

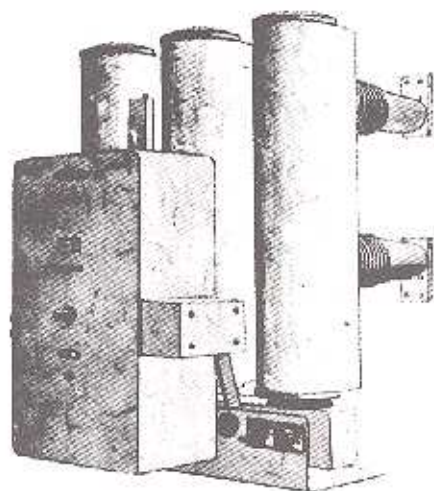
SF₆ CIRCUIT BREAKERS FOR INDOOR INSTALLATION

RATED VOLTAGE: 7,2 – 36 kV
RATED NORMAL CURRENT: 1250; 1600; 2000 A
RATED BREAKING CURRENT: 31,5 kA

TYPE SPP

9826 14 0119

ACCORDING TO JUS AND IEC STANDARDS AND RECOMMENDATIONS



DESCRIPTION

Circuit breakers, type SPP are apparatus intended for indoor installation. Sulphur hexafluoride (SF₆) gas is used as a medium for insulation and arc extinguishing. By operation principle they belong to a „puffer“ type of SF₆ circuit breakers, where gas stream for arc extinguishing is realized by compression and puffing of SF₆ gas during opening operation.

The circuit breakers are composed of three identical poles placed on a common housing incorporating a coupling leverage system. The housing is fixed on a metal chassis. One common operating mechanism is fixed on the chassis front side.

A cross-section of SPP circuit breaker pole is shown in the drawing. Each pole is composed of metal housing which incorporates the following:

- upper fixed main and arcing contacts,
- assembly of movable main and arcing contacts with insulating cylinder, piston for gas compression and nozzle
- lower fixed contacts
- bushings with suitable terminals

The connection between movable piston and coupling leverage system is realized by means of insulating lever. The coupling leverage system is connected to the motor-spring operating mechanism, type BNR-3LM. The common housing incorporates a molecular sieve absorbing moisture and non-recombined decomposition products of SF₆ gas.

Safety membrane, gas filling and exhaust valve, as well as two pressure switches are placed on external side of the common housing.

Each circuit breaker component has been fully analysed and tested thus obtaining high performances, long life and high reliability together with optimum solutions in design. A special attention has been paid to the selection of materials which are in an immediate contact with electric arc. Thus, the arcing contacts are made of sintered material on the basis of copper and tungsten, and the nozzle is made of polytetra-fluor-ethylene (Teflon).

Rated overpressure of SF₆ gas in the SPP circuit breakers at ambient temperature of 20°C is 3 bar for 36 kV c.b., and 2,5 bar for 7,2 – 24 kV c.b. 36 kV circuit breakers contain appr. 2,0 kg of gas, while circuit breakers for 7,2 – 24 kV contain about 1,0 kg of gas. High quality system of static and dynamic sealing makes gas leakage practically impossible (below 1% per year). However, if overpressure drops below 2,7 bar (for 36 kV c.b.), or below 2,2 bar (for 7,2 – 24 kV c.b.), pressure switch gives light or, if needed, also a sound signal. Overpressure drop below 2,3 bar (for 36 kV c.b.) or below 1,8 bar (for 7,2 – 24 kV c.b.) automatically causes opening operation of the circuit breaker with simultaneous locking of closing operation. Rated characteristics of the circuit breaker are guaranteed in overpressure range between 2,3 and 3,0 bar (for 36 kV c.b.) or 1,8 and 2,5 bar (for 7,2 – 24 kV c.b.). Possible refilling with SF₆ gas is done by a simple connection of gas cylinder to the filling valve.

OPERATING MECHANISM

Circuit breakers, type SPP are equipped with motor spring operating mechanism, type BNR-3LM. Circuit breaker closing is performed by means of energy accumulated in closing springs. These springs accumulate energy by charging with an universal electric motor (110, 220 V \approx), and the required time for charging is maximum 10 sec. In case of supply voltage failure of motor, closing springs can be charged manually. The energy accumulated in the charged springs for closing enables the following circuit breaker operations, without any need for springs recharging:

- starting from „OFF“ position:
CLOSING – OPENING
- starting from „ON“ position:
OPENING – CLOSING – OPENING

The operating mechanism has a possibility of quick automatic reclosing, and so the breaking capacity of the circuit breaker has been tested in rated operating sequence O-0,3s CO-15s-CO. The circuit breaker can be operated remotely or on the operating mechanism. The motor spring operating mechanism is equipped with:

- signalling switch with 4 „NO“ + 4 „NC“ signalling contacts
- parallel closing and opening releases (12, 24, 32, 48, 60, 110, 220 V AV or DC).

Upon Purchaser's request, it is possible to incorporate in addition 4 „NO“ + 4 „NC“ signalling contacts, parallel opening release, under-voltage release, operations counter, permanent heater, lock for mechanical interlocking of closing in the open position, antipumping relay and connector.

USE AND FEATURES

The circuit breakers, type SPP are intended for installation in the cubicles of distributive and industrial plants. They have been tested for breaking of short circuit currents, switching of single capacitor bank, back to back capacitor bank, cable charging current and small inductive currents and for operation in the out of phase conditions.

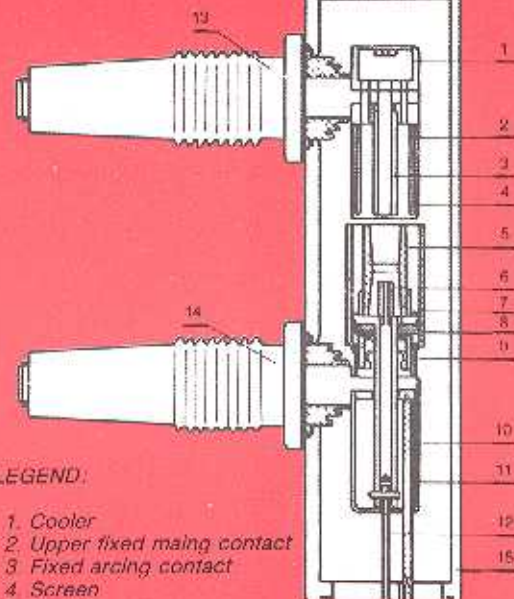
The tests have been performed in accordance with JUS and IEC Standards and Recommendations. The results are given in the Table of technical characteristics. Mechanical endurance test has been performed on these circuit breakers for 2000 operations. Electrical durability of the circuit breaker is such as to allow 15 – 20 breakings of rated short-circuit current, as well as 1500 breakings of rated normal current without revision. With regard to real conditions of networks, this practically means that these circuit breakers require no special maintenance. The circuit breakers are, in principle, intended for installation in normal climatic conditions (– 5°C up to +40°C) and altitudes up to 1000 m.

There is a possibility for installation of these circuit breakers at higher altitudes and under more severe conditions. In that case, the Manufacturer should be consulted.

The circuit breakers, type SPP are made in two basic variants:

- T – The circuit breaker intended for installation in the own cubicles, manufactured by „ENERGOINVEST“ – Factory of Transformer Stations and Switchgears. This design variant is featured by reduced dielectric distances adapted to the design of these adequate cubicle.
- A – The circuit breaker intended for general use with normal dielectric distances.

CROSS-SECTION OF
CIRCUIT BREAKER POLE



LEGEND:

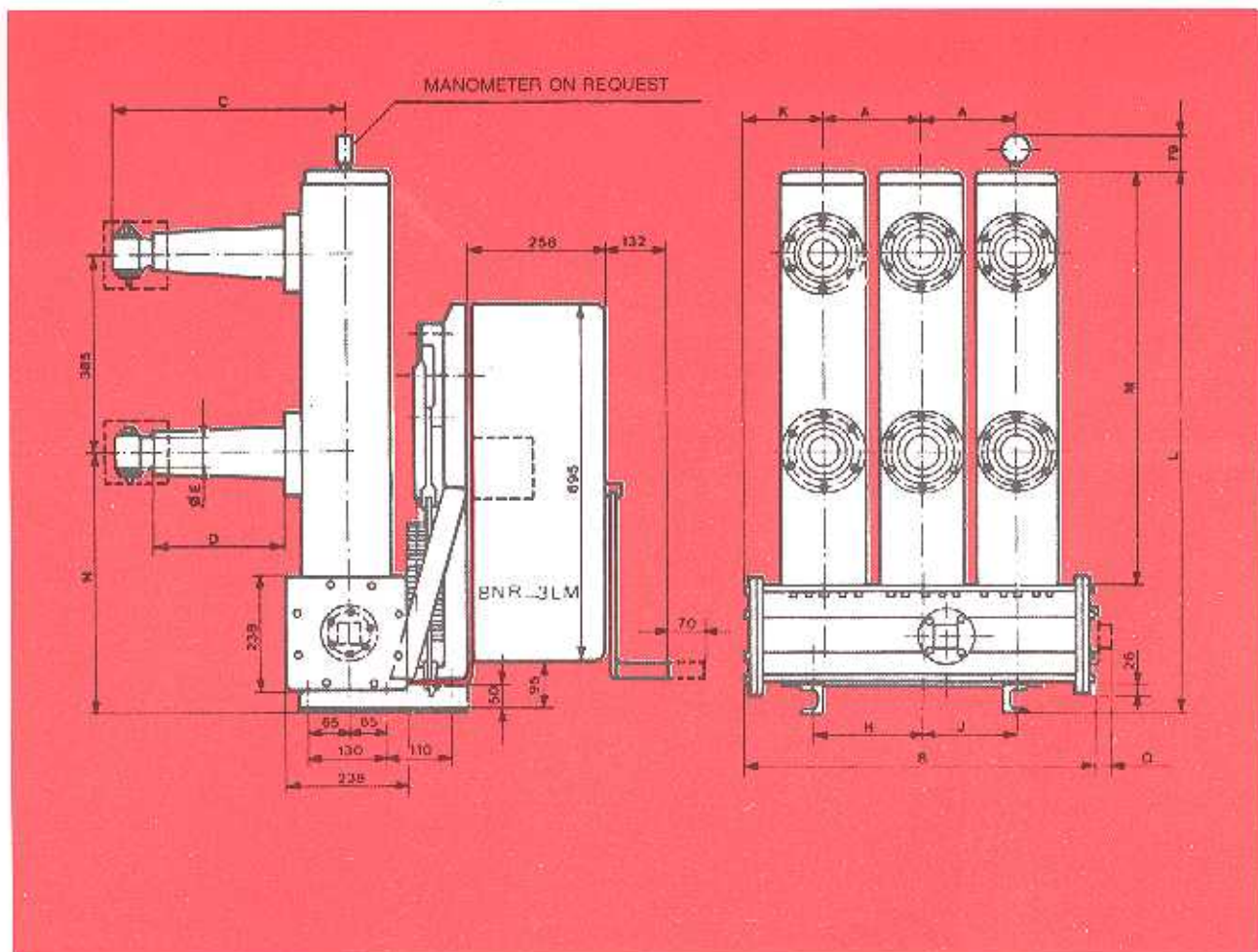
1. Cooler
2. Upper fixed main contact
3. Fixed arcing contact
4. Screen
5. Nozzle
6. Movable arcing contact
7. Lower movable contact with piston
8. Insulating cylinder
9. Lower fixed contact
10. Insulating spacer
11. Screen
12. Insulating lever
- 13., 14. Bushings
15. Pole housing

TABLE OF TECHNICAL CHARACTERISTICS

TYPE OF CIRCUIT BREAKER	Rated voltage [kV]	Rated normal current [A]	Rated frequency [Hz]	Rated breaking capacity [kA]	Rated operating sequence	Rated short-time current, 3 sec. [kA]	Rated small inductive breaking current [A]	Rated single capacitor breaking current [A]	Rated back to back capacitor breaking current [A]	Rated capacitor charging breaking current [A]	Rated lightning impulse withstand voltage [kV _{peak}]	Rated power frequency withstand voltage [kV]
SPP 7,2/31 – 12	7,2	1250	50–60	31,5	0 – 0,3 sec. – CO – 15 sec. – CO	31,5	5–15	700	400	10	60	20
SPP 7,2/31 – 16		1600										
SPP 7,2/31 – 20		2000										
SPP 12/31 – 12	12	1250										
SPP 12/31 – 16		1600										
SPP 12/31 – 20		2000										
SPP 24/31 – 12	24	1250										
SPP 24/31 – 16		1600										
SPP 24/31 – 20		2000										
SPP 36/31 – 12	36	1250										
SPP 36/31 – 16		1600										
SPP 36/31 – 20		2000										
										50	170	75

NOTE: When ordering please specify: circuit breaker type, rated voltage, rated current, breaking capacity (kA) at rated operating sequence, type of operating mechanism, motor voltage, number and type of signalling contacts, voltage of closing and opening releases.

MEASURING DRAWING OF THE AUTONOMOUS CIRCUIT BREAKERS (DESIGN VARIANT A)



CIRCUIT BREAKER TYPE	DIMENSIONS (mm)											
	A	B	C	D	ØE	H	J	K	L	M	N	O
SPP 7.2/31 - 12 A	185	630	315	155	24	225	185	139	1084	455	800	800
SPP 7.2/31 - 16 A	250	775	310	155	30	225	185	141	1084	455	800	800
SPP 7.2/31 - 20 A	250	775	310	155	56	225	185	141	1084	455	800	800
SPP 12/31 - 12 A	185	630	315	155	24	225	185	139	1084	455	800	800
SPP 12/31 - 16 A	250	775	310	155	30	225	185	141	1084	455	800	800
SPP 12/31 - 20 A	250	775	310	155	56	225	185	141	1084	455	800	800
SPP 24/31 - 12 A	250	775	415	255	24	225	185	141	1084	455	800	800
SPP 24/31 - 16 A	300	875	410	255	36	300	260	141	1084	455	800	800
SPP 24/31 - 20 A	300	875	410	255	56	300	260	141	1084	455	800	800
SPP 36/31 - 12 A	390	1075	550	364	24	300	260	141	1154	495	870	870
SPP 36/31 - 16 A	390	1075	545	364	36	300	260	141	1154	495	870	870
SPP 36/31 - 20 A	390	1075	545	364	56	300	260	141	1154	495	870	870

NOTE: The Manufacturer reserves the right for further improvements of the apparatus, so, the dimensions and technical characteristics given in this catalogue are not final and obligatory. Measuring drawing with final and obligatory dimensions is delivered by the Manufacturer upon Purchaser's request as a separate document enclosed with the offer. There is a possibility for adapting a circuit breaker according to a Purchaser's request. In that case, please contact the Manufacturer.