in all circuit-breakers, plate-type pressing springs are installed in insulating tie-rod bushings. Only in circuit-breakers series BP3 and BP6B rated for 2500 A and 3150 A currents, pole tie-rods are fitted with groups of coiled pressing springs. The local manual emergency opening almost in all circuit-breakers is actuated by a separate opening lever, which is common for all types of BP circuit-breakers (from BP2 to BP35). Control block schemes are realized by using PCBs housed in circuit-breakers of BP series. Schematic circuit diagram options for circuit-breakers are set in annex B.

The circuit-breakers of BP0 and BP1 series were upgraded in 2008. The design of these circuit-breakers is described in annex D.

Main differences between the current design of BP0 and BP1 circuit-breakers and the previous one:

- the use of new upgraded electromagnetic drive with possible installation of up to four tripping coils (YAT, YAV, YAA1, YAA2), and the trip circuits for layouts with bridging (YAA1, YAA2) disconnect directly from current transformers, as well as the new tripping mechanism allowing the local manual emergency opening of the circuit-breaker by means of a button;
- significantly simplified circuit-breaker controlling circuit (the circuit does not have any breaker capacitor, relay range etc.);
- the circuit-breaker is open with and opening spring housed in circuit-breaker, and fixed in the O position by means of magnetic latch and opening spring.

New controlling circuits of upgraded BP0 and BP1 circuit-breakers (version 4 and 5) are compatible with the previously manufactured BP0 and BP1 circuit-breakers (version 1 and 3); all external contacts of auxiliary circuits of the upgraded BP0 and BP1 circuit-breakers (version 4) are compatible with the similar external contacts of previous BP0 and BP1 circuit-breakers with the auxiliary circuits in version 1, similarly, the external contacts of version 5 correspond to the external contacts of previously produced BP0 and BP1 circuit-breakers in version 3.

Orig. Inv. No.	Sign. & date	Repl. inv. No.	Copy Inv. No.	Sign. & date	<p>four tripping coils (YAI, YAV, YAA1, YAA2), and the trip circuits for layouts with bridging (YAA1, YAA2) disconnect directly from current transformers, as well as the new tripping mechanism allowing the local manual emergency opening of the circuit-breaker by means of a button;</p> <p>- significantly simplified circuit-breaker controlling circuit (the circuit does not have any breaker capacitor, relay range etc.);</p> <p>- the circuit-breaker is open with and opening spring housed in circuit-breaker, and fixed in the O position by means of magnetic latch and opening spring.</p> <p>New controlling circuits of upgraded BP0 and BP1 circuit-breakers (version 4 and 5) are compatible with the previously manufactured BP0 and BP1 circuit-breakers (version 1 and 3); all external contacts of auxiliary circuits of the upgraded BP0 and BP1 circuit-breakers (version 4) are compatible with the similar external contacts of previous BP0 and BP1 circuit-breakers with the auxiliary circuits in version 1, similarly, the external contacts of version 5 correspond to the external contacts of previously produced BP0 and BP1 circuit-breakers in version 3.</p>	
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Operation of upgraded BP0 and BP1 circuit-breakers

1 Closing:

- following the 'CLOSE' command, the making current from the control block runs the close coil 13;
- the core 17 is retracted by the electromagnetic close coil and makes the fuse element 12 move;
- the fuse element 12 turns the countershaft 11 that together with the tie-rod 10 turns the main shaft 8 of the circuit-breaker;
- along with the main shaft 8, the insulation tie-rod 6 and vacuum interrupter moving contact move upwards;
- vacuum interrupter contacts close;
- the core 17 and connected insulation tie-rod 6 keep moving upwards and with pressing springs 5 press the vacuum interrupter contacts;
- the core 17 reaches its end position and closes the permanent magnet close loop 14 (magnetic latch), thus, ensuring the keeping of vacuum interrupter contacts in the close position with the necessary pressure on contacts and compression of the spring, CLOSE COIL 13 IS DE-ENERGIZED.

2 Opening:

- following the 'OPEN' command, the breaking current runs the close coil 15 and makes the electromagnetic field in the electromagnet trip loop much stronger than the field created by permanent magnets 14 in the close loop;
- affected by the electromagnetic field, pressure and opening spring, the core 17 moves to the opening fuse element and drives the shaft 8 by means of the countershaft 11 and tie-rod 10;
- the electromagnet and the energy accumulated in pressing springs 5 and in opening spring 20 during the closing cause the quick motion of the insulation tie-rod 6 and connected to it vacuum interrupter moving contact downwards;
- the circuit-breaker is open fast;
- the core 17 reaches its end position and closes the permanent magnet trip loop 14 (magnetic latch), TRIP COIL 15 IS DE-ENERGIZED, the drive is in initial position.

3 Manual Opening

The circuit-breaker design allows the local manual emergency opening. To open the circuit-breaker manually, push the open push button 19. After the push button 19 is pressed, the manually-operated opening device is activated; it actuates the open slide 18 that makes the electromagnet core 17 move from close to open position due to the charge in pressing springs 5 and opening spring 20.

Sign. & date	<p>opening spring 20 during the closing cause the quick motion of the insulation tie-rod 6 and connected to it vacuum interrupter moving contact downwards;</p> <ul style="list-style-type: none"> - the circuit-breaker is open fast; - the core 17 reaches its end position and closes the permanent magnet trip loop 14 (magnetic latch), TRIP COIL 15 IS DE-ENERGIZED, the drive is in initial position. 									
Copy Inv. No.	<p>3 Manual Opening</p> <p>The circuit-breaker design allows the local manual emergency opening. To open the circuit-breaker manually, push the open push button 19. After the push button 19 is pressed, the manually-operated opening device is activated; it actuates the open slide 18 that makes the electromagnet core 17 move from close to open position due to the charge in pressing springs 5 and opening spring 20.</p>									
Repl. inv. No.										
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										15
Cha	Sheet	Doc No.	Sign.	Date						

5 Supply Package

Standard supply package:

- circuit-breaker, pcs	1
- list of operation papers, pcs	1
- package of operation papers according to the list of operation papers (passport, operation guidelines), package	1
- manual opening lever, pcs	1*
- kit of spare parts, tools and accessories according to the SPTA Set List, kit	1
- kit of spare parts, tools and accessories according to repair SPTA Set List, kit	1**
- closing unit, pcs.....	1**

Notes:

* for 5 and less circuit-breakers supplied to one address but not more than 4 pcs per one complete switchgear substation (for circuit-breakers of BP2, BP3, BP6, BP6B, BP6K, BP35 series);

* supplied against separate order at extra charge.

6 Ordering of Circuit-Breakers

When making an order, please use Annexes E.1 and E.3 as an example how to fill in the supply questionnaires, and Annexes E.2 and E.4 are empty forms for order. According to Annex E.1, E.3, in addition to design reference of circuit-breaker version, the following parameters must be stated:

For BP0 and BP1 circuit-breakers

1. Number of schematic circuit diagram option of circuit-breaker according to Annex B.
2. Kind of current (AC or DC), voltage and frequency for:
 - a) electromagnet close coil circuit (YAC);
 - b) close circuit (KM);
 - c) trip circuit (YAT);
 - d) trip circuit from stand-alone supply (YAV);
3. Trip current of trip circuits for layouts with bridging (YAA1, YAA2).
4. Is it necessary to supply the closing unit?

For BP2, BP3, BP6, BP6B, BP6K, BP35 circuit-breakers:

1. Number of schematic circuit diagram option of circuit-breaker according to Annex B.
2. Kind of current (AC or DC), voltage and frequency for:
 - a) electromagnet circuit (YA1);
 - b) close circuit (KCC);
 - c) trip circuit (KCT);
 - d) trip circuit from stand-alone supply (KCV);
3. Trip current of trip circuits for layouts with bridging (KCA).

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Cha	Sheet	Doc No.	Sign.	Date	NKAI.670049.011 TI					Sheet
										16

4. Circuit-breaker designs: withdrawable or unit mount (for BP35 circuit-breakers only).
5. Is it necessary to supply the closing unit?

If there are no additional instructions in the order:

- *BP0, BP1 circuit-breakers* are manufactured with the electromagnet close coil circuit (YAC), close circuit (KM) and trip circuit (YAT) for 220 V DC with the version 4 (figure B.1) Annex B of wiring diagram without trip circuit from stand-alone supply (YAV), without trip circuits for layouts with bridging (YAA1, YAA2), without closing unit;

- *BP2 circuit-breakers* are manufactured with the electromagnet circuit (YA1), close circuit (KCC) and trip circuit (KCT) for 220 V DC with the version 1 (figure B.3) of wiring diagram without trip circuit from stand-alone supply (KCV), without trip circuits for layouts with bridging (KCA), without closing unit;

- *BP3, BP6, BP6B, BP6K circuit-breakers* are manufactured in accordance with versions 3, 4, 6 (figures B.4, B.5, B.7) respectively, Annex B, of wiring diagrams with the electromagnet circuits (YA1), close circuit (KCC) and trip circuit (KCT) for 220 V DC, without trip circuit from stand-alone supply (KCV), without trip circuits for layouts with bridging (KCA), without closing unit;

- *BP35 circuit-breakers* are manufactured in unit mount version, with the electromagnet circuit (YA1), close circuit (KCC) and trip circuit (KCT) for 220 V DC according to the wiring diagram of figure B.10, Annex B, without trip circuit from stand-alone supply (KCV), without trip circuits for layouts with bridging (KCA), without closing unit.

Contacts

HIGH-VOLTAGE UNION-RZVA LLC

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330001, Ukraine

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Principal Designer: (+38 0362) 617-245

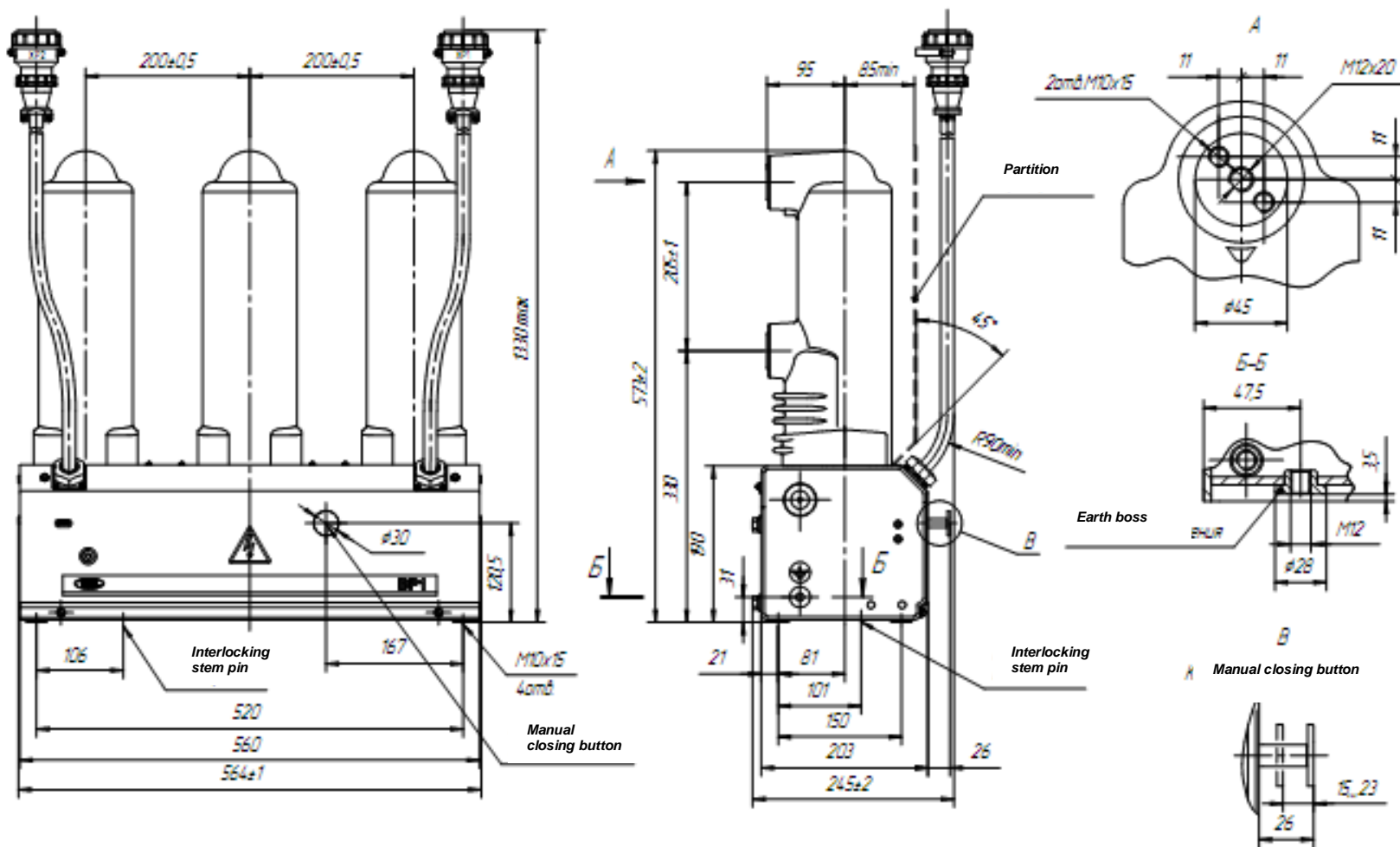
Fax: (+38 0362) 617-210

www.rzva.ua

e-mail: office@rzva.ua

Contacts						
<i>Sign. & date</i>	HIGH-VOLTAGE UNION-RZVA LLC 16, Bila Street, Rivne 33001, Ukraine Phones: Sales Director: (+38 0362) 617-296 Principal Designer: (+38 0362) 617-245 Fax: (+38 0362) 617-210 www.rzva.ua e-mail: office@rzva.ua					
<i>Copy Inv. No.</i>						
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<i>Sign. & date</i>						
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<i>Cha</i>	<i>Sheet</i>	<i>Doc No.</i>	<i>Sign.</i>	<i>Date</i>		<i>17</i>

Annex A



*Figure A.1 –
Overall, mounting and connection dimensions of BP0 and BP1 vacuum circuit-breakers*

Technical drawings of the 2000 series fire alarm control panel. The main drawing shows a front view with dimensions: 568mm height, 530mm width, and 200±0.5mm spacing between terminals. It includes a circular interlocking mechanism pin and a manual closing lever. Detailed views A and B show internal components and the lever mechanism.

*Figure A.2 –
Overall, mounting and connection dimensions of BP2 vacuum circuit-breakers for 630-1250 A
rated currents*

Annex A (continued)

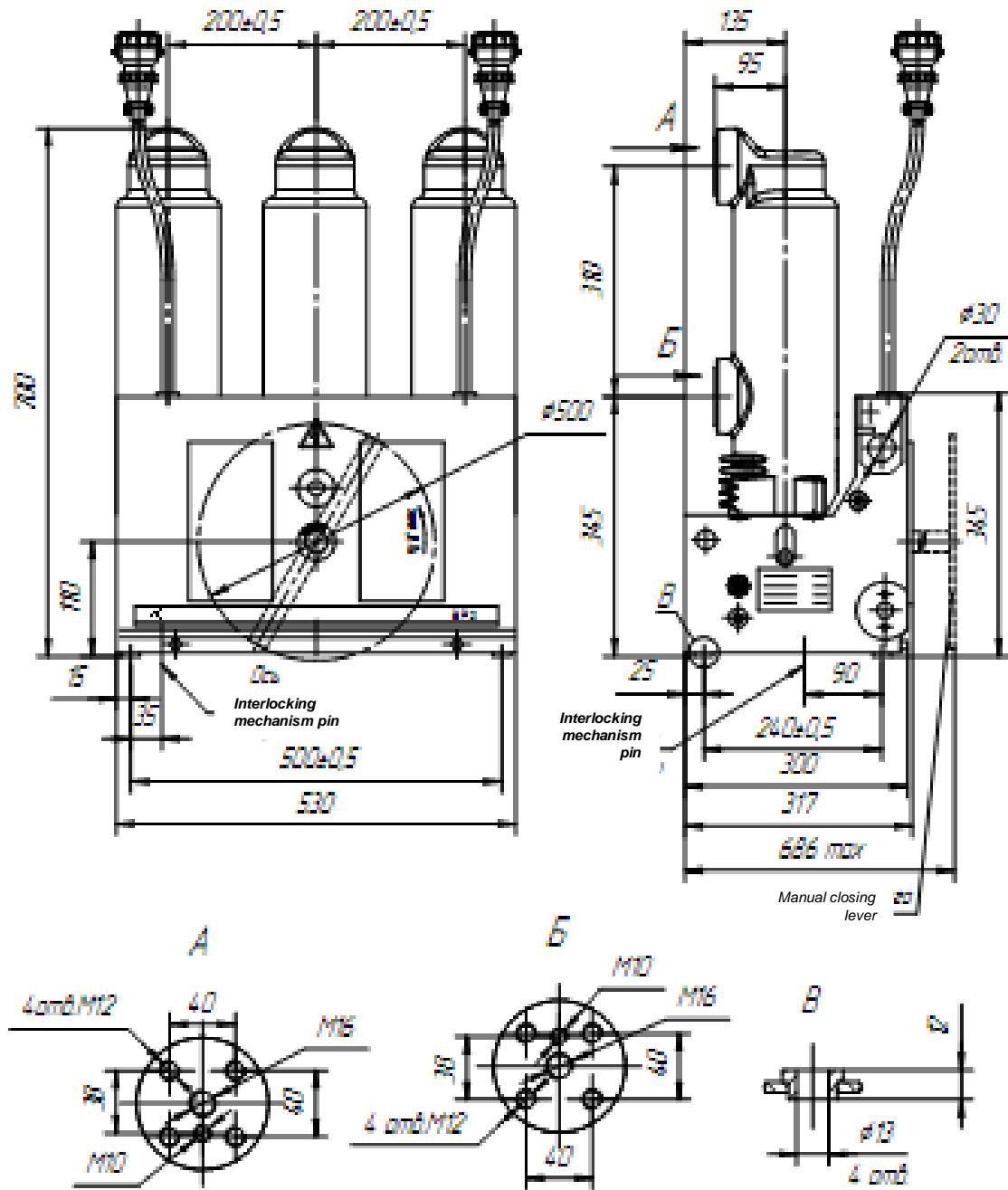


Figure A.3 –
Overall, mounting and connection dimensions of BP2 vacuum circuit-breakers for
1600-2000 A rated currents

Annex A (continued)

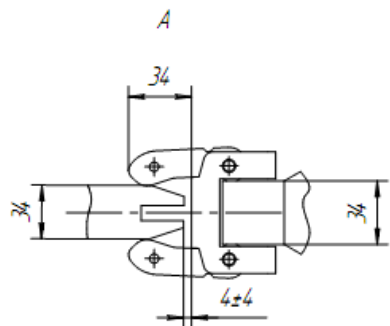
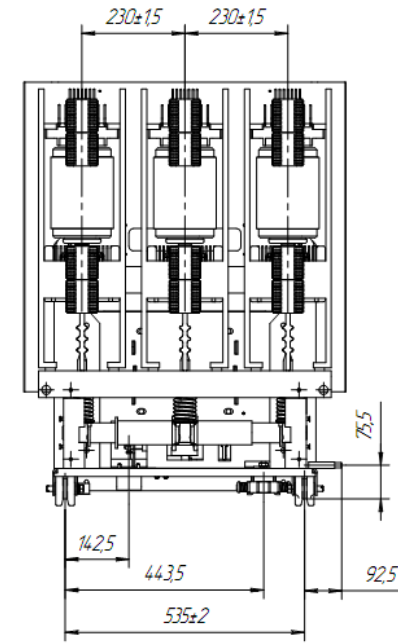
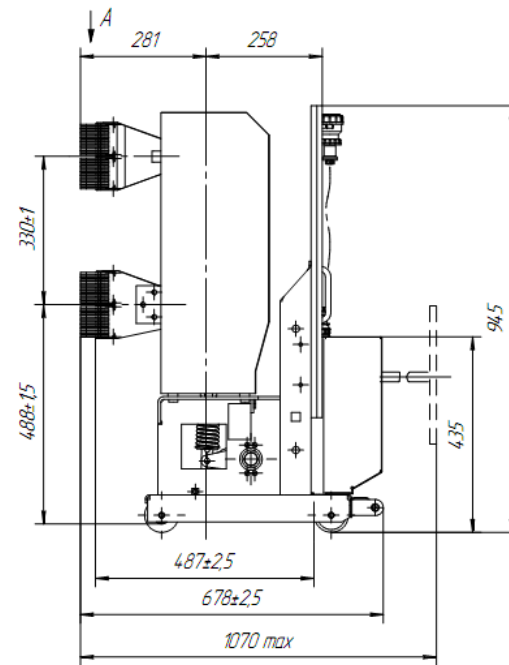
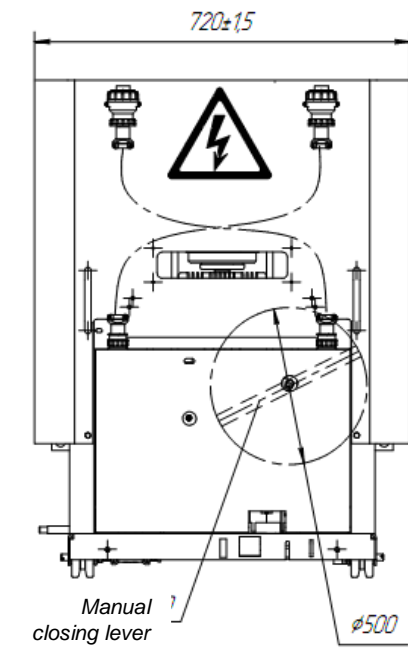


Figure A.4 –
Overall, mounting and connection dimensions of BP3 vacuum circuit-breakers

Annex A (continued)

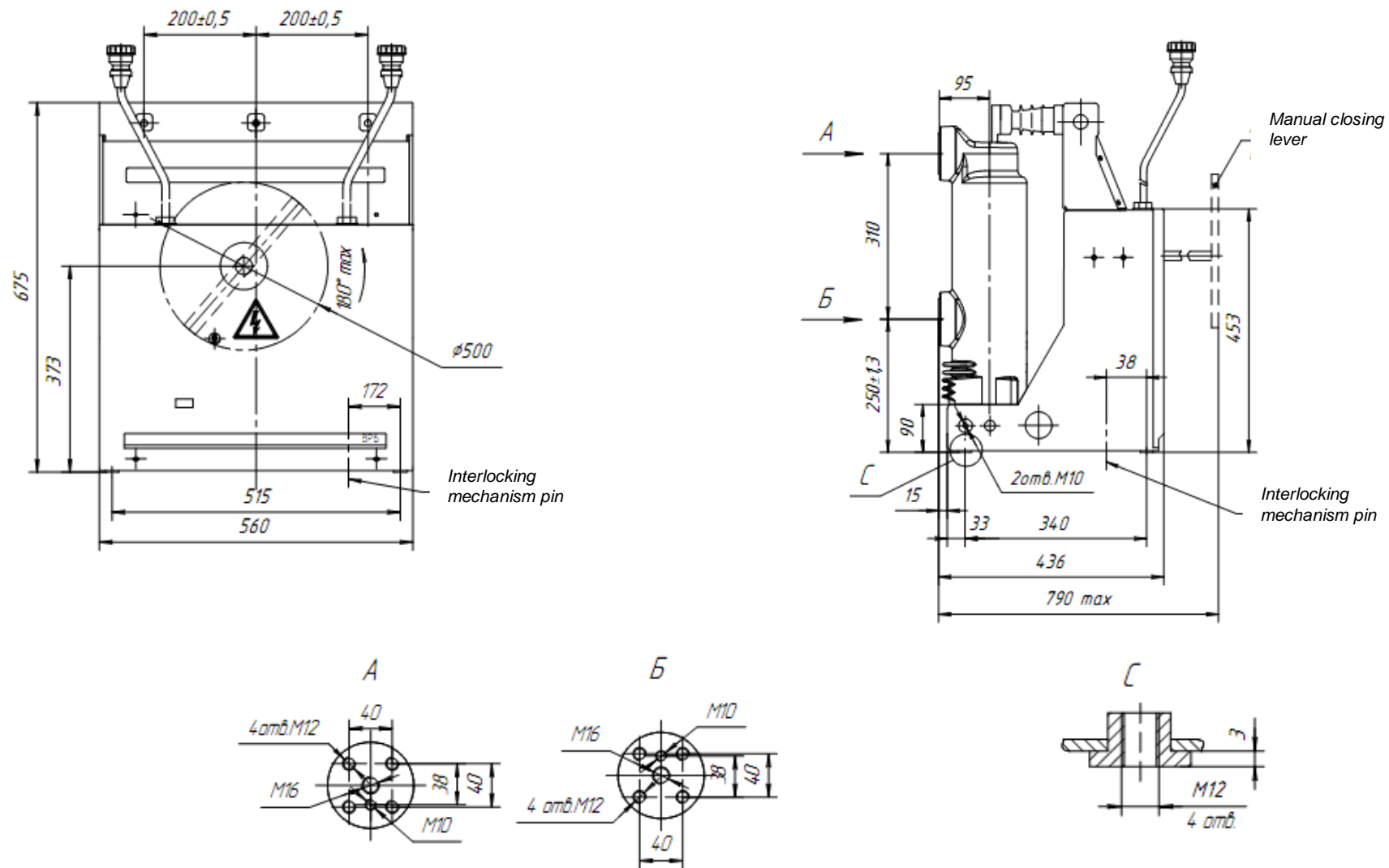


Figure A.5 –
Overall, mounting and connection dimensions of BP6 vacuum circuit-breakers

Annex A (continued)

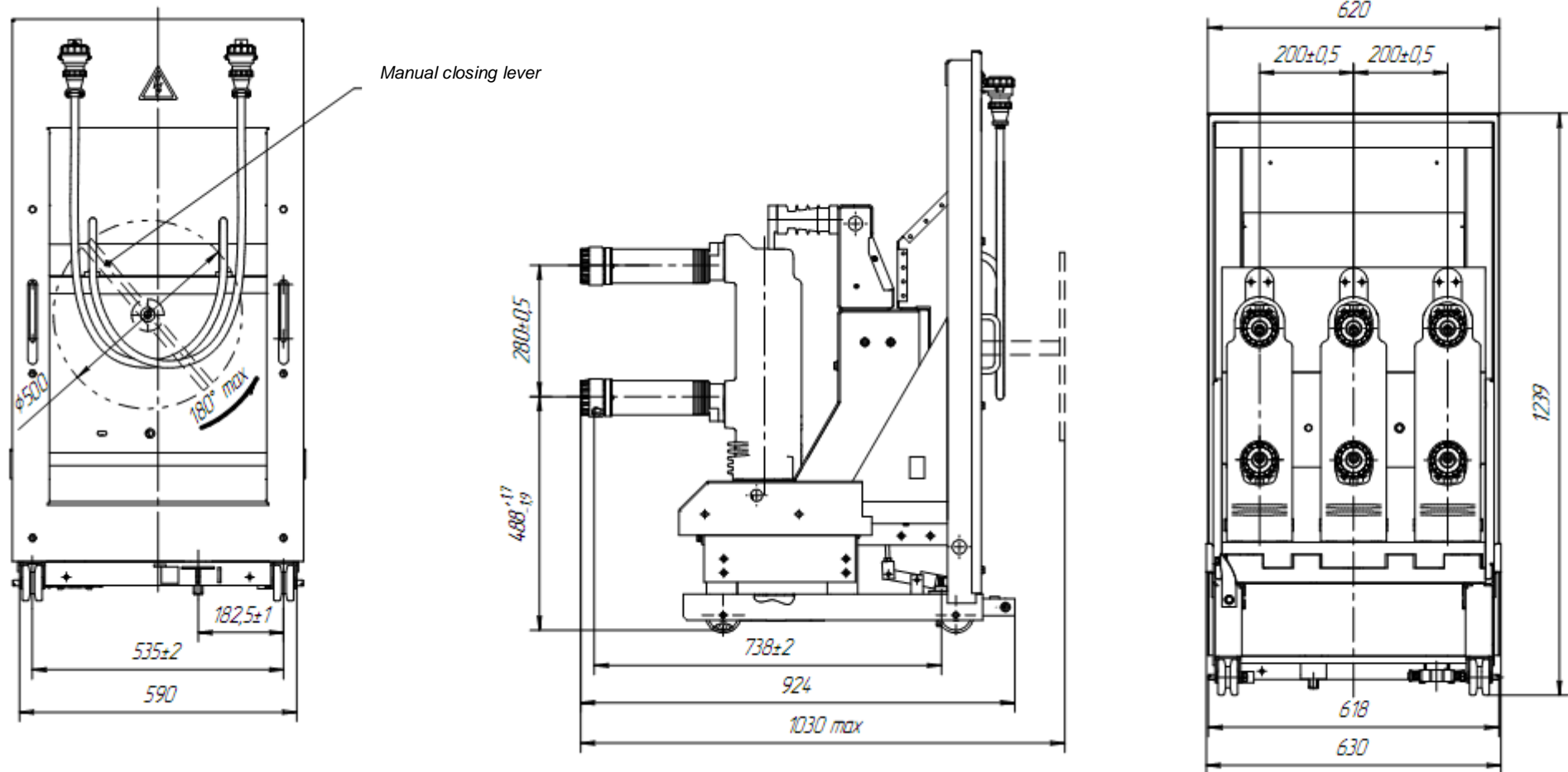
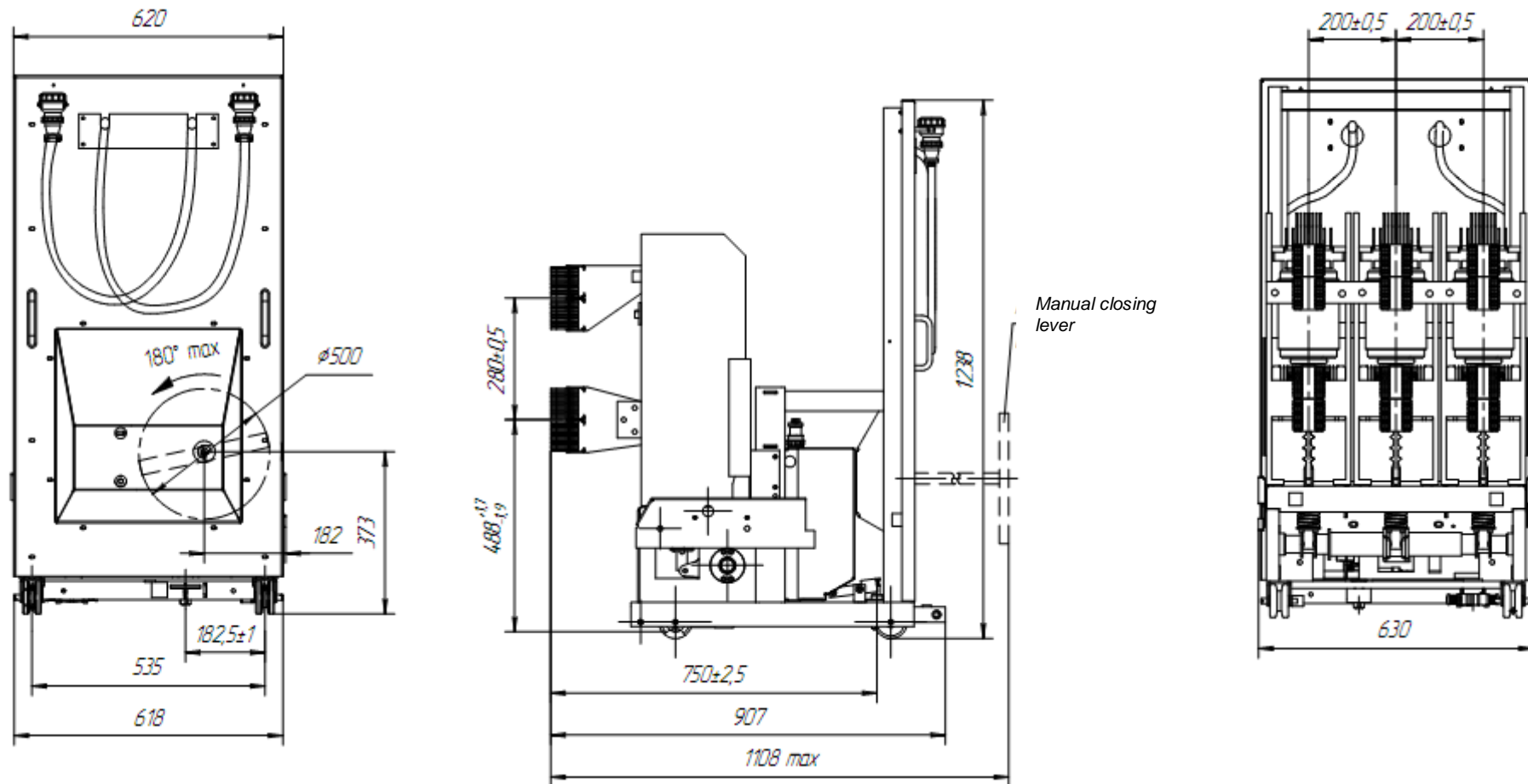


Figure A.6 –
Overall, mounting and connection dimensions of BP6B vacuum circuit-breakers for
1600 and 2000 A rated currents

Annex A (continued)



*Figure A.7 –
Overall, mounting and connection dimensions of BP6B vacuum circuit-breakers for 2500 and 3150 A rated currents*

Annex A (continued)

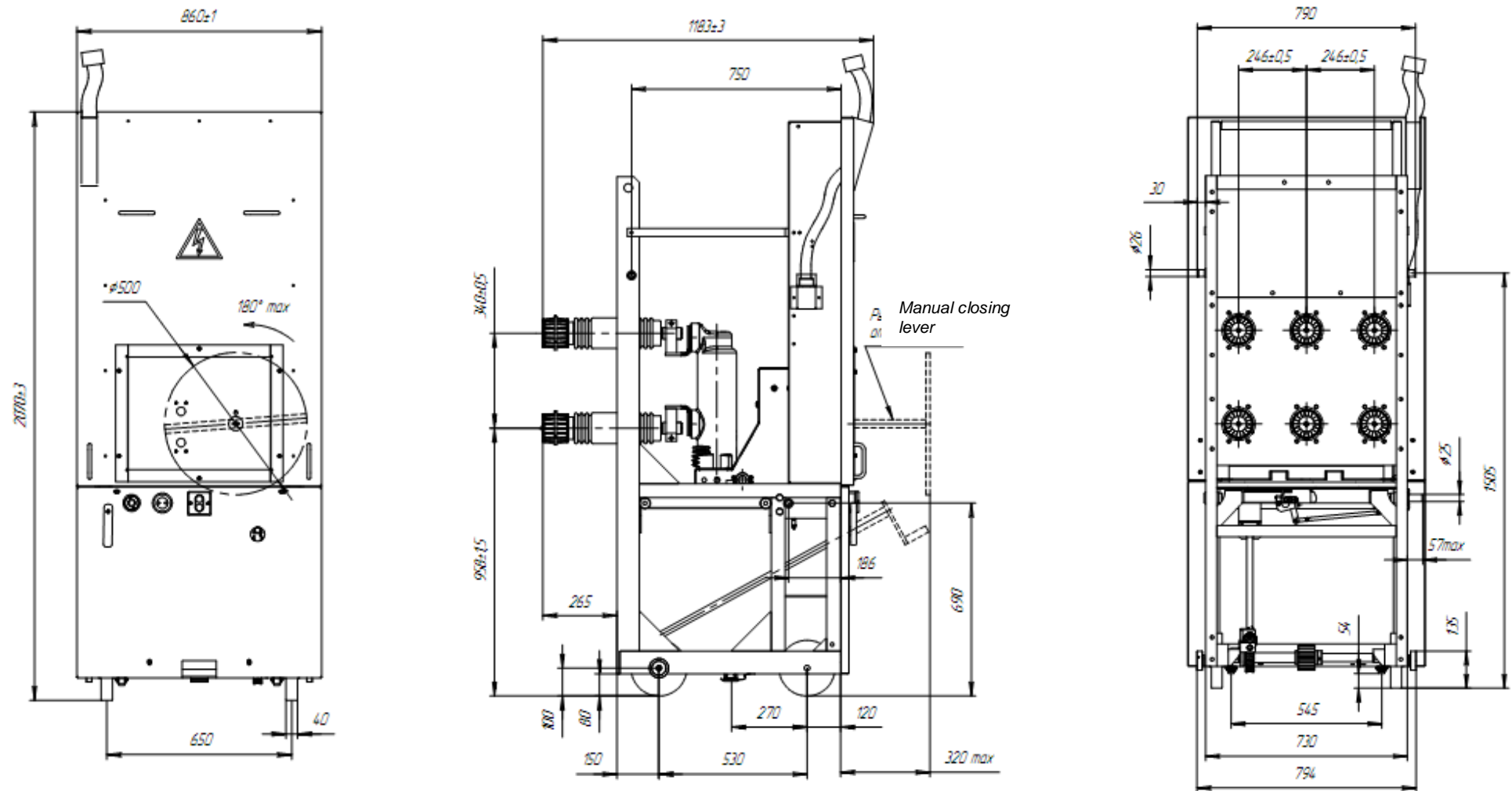
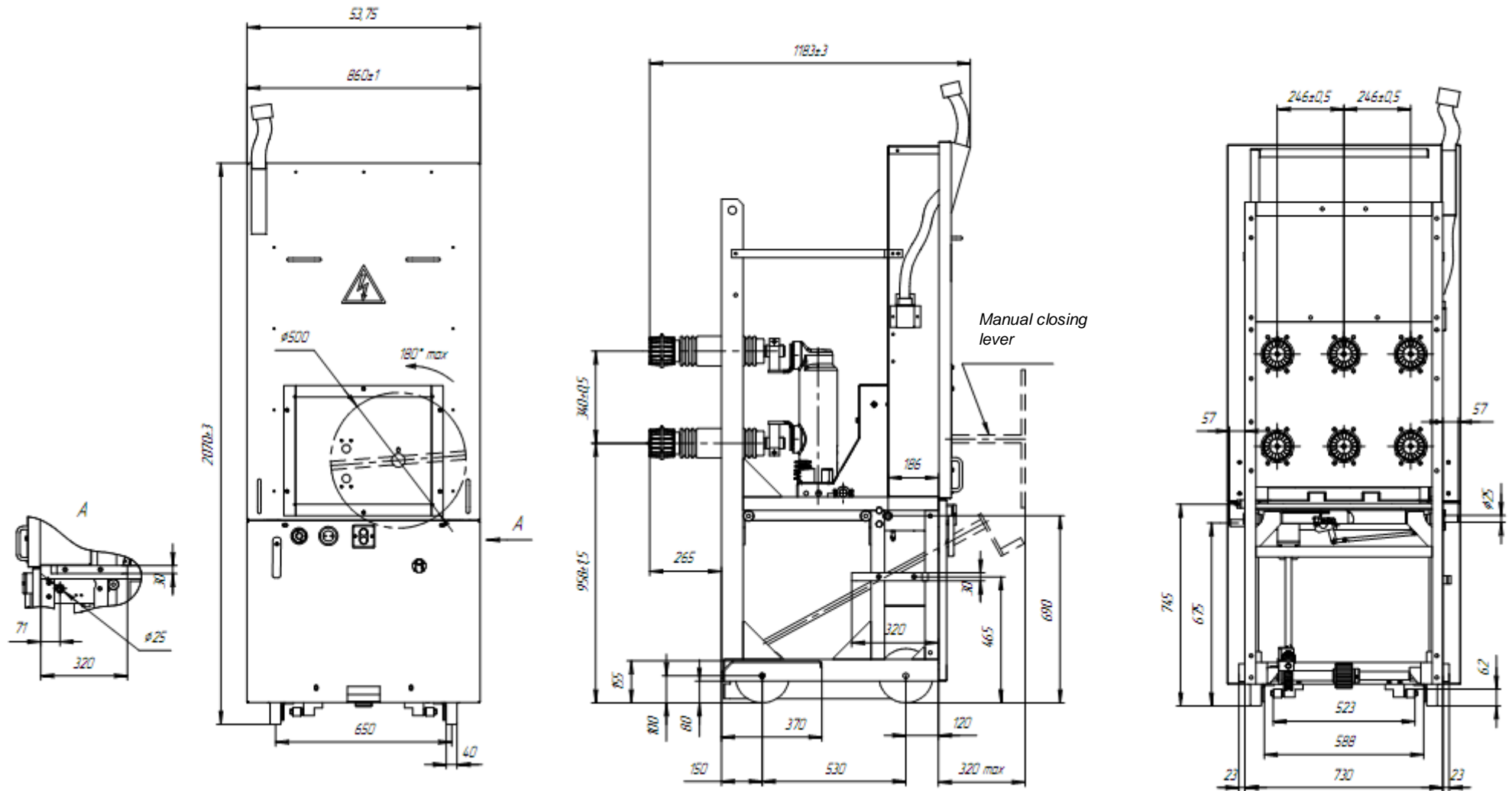


Figure A.8 –
Overall, mounting and connection dimensions of BP6K vacuum circuit-breakers for 1600 and 2000 A rated currents for mounting in the switchgear of K-X series

Annex A (continued)



*Figure A.9 –
Overall, mounting and connection dimensions of BP6K vacuum circuit-breakers for 1600 and 2000 A rated currents for mounting in the switchgear of K-XXV series*

Annex A (continued)

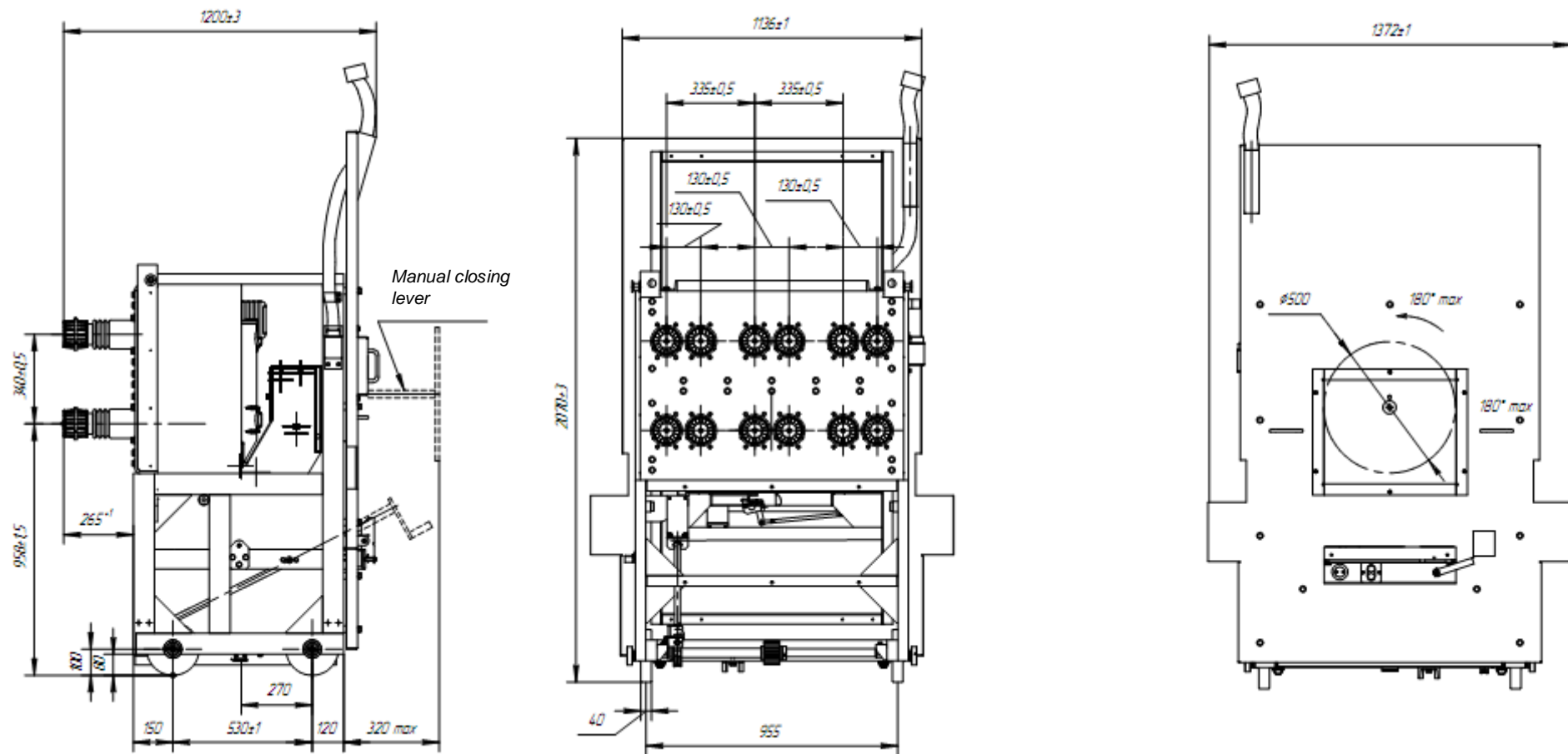
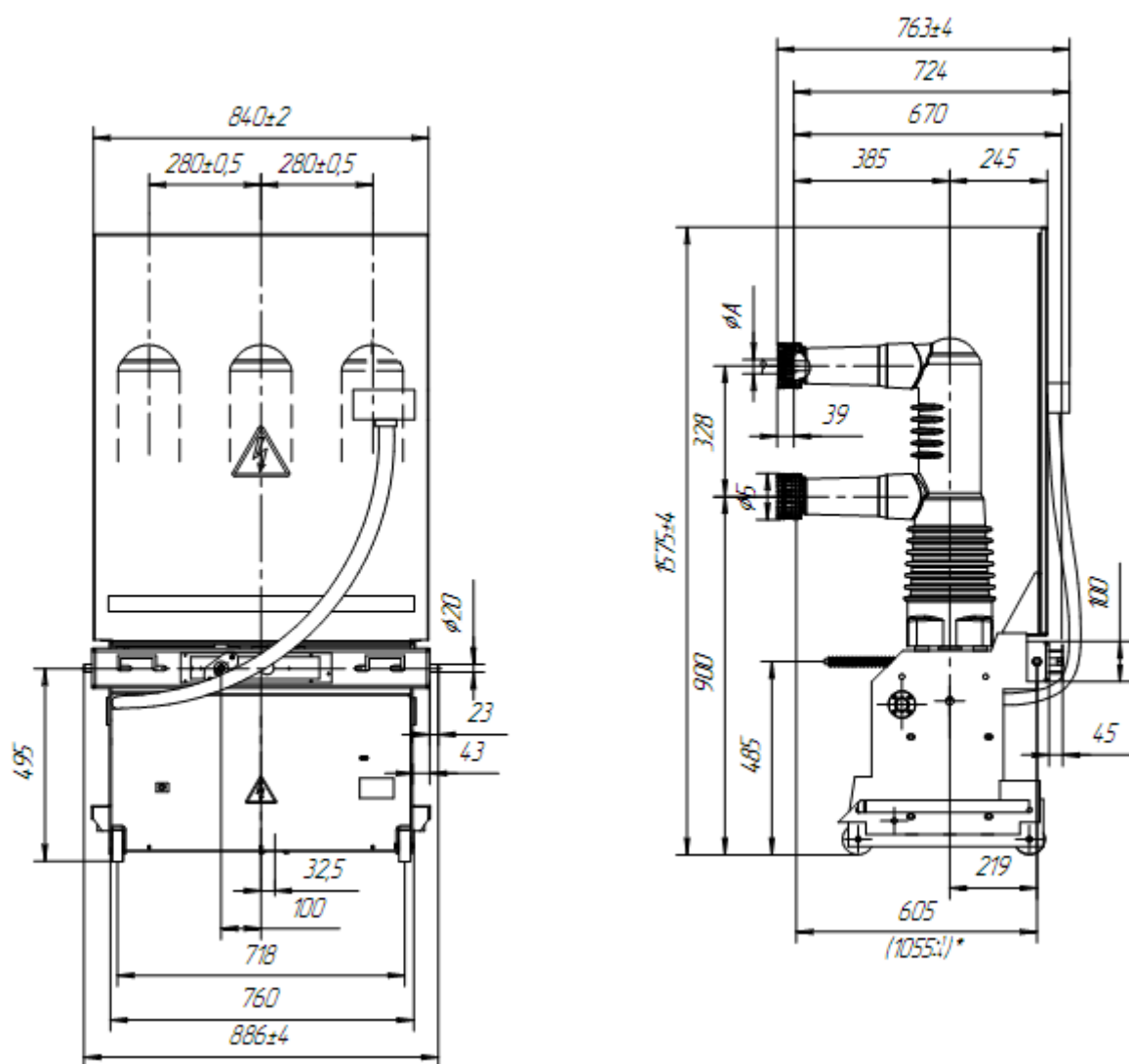


Figure A.10 –
Overall, mounting and connection dimensions of BP6K vacuum circuit-breakers for 3150 A rated current for mounting in the switchgear of K-XXIV series

Annex A (continued)



Version of circuit-breaker	Ø A, mm	Ø B, mm
BP35-35-20/630...1600 U2	35	75
BP35-35-20/800...1250 T3		
BP35-35-20/1600 T3	79	116
BP35-35-20/2000 U2		

* for fully connected position of a breaker

Figure A.11 –
Overall, mounting and connection dimensions of withdrawable BP35 vacuum circuit-breakers

Annex A (continued)

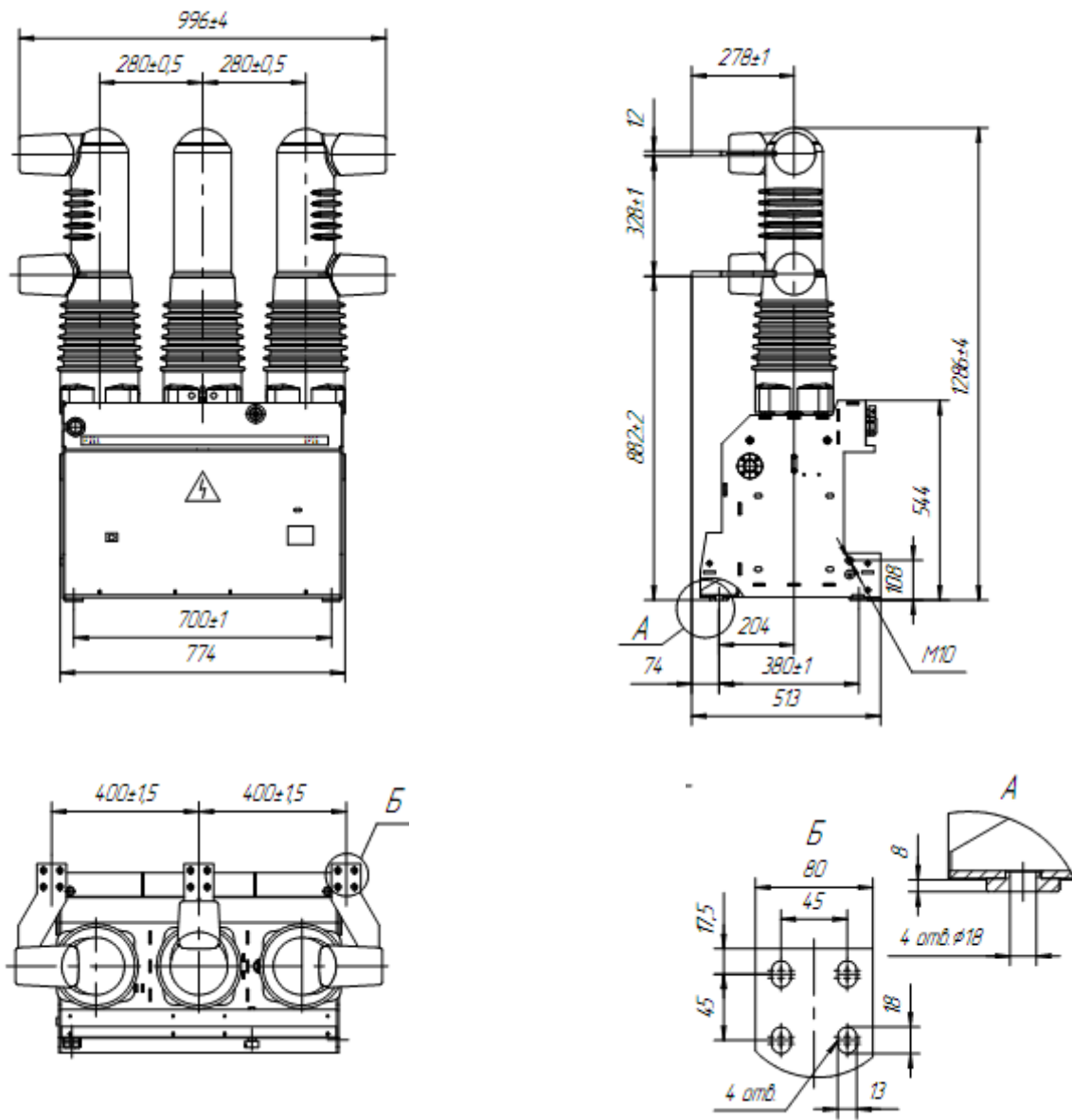


Figure A.12 –
Overall, mounting and connection dimensions of unit mount BP35 vacuum circuit-breakers

Annex B

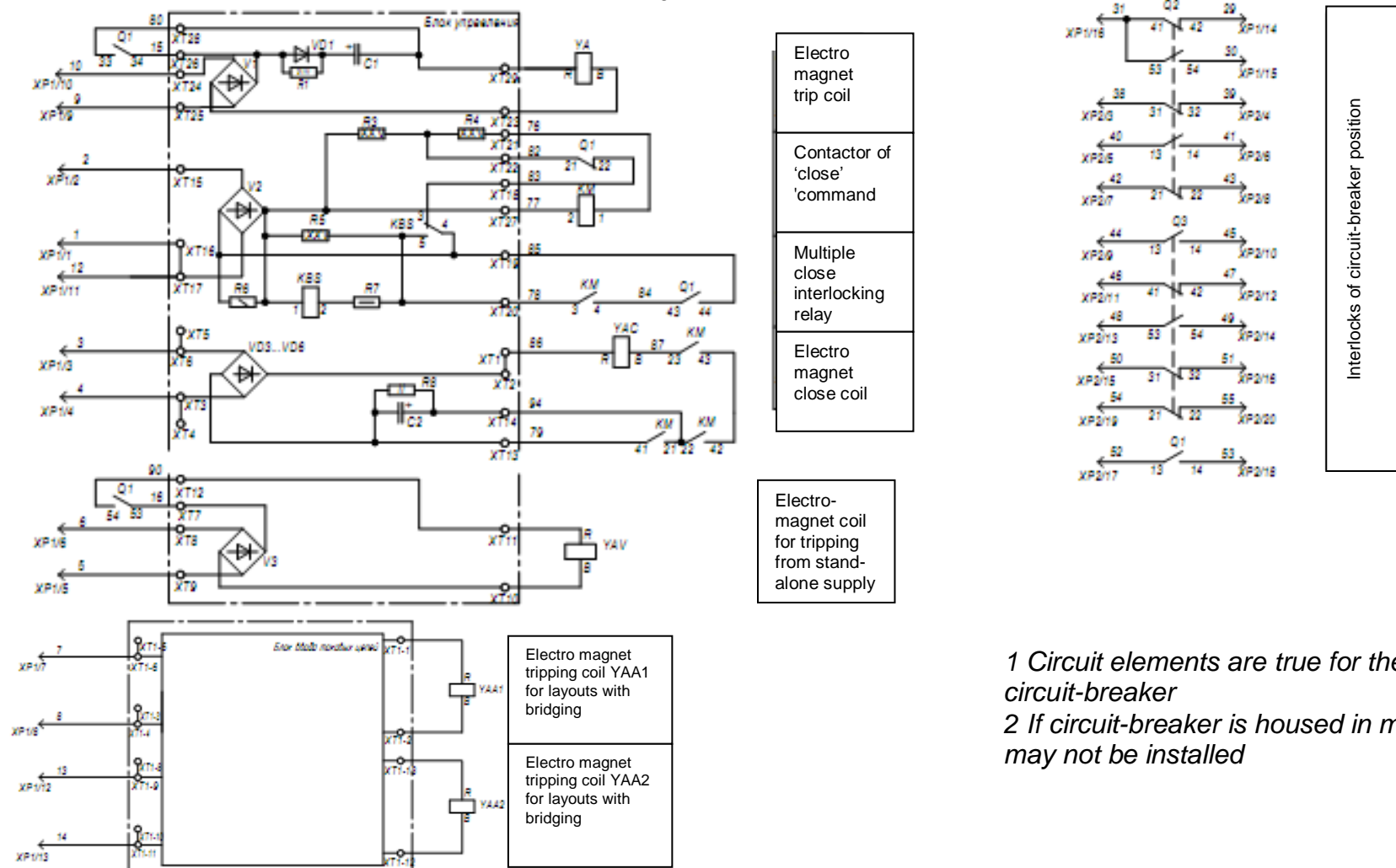
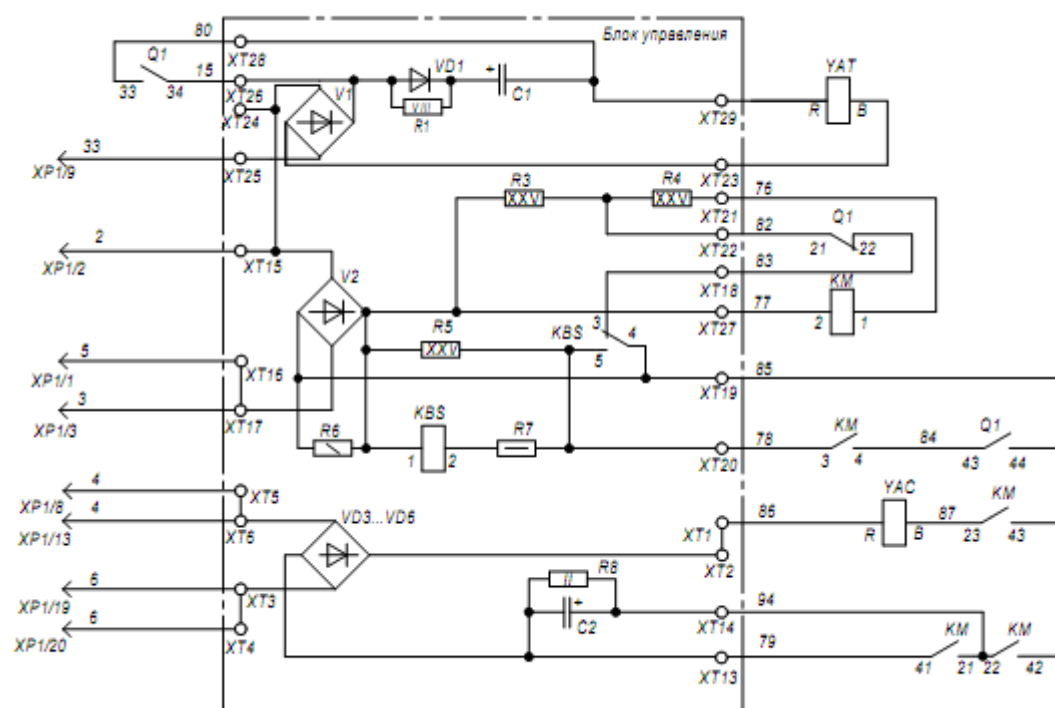


Figure B.1 –

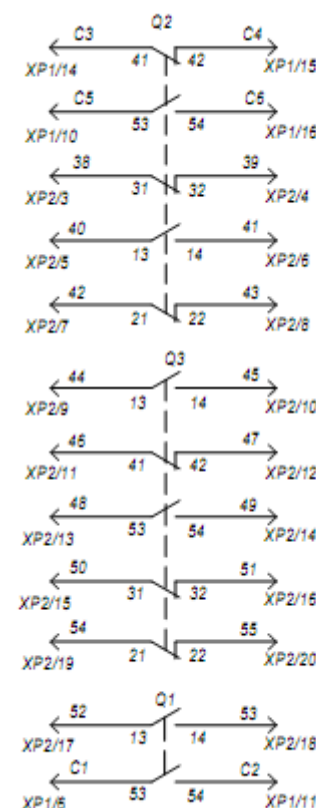
Schematic circuit diagram of BP0 and PB1 vacuum circuit-breakers. Version 4

(AC, 220V; DC, 220V, 110V; with re-close interlock (KBS), with trip circuit from stand-alone supply (YAV), with trip circuits for layouts with bridging (YAA1, YAA2); spring drive analog)

Annex B (continued)



Electro magnet trip coil
Contactor of 'close' command
Multiple close locking relay
Electro magnet close coil



Interlocks of circuit-breaker position

- 1 Circuit elements are true for the 'Open' position of circuit-breaker
- 2 If circuit-breaker is housed in module, plugs XP1, XP2 may not be installed

Figure B.2 –

Schematic circuit diagram of BP0 and PB1 vacuum circuit-breakers. Version 5 (DC, 220V, 110V; with re-close interlock (KBS), without trip circuit from stand-alone supply (YAV), and without trip circuits for layouts with bridging (YAA1, YAA2); electromagnetic drive analog)

Annex B (continued)

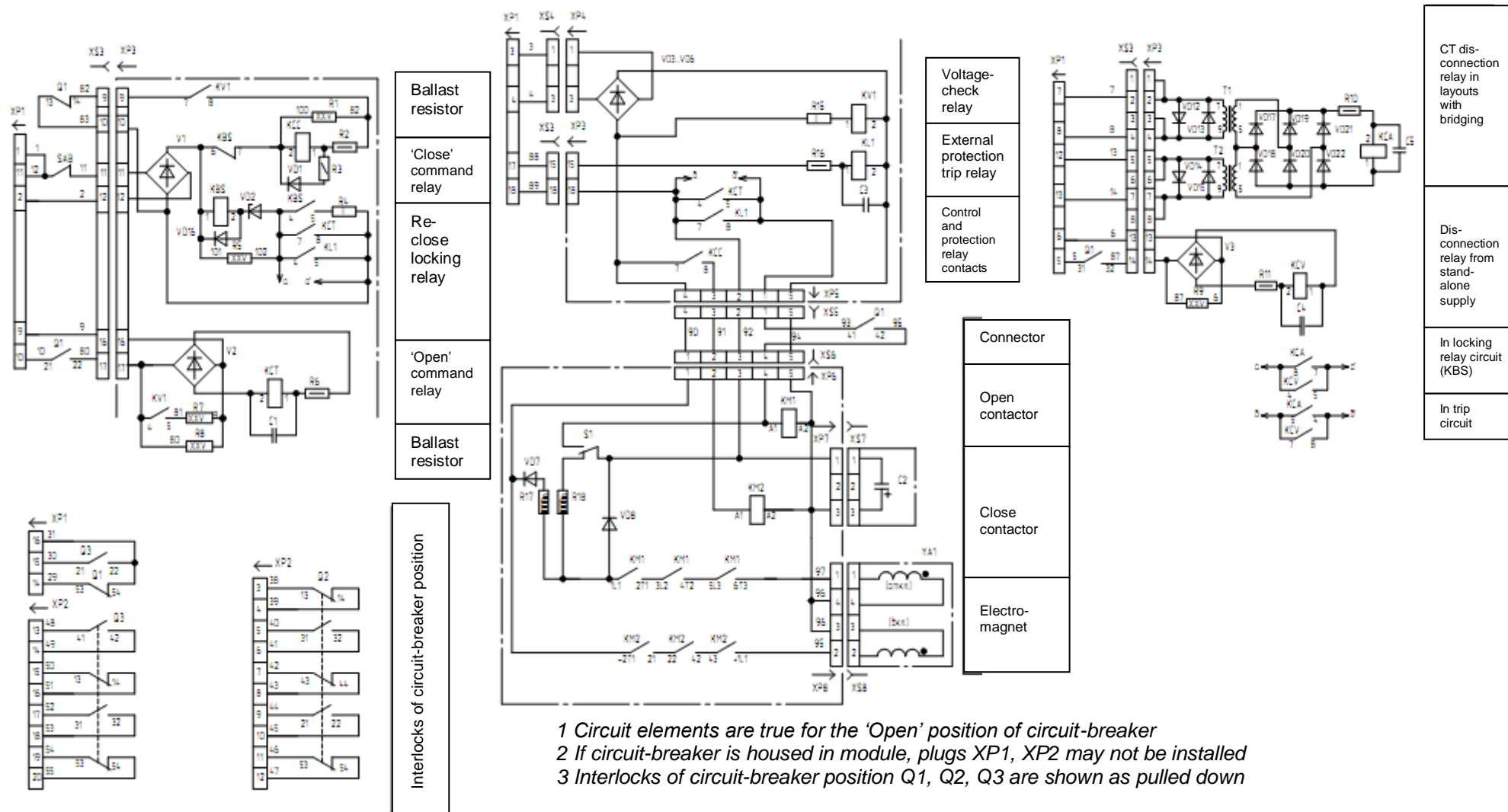
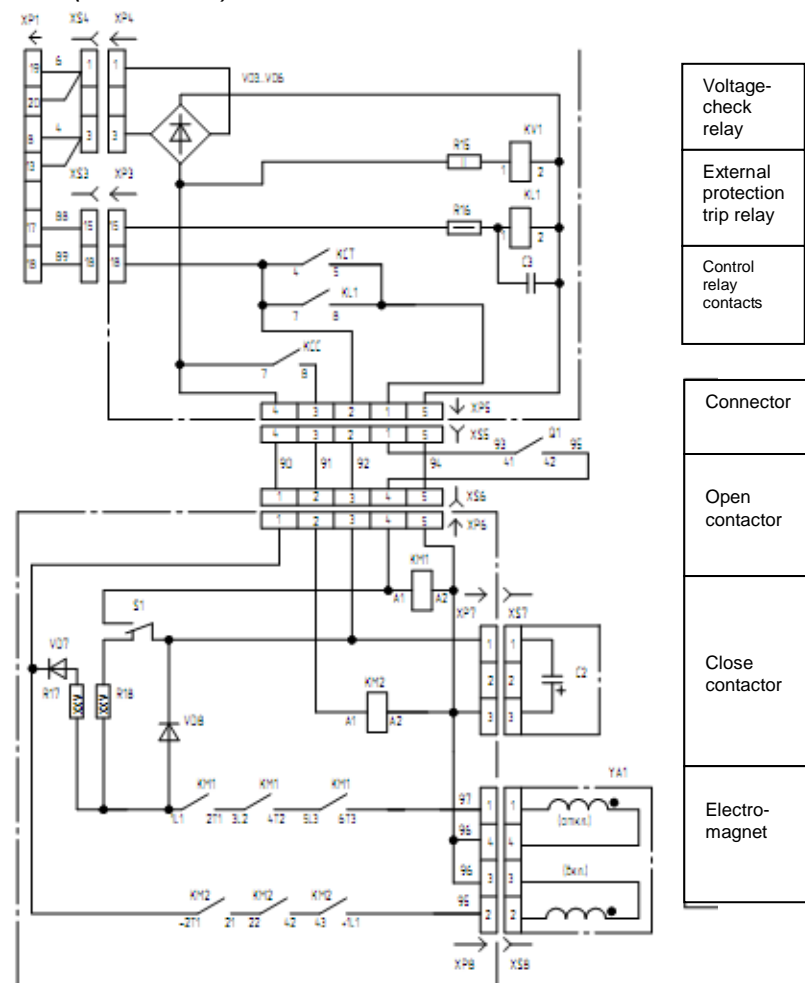
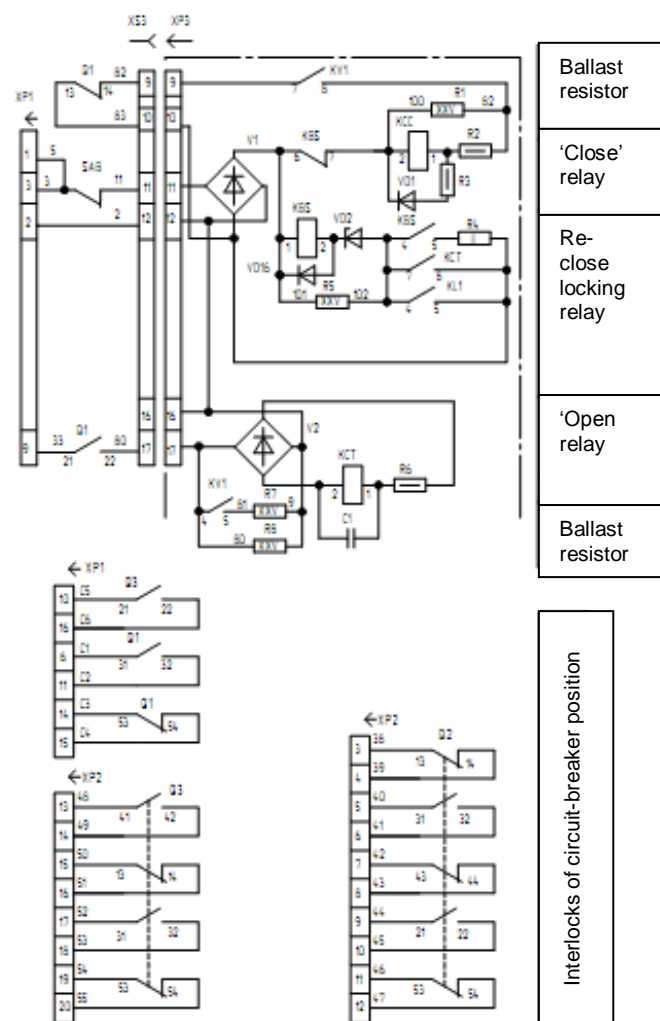


Figure B.3 –

Schematic circuit diagram of BP2, BP3, BP6, BP6B. Version 1 (BP2, BP3 – AC, DC, 220V; BP6 and BP6B – DC, 220V, with re-close interlock (KBS), with trip circuit from stand-alone supply (KCV), and with trip circuits for layouts with bridging (KCA); spring drive analog)

Annex B (continued)

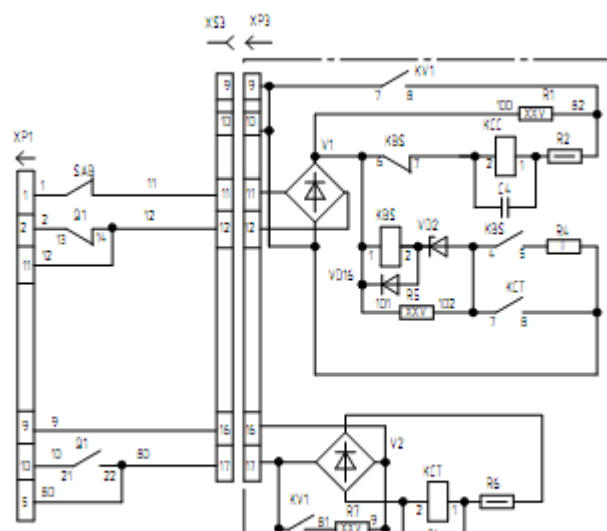


- 1 Circuit elements are true for the 'Open' position of circuit-breaker
- 2 If circuit-breaker is housed in module, plugs XP1, XP2 may not be installed
- 3 Interlocks of circuit-breaker position Q1, Q2, Q3 are shown as pulled down

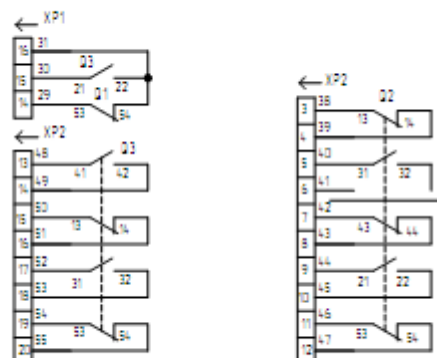
Figure B.4 –

Schematic circuit diagram of BP2, BP3, BP6, BP6B circuit-breakers. Version 3 (DC, 220V; with re-close interlock (KBS), without trip circuit from stand-alone supply (KCV) and trip circuits for layouts with bridging (KCA); electromagnetic drive analog)

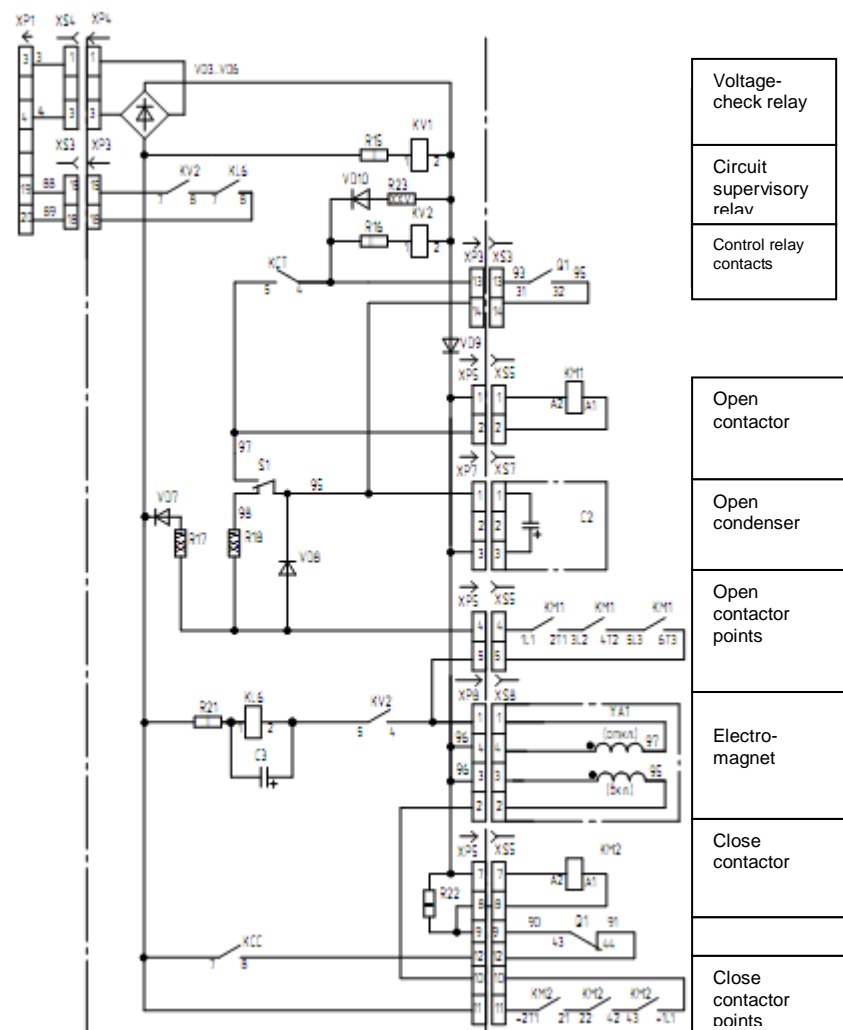
Annex B (continued)



Ballast resistor
'Close' relay
Re-close locking relay
'Open' relay
Ballast resistor



Interlocks of circuit-breaker position
--



Voltage-check relay
Circuit supervisory relay
Control relay contacts

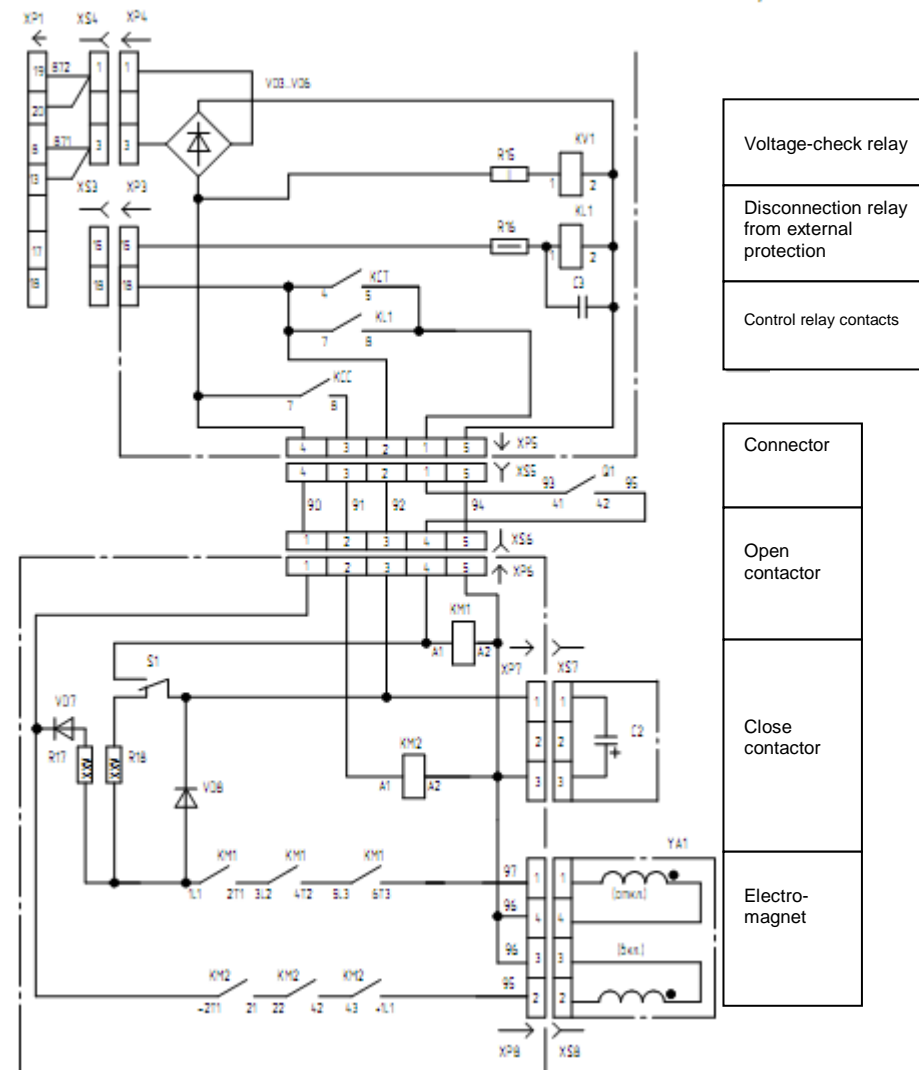
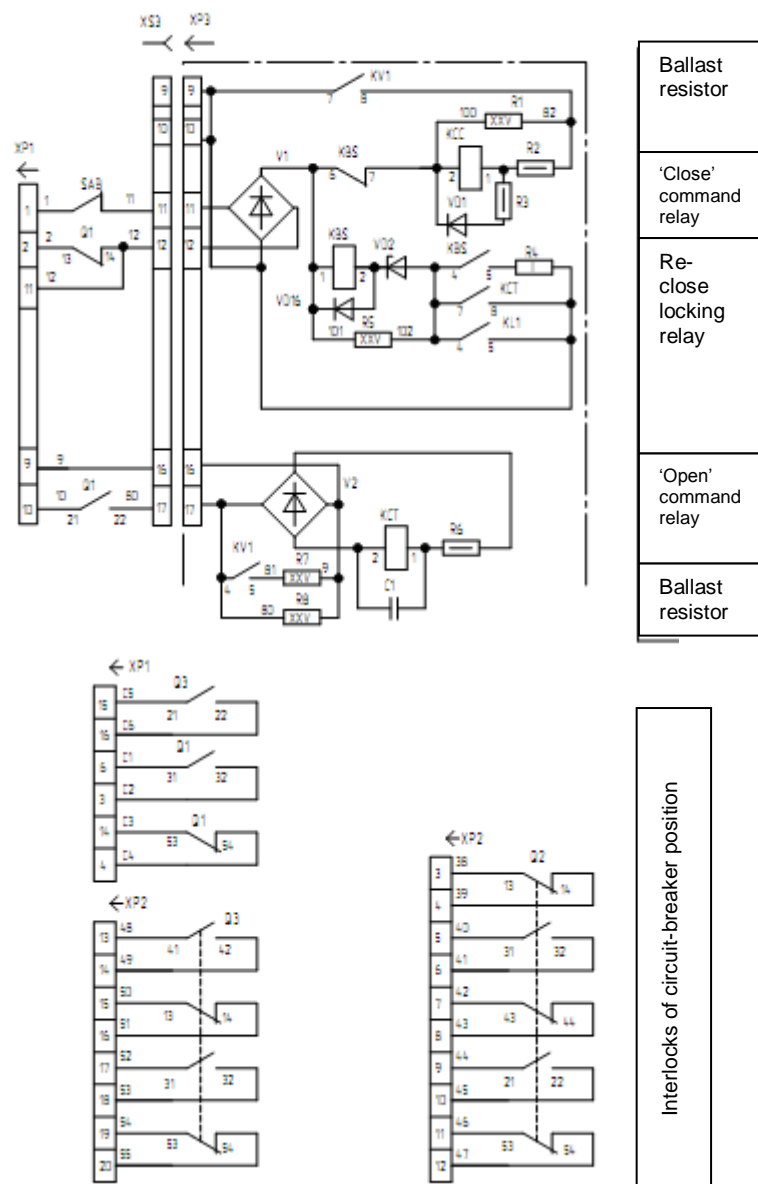
Open contactor
Open condenser
Open contactor points
Electro-magnet
Close contactor
Close contactor points

- 1 Circuit elements are true for the 'Open' position of circuit-breaker
- 2 If circuit-breaker is housed in module, plugs XP1, XP2 may not be installed
- 3 Interlocks of circuit-breaker position Q1, Q2, Q3 are shown as pulled down

Figure B.5–

Schematic circuit diagram of BP6, BP6B circuit-breakers. Version 4 (DC, 220V; without re-close interlock (KBS), without trip circuit from stand-alone supply (KCV) and trip circuits for layouts with bridging (KCA); spring drive analog)

Annex B (continued)

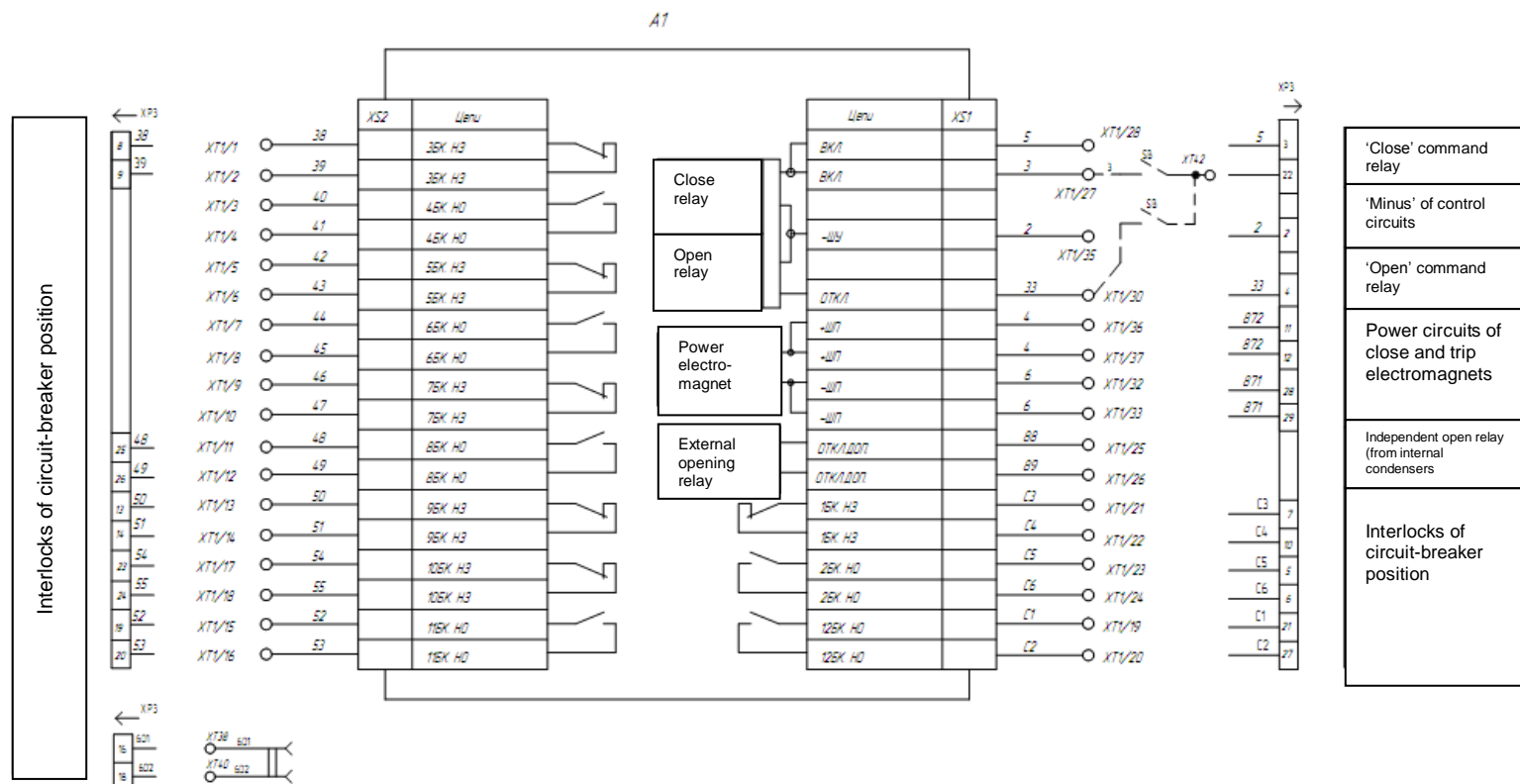


- 1 Circuit elements are true for the 'Open' position of circuit-breaker
- 2 If circuit-breaker is housed in module, plugs XP1, XP2 may not be installed
- 3 Interlocks of circuit-breaker position Q1, Q2, Q3 are shown as pulled down

Figure B.6 –

Schematic circuit diagram of BP2, BP3, BP6, BP6B circuit-breakers. Version 5 (BP2, BP3, BP6, and BP6B – DC, 220V; without re-close interlock (KBS), without trip circuit from stand-alone supply (KCV) and trip circuits for layouts with bridging (KCA); electromagnetic drive analog)

Annex B (continued)



- 1 Circuit elements are true for the 'Open' position of circuit-breaker
- 2 Circuit-breaker A1 is made according to the diagram of figure B.5
- 3 Wire bonding is according to schematic circuit diagram, the customer performs connection depending on the cubicle circuit

Figure B.7 –
Schematic circuit diagram of BP6K circuit-breakers. Version 6 (DC, 220V)

Annex B (continued)

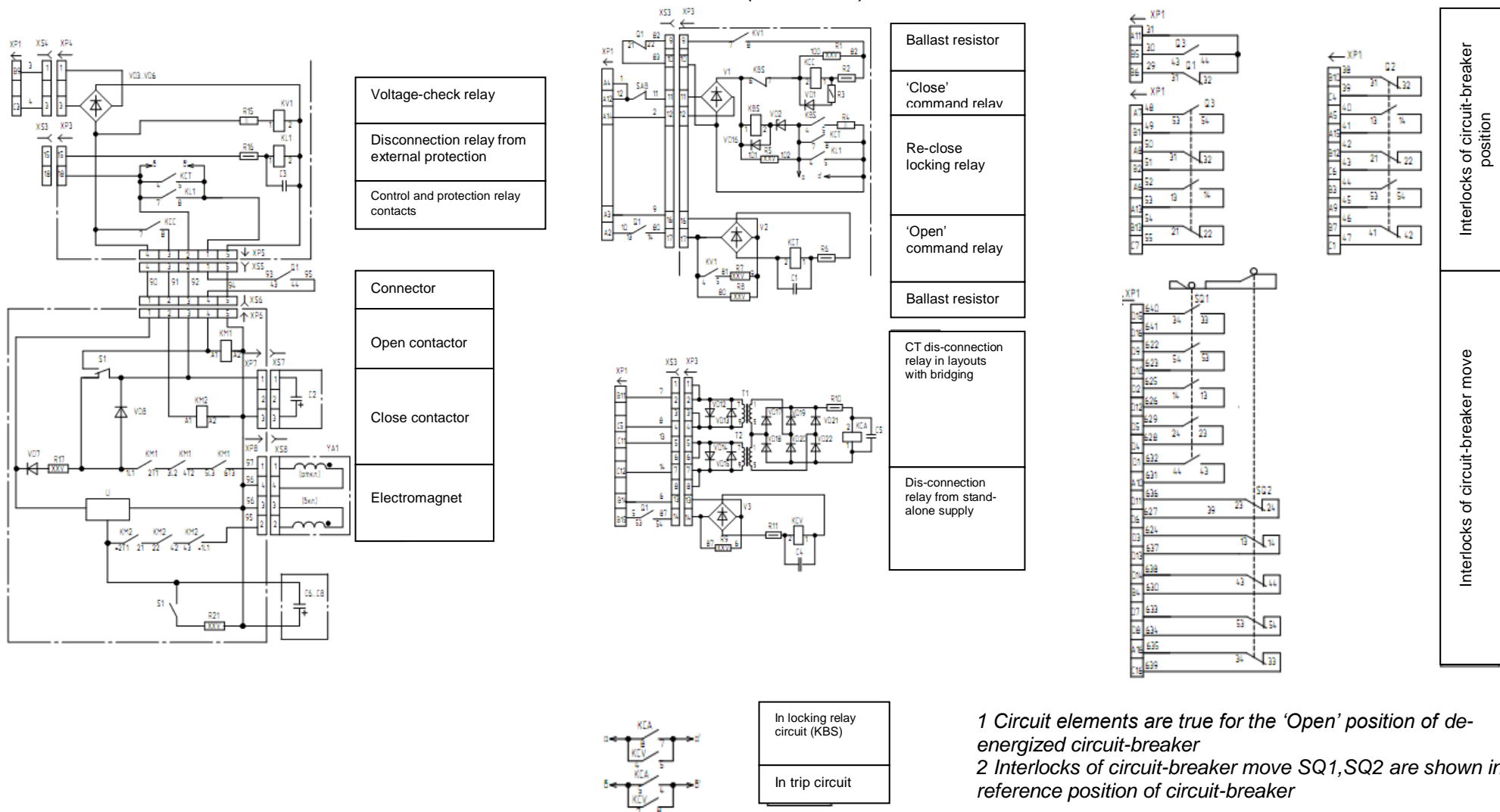


Figure B.8 –

Schematic circuit diagram of withdrawable circuit-breakers of BP35 series. Version 1 (AC or DC, 220V; with re-close interlock (KBS), with trip circuit from stand-alone supply (KCV) and trip circuits for layouts with bridging (KCA))

Annex B (continued)

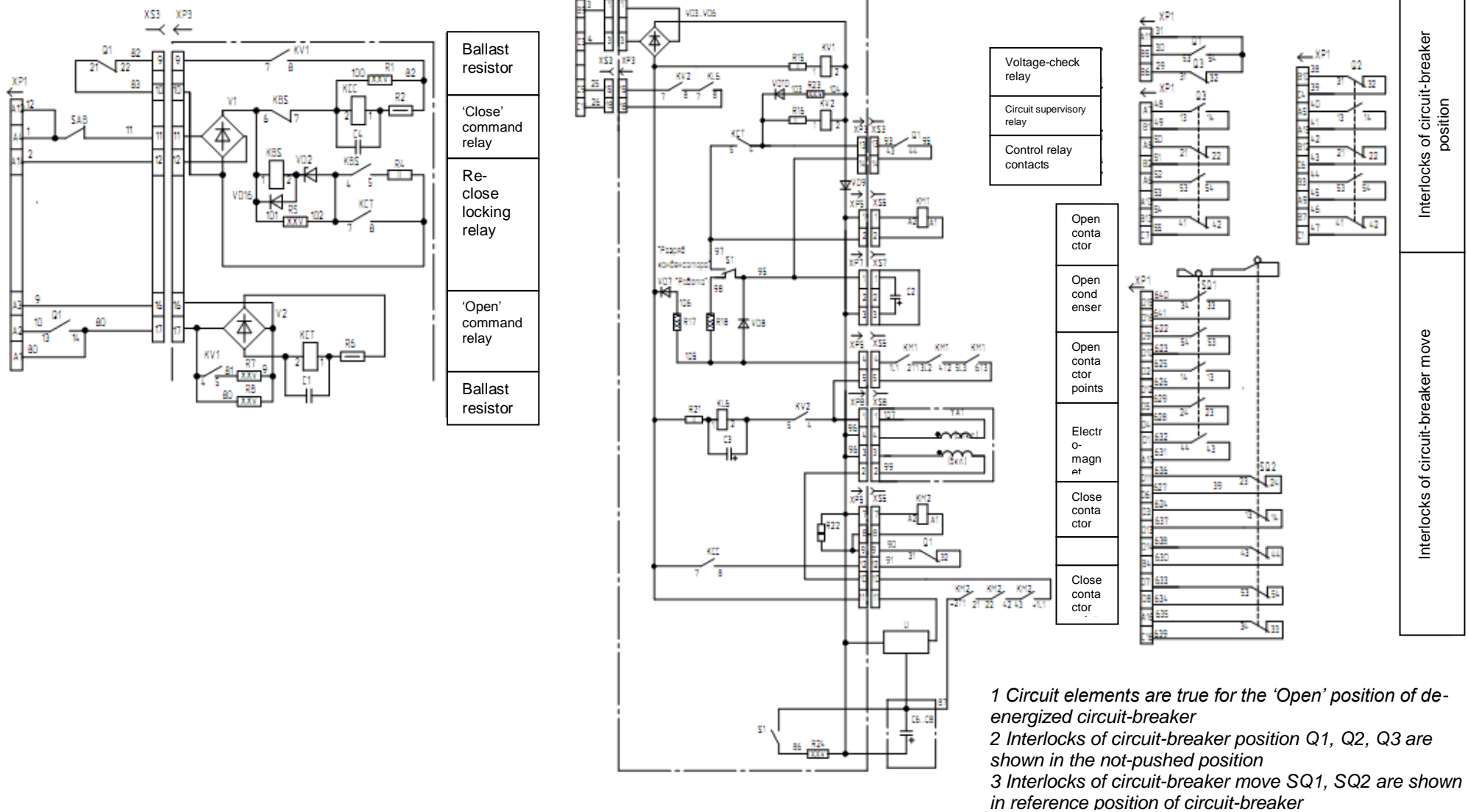


Figure B.9 –

Schematic circuit diagram of withdrawable circuit-breakers of BP35 series. Version 2 (AC or DC, 220V; with re-close interlock (KBS), without trip circuit from stand-alone supply (KCV) and without trip circuits for layouts with bridging (KCA))

Annex B (continued)

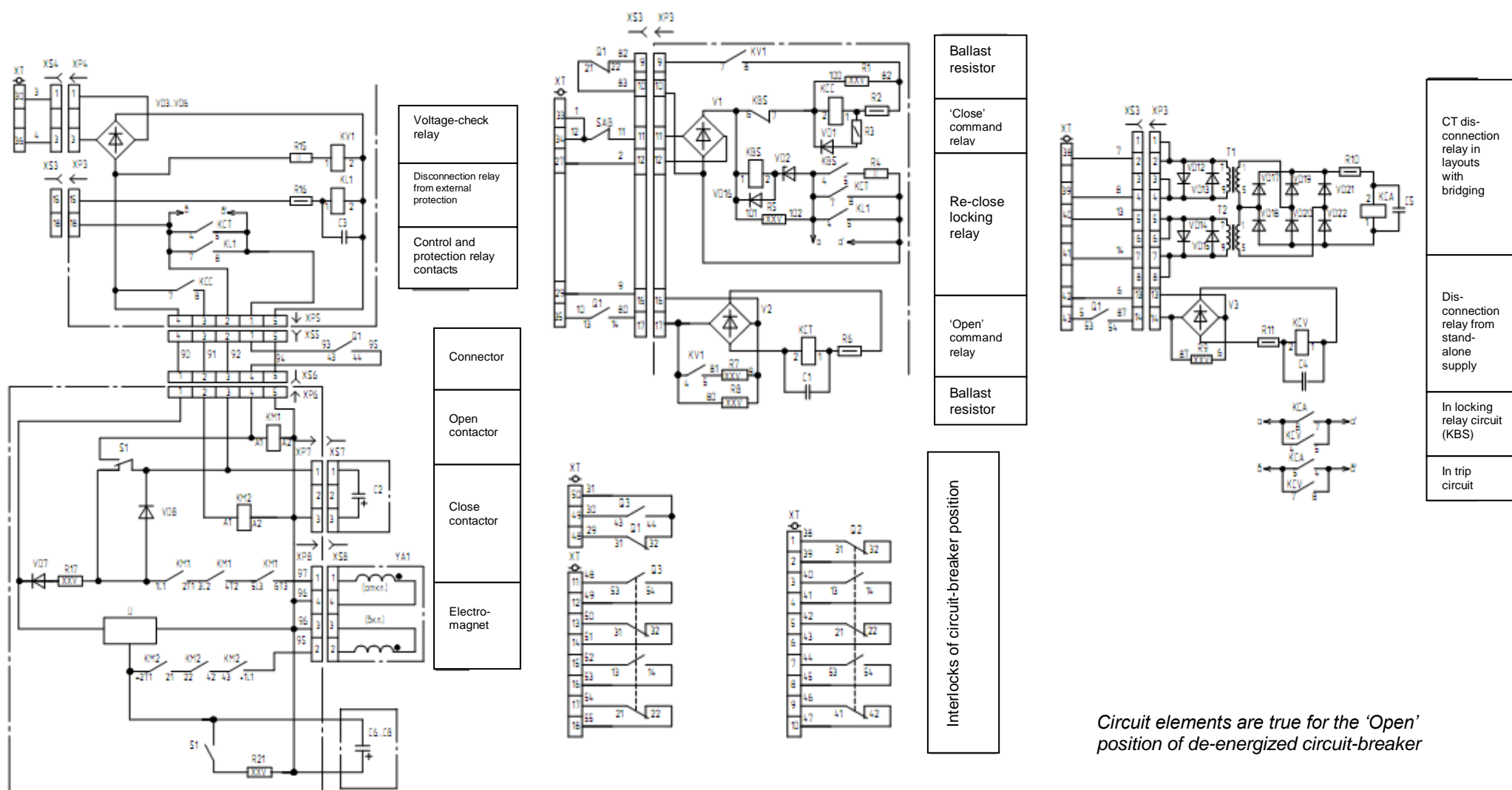
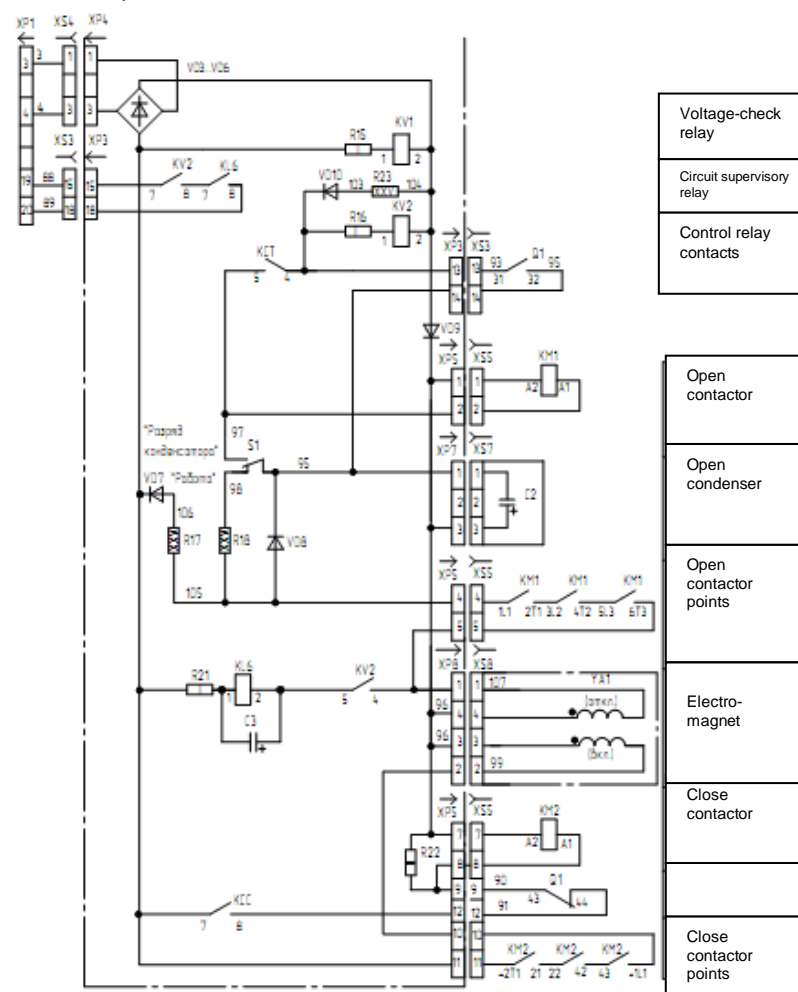
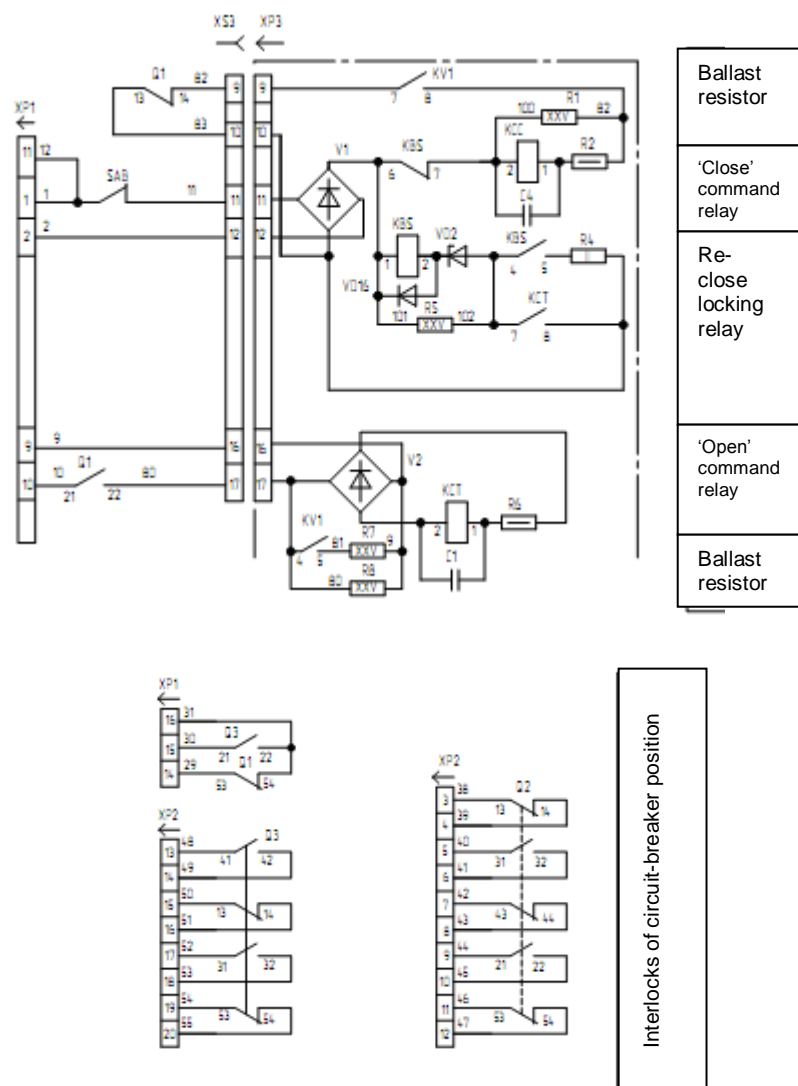


Figure B.10 –
Schematic circuit diagram of unit mount circuit-breakers of BP35 series (AC or DC, 220V; with re-close interlock (KBS), with trip circuit from stand-alone supply (KCV) and trip circuits for layouts with bridging (KCA))

Annex B (continued)



- 1 Circuit elements are true for the 'Open' position of circuit-breaker
- 2 If circuit-breaker is housed in module, plugs XP1, XP2 may not be installed
- 3 Interlocks of circuit-breaker position Q1, Q2, Q3 are shown as pulled down

Figure B.9 –

Schematic circuit diagram of withdrawable circuit-breakers of BP35 series. Version 2 (AC or DC, 220V; with re-close interlock (KBS), without trip circuit from stand-alone supply (KCV) and without trip circuits for layouts with bridging (KCA))

Annex C

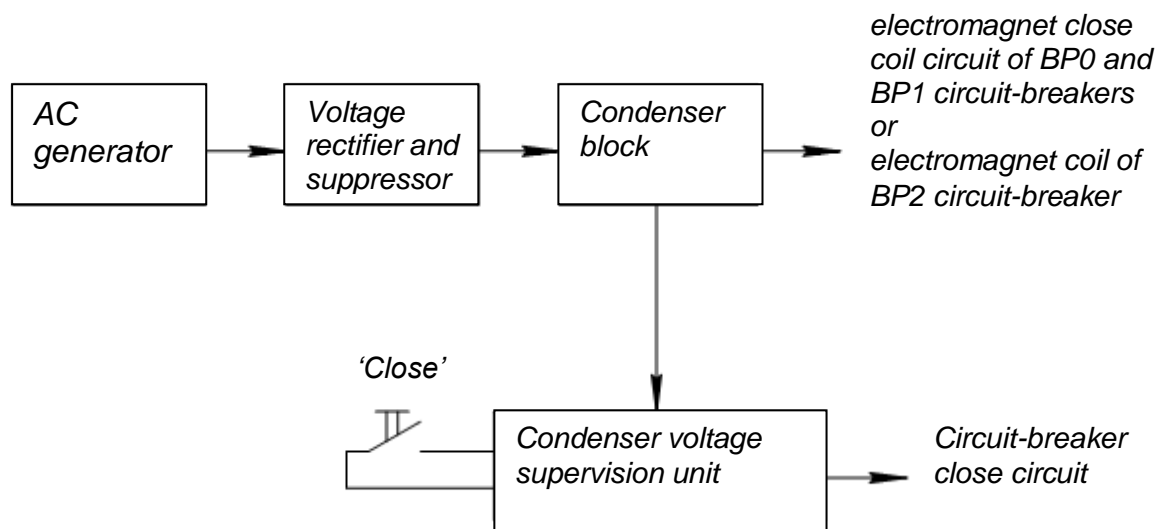


Figure C.1 – Block diagram of manually-operated closing device

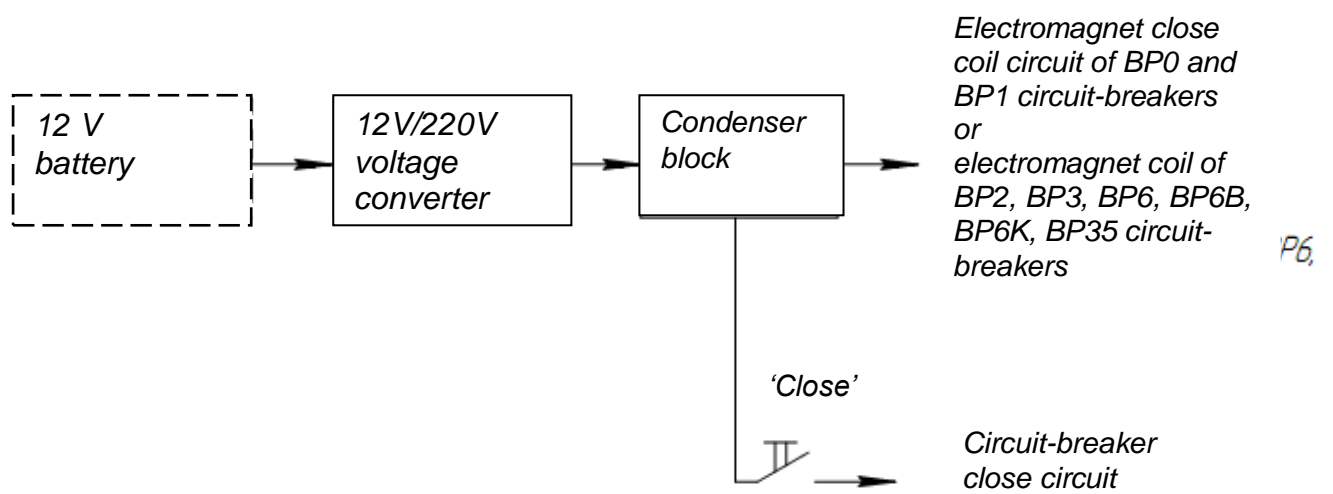
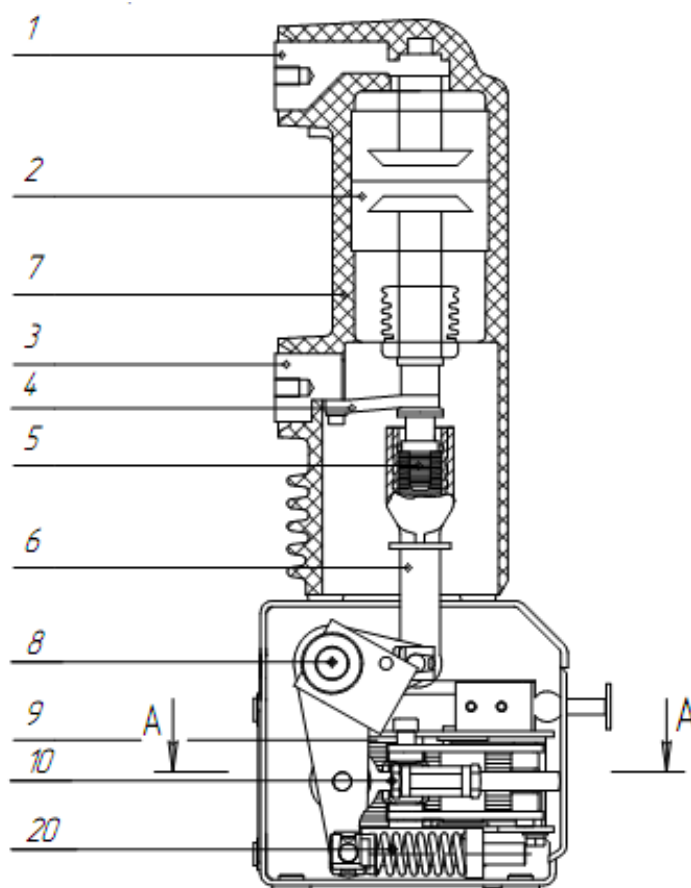


Figure C.2 – Block diagram of Routine close cubicle

Annex D



- 1 – upper terminal
- 2 – vacuum interrupter
- 3 – lower terminal
- 4 – flexible coupling
- 5 – pressing spring
- 6 – insulation tie-rod
- 7 – insulation frame of pole
- 8 – main shaft
- 9 – electromagnet
- 10 – adjusting rod
- 11 – countershaft
- 12 – close fuse element
- 13 – close coil
- 14 – permanent magnet
- 15 – trip coil
- 16 – manually-operated close device
- 17 – core
- 18 – open slide
- 19 – manually-operated close press-button
- 20 – opening spring

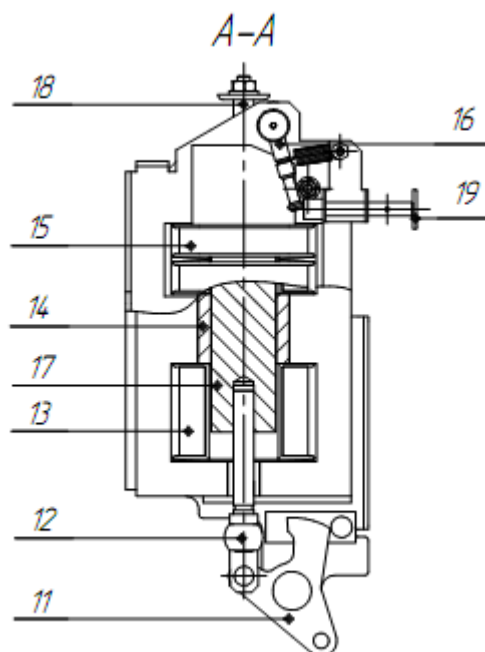


Figure D.1 – Design of BP0 and BP1 vacuum circuit-breakers

Annex E.1

Questionnaire (example how to fill in)

to order vacuum circuit-breakers of series BP0, BP1

(strike out whichever does not apply)

TO BE COMPLETED BY CUSTOMER				
1	CUSTOMER	JSC ENERGY SUPPLY COMPANY 'Khmelnyskoblenenergo'		
2	Name of facility	"Yarmolyntsi" Substation		
3	Reference number of cubicle where circuit-breaker will be installed			
Specification of Circuit-Breaker				
4	Parameters of main circuits	Rated voltage	kV	10
5		Rated breaking capacity	kA	20
6		Rated current	A	630
7	Climatic modification and category of location according to GOST 15150-69			U2/T3
8	Parameters of auxiliary circuits	Option of schematic circuit diagram according to tech spec (or tech info)	Version 4	
9		Kind of current and rated voltage of electromagnet close coil circuit (YAC)	V	~220
10		Kind of current and rated voltage of close circuit (KM)	V	~220
11		Kind of current and rated voltage of trip circuit (YAT)	V	~220
12		Kind of current and rated voltage of trip circuit from stand-alone supply (YAV)	V	~220
13		Trip current of trip circuits for layouts with bridging (YAA1, YAA2)	A	5
14	Necessary production of auxiliary circuits terminals	wiring with SSHR48P20EG2 plugs wiring for terminal row connection		
15	Necessary length of auxiliary circuits wiring from circuit-breaker frame to end of socket or to cable termination point (see table "Length of wiring" Annex E.5)			mm
Order of necessary equipment				
16	Number of ordered same-type circuit-breakers			5
17	Design (conditional) reference of circuit-breaker according to tech spec (or tech info)		BP1-10-20/630 U2	
Order of equipment supplied at extra charge				
18	Manually-operated closing device with generator		yes/no	no
19	Routine close cubicle with 12V/220V voltage converter		yes/no	no
20	Other additional equipment		Q-ty	-
21				
Full name, position of person responsible for order Chief Engineer, JSC ENERGY SUPPLY COMPANY 'Khmelnyskoblenenergo'				
Phones, fax 0 038-22-2-17-34 Date, signature _____				
Note: circuit-breakers of different parameters or different area of operations should have different questionnaires filled in				

TO BE COMPLETED BY MANUFACTURER				
Specification for execution of order				
22	Circuit-breaker	Circuit-breaker code	Q-ty	5
23		Design (conditional) reference		BP1-10-20/630 U2
24		General assembly diagram reference		NKAI.674152.043
25		Schematic circuit diagram		NKAI.670209.319 E3
Options				
	Name	Reference	Q-ty	
26				
27				
28				
Specification is made by: _____ Date, signature _____				

<i>Orig. Inv. No.</i>	<i>Sign. & date</i>	<i>Repl. inv. No.</i>	<i>Copy Inv. No.</i>	<i>Sign. & date</i>

Annex E.2

Questionnaire
to order vacuum circuit-breakers of series BP0, BP1
(strike out whichever does not apply)

TO BE COMPLETED BY CUSTOMER				
1	CUSTOMER			
2	Name of facility			
3	Reference number of cubicle where circuit-breaker will be installed			
Specification of Circuit-Breaker				
4	Parameters of main circuits	Rated voltage	kV	
5		Rated breaking capacity	kA	
6		Rated current	A	
7	Climatic modification and category of location according to GOST 15150-69		U2/T3	
8	Parameters of auxiliary circuits	Option of schematic circuit diagram according to tech spec (or tech info)		
9		Kind of current and rated voltage of electromagnet close coil circuit (YAC)		V
10		Kind of current and rated voltage of close circuit (KM)		V
11		Kind of current and rated voltage of trip circuit (YAT)		V
12		Kind of current and rated voltage of trip circuit from stand-alone supply (YAV)		V
13		Trip current of trip circuits for layouts with bridging (YAA1, YAA2)		A
14	Necessary production of auxiliary circuits terminals	wiring with SSHR48P20EG2 plugs wiring for terminal row connection		
15	Necessary length of auxiliary circuits wiring from circuit-breaker frame to end of socket or to cable termination point (see table "Length of wiring" Annex E.5)			mm
Order of necessary equipment				
16	Number of ordered same-type circuit-breakers			
17	Design (conditional) reference of circuit-breaker according to tech spec (or tech info)			
Order of equipment supplied at extra charge				
18	Manually-operated closing device with generator		yes/no	
19	Routine close cubicle with 12V/220V voltage converter		yes/no	
20	Other additional equipment		Q-ty	
21				
Full name, position of person responsible for order _____ Phones, fax _____ Date, signature _____				
Note: circuit-breakers of different parameters or different area of operations should have different questionnaires filled in				

TO BE COMPLETED BY MANUFACTURER				
Specification for execution of order				
22	Circuit-breaker	Circuit-breaker code	Q-ty	
23		Design (conditional) reference		
24		General assembly diagram reference		
25		Schematic circuit diagrams		
Options				
	Name	Reference	Q-ty	
26				
27				
28				
Specification is made by: _____ Date, signature _____				

<i>Orig. Inv. No.</i>	<i>Sign. & date</i>	<i>Repl. inv. No.</i>	<i>Copy Inv. No.</i>	<i>Sign. & date</i>						<i>Sheet</i> 45	
					<i>Cha</i>	<i>Sheet</i>	<i>Doc No.</i>	<i>Sign.</i>	<i>Date</i>	NKAI.670049.011 TI	

Annex E.3

Questionnaire (example how to fill in)
 order of BP2, BP3, BP6, BP6B, BP6K, BP35 circuit-breakers
 (strike out whichever does not apply)

TO BE COMPLETED BY CUSTOMER				
1	CUSTOMER	JSC ENERGY SUPPLY COMPANY 'Khmelnyskoblenenergo'		
2	Name of facility	"Yarmolyntsi" Substation		
3	Reference number of cubicle where circuit-breaker will be installed			
Specification of Circuit-Breaker				
4	Parameters of main circuits	Rated voltage	kV	10
5		Rated breaking capacity	kA	20
6		Rated current	A	1600
7	Climatic modification and category of location according to GOST 15150-69		U2/T3	U2
8	Parameters of auxiliary circuits	Option of schematic circuit diagram according to tech spec (or tech info)	Version 1	
9		Kind of current and rated voltage of electromagnet circuit (YA1)	V	~220
10		Kind of current and rated voltage of close circuit (KCC)	V	~220
11		Kind of current and rated voltage of trip circuit (KCT)	V	~220
12		Kind of current and rated voltage of trip circuit from stand-alone supply (KCV)	V	~220
13		Trip current of trip circuits for layouts with bridging (KCA).	A	5
14	Necessary production of auxiliary circuits terminals	wiring with SSHR48P20EG2 plugs (BP2, BP3, BP6, BP6B) wiring for terminal row connection (BP2, BP3, BP6) with row connection (BP35)		X
15	Necessary length of auxiliary circuits wiring from circuit-breaker frame to end of socket or to cable termination point (see table "Length of wiring" Annex E.5)		mm	640
16	Required type of circuit-breaker (for BP35 only) (unit mount or withdrawable)		-	
Order of necessary equipment				
17	Number of ordered same-type circuit-breakers			5
18	Design (conditional) reference of circuit-breaker according to tech spec (or tech info)		BP2-10-20/1600 U2	
Order of equipment supplied at extra charge				
19	Manually-operated closing device with generator (for BP2 only)		yes/no	no
20	Routine close cubicle with 12V/220V voltage converter		yes/no	no
21	Other additional equipment		Q-ty	-
Full name, position of person responsible for order Chief Engineer, JSC ENERGY SUPPLY COMPANY 'Khmelnyskoblenenergo'				
Phones, fax 0 038-22-2-17-34 Date, signature 27.11.2013				
Note: circuit-breakers of different parameters or different area of operations should have different questionnaires filled in				

TO BE COMPLETED BY MANUFACTURER				
Specification for execution of order				
22	Circuit-breaker	Circuit-breaker code	Q-ty	5
23		Design (conditional) reference	BP2-10-20/1600 U2	
24		General assembly diagram reference	NKAI.674152.007	
25		Schematic circuit diagram	NKAI.670209.319 E3	
Options				
	Name	Reference	Q-ty	
26				
27				
28				
Specification is made by: _____ Date, signature _____				

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Annex E.4

Questionnaire

order of BP2, BP3, BP6, BP6B, BP6K, BP35 circuit-breakers

(strike out whichever does not apply)

TO BE COMPLETED BY CUSTOMER

1	CUSTOMER			
2	Name of facility			
3	Reference number of cubicle where circuit-breaker will be installed			
Specification of Circuit-Breaker				
4	Parameters of main circuits	Rated voltage	kV	
5		Rated breaking capacity	kA	
6		Rated current	A	
7	Climatic modification and category of location according to GOST 15150-69		U2/T3	
8	Parameters of auxiliary circuits	Option of schematic circuit diagram according to tech spec (or tech info)		
9		Kind of current and rated voltage of electromagnet circuit (YA1)		V
10		Kind of current and rated voltage of close circuit (KCC)		V
11		Kind of current and rated voltage of trip circuit (KCT)		V
12		Kind of current and rated voltage of trip circuit from stand-alone supply (KCV)		V
13		Trip current of trip circuits for layouts with bridging (KCA).		A
14	Necessary production of auxiliary circuits terminals	wiring with SSHR48P20EG2 plugs (BP2, BP3, BP6, BP6B) wiring for terminal row connection (BP2, BP3, BP6) with row connection (BP35)		
15	Necessary length of auxiliary circuits wiring from circuit-breaker frame to end of socket or to cable termination point (see table "Length of wiring" Annex E.5)			mm
16	Required type of circuit-breaker (for BP35 only) (unit mount or withdrawable)			
Order of necessary equipment				
17	Number of ordered same-type circuit-breakers			
18	Design (conditional) reference of circuit-breaker according to tech spec (or tech info)			
Order of equipment supplied at extra charge				
19	Manually-operated closing device with generator (for BP2 only)		yes/no	
20	Routine close cubicle with 12V/220V voltage converter		yes/no	
21	Other additional equipment		Q-ty	
Full name, position of person responsible for order _____				
Phones, fax _____ Date, signature _____				
Note: circuit-breakers of different parameters or different area of operations should have different questionnaires filled in				

TO BE COMPLETED BY MANUFACTURER

Specification for execution of order

22	Circuit-breaker	Circuit-breaker code	Q-ty	
23		Design (conditional) reference		
24		General assembly diagram reference		
25		Schematic circuit diagram		
Options				
	Name	Reference	Q-ty	
26				
27				
28				
Specification is made by: _____ Date, signature _____				

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Annex E.5

for completion of para 15 of questionnaire of vacuum circuit-breakers of BP0, BP1, BP2, BP3, BP6, BP6B, BP6K and BP35 series

Series of circuit-breakers	Usability in cubicles/ Length of auxiliary circuits wiring (from circuit-breaker frame to end of socket or to cable termination point)							
	with SSHR48P20EG2-type plugs			with plug		without plugs for connection to terminal block		Weidmuller terminal block ZDU 2.5-2/3AN
				SSHR55P30E51	by Weidmuller			
BP0, BP1	KU-10C	KM-1F				Module		
	760 mm	1120 mm				260 mm		
BP2	KU-10C	KM-1F	KRU (switch gear)2-10			Module		
	640 mm	1120 mm	2320 mm			350 mm		
BP3	KU-10C	Module				Module		
	850 mm	2300 mm				220 mm		
BP6	KG-6					BP6K, modules		
	1550 mm					270 mm		
BP6B	KG-6							
	Not mentioned in the questionnaire							
BP6K				KX, KXXV				
				Not mentioned in the questionnaire				
withdrawable BP35					KU35 Not mentioned in the questionnaire			
Unit mount BP35								Terminal block is housed in frame.

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