



# SF6 GAS CIRCUIT BREAKERS

Rated Voltage: 7,2 kV to 36 kV

Rated Current: 630 A to 2500 A

Rated Breaking Current: Up to 25 kA

Standard: IEC 56

### Why SF6?

Sulfur Hexafluoride (SF6) is an excellent gaseous dielectric for high voltage power applications. It has been used extensively in high voltage circuit breakers and other switchgears employed by the power industry. Applications for SF6 include gas insulated transmission lines and gas insulated power distributions. The combined electrical, physical, chemical and thermal properties offer many advantages when used in power switchgear. Some of the outstanding properties of SF6 which make it desirable to use in power applications are:

- ✓ High dielectric strength
- ✓ Unique arc-quenching ability
- ✓ Excellent thermal stability
- ✓ Good thermal conductivity

### **General Information**

Elimsan SF6 circuit breaker is equipped with independent poles each having its own gas. In all types of the circuit breaker, the gas pressure is 2 bars (absolute 3 bars).

Even if the pressure drops to 1 bar, there will not be any change in the breaking properties of the circuit breaker owing the superior features of SF6 and Elimsan's high safety factor for the poles. During arcing, the circuit breaker maintains a relatively low pressure (max 5 - 6 bars) inside the chamber and there will be no danger of explosion and spiling of the gas

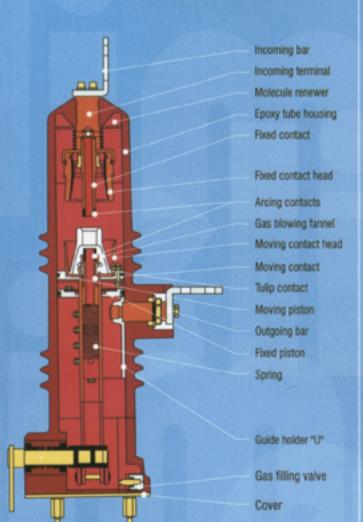
around, any leakage from the chamber will not create a problem since SF6 can undergo considerable decomposition, in which some of toxic products may stay inside the chamber in the form of white dust. If the poles are dismantled for maintenance, it needs special attention during removal of the parts of the pole. This type of maintenance should be carried out only by the experts of the manufacturer.

(According to DİSSAN Arcing Products and Safety Instruction for Working on SF6 Circuit Breakers).

### Operation of Circuit Breaker

In general, the circuit breakers consist of two main parts, the poles and the mechanism. The poles consist of contact and arcextinguishing devices. The mechanism is the part which opens or closes the contacts in the poles at the same time instantaneously (with max. 5 millisec. Tolerance). The closing and opening procedures are performed through springs which are charged by a servomotor and a driving lever. In the system, the closing springs are first charged. If "close" button is pressed the opening springs are charged while the contacts are closed. Thus, circuit breaker will be ready for opening. The mechanical operating cycle of the circuit breaker is (OPEN -3 Min CLOSE/OPEN-3 Min CLOSE/OPEN) or (OPEN-0.3 sec-CLOSE/OPEN-3 Min CLOSE/OPEN). The second cycle is valid when the circuit breaker is used with re-closing relay. In this event, after the closing operation, the closing springs are charged by the driving lever or by driving motor (if equipped). Thus, the circuit breaker will be ready for opening and re-closing.

### CROSS SECTION OF A 16 KA POLE AND PART NAMES



### INSIDE VIEW OF THE MECHANISM

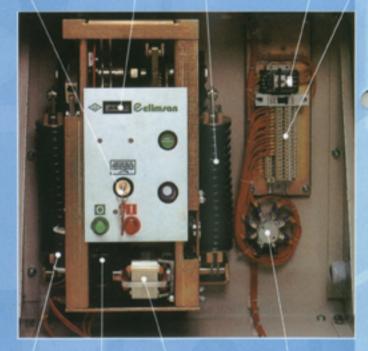
Antipumping relay

Closing spring

Operation counter

Terminals

Interlocking key



Opening coil

Closing coil Motor

Auxiliary switch

### Mechanical Life and

### Maintenance of mechanism

Elimsan "L" type breaker mechanism can perform 10.000 opening-closing operations without changing any component. The mechanical life of the circuit breaker is minimum 10.000 operations. However, it needs a periodical maintenance depending on its environment. In ideal working conditions, a lubrication once a year or after 1000 operations is sufficient. In dusty and damp environment, the mechanism should be lubricated at each 3-6 months period or after 250 - 500 operations.

Thin machine oil and grease with molybdenum must be used for lubricating. Because of mechanism is capable of operating between -5°C and + 40 °C it does not require a heater.

### **Auxiliary Switch**

The auxiliary switch which is mounted on the circuit breaker has 12 contacts. One of them is for antipumping circuit, four of them are allocated for opening and closing coils. The remaining

7 contacts are spare. Three of them are normally opened and four are normally closed. When it is necessary, the number of the contacts can be increased.

### Rapid automatic R-Closing

The circuit breaker opens in case of a short circuit failure, can be re-closed after a pre selected time by are-closing relay" assuming the fault is temporary. Thus, the Interruption of the supply for a long duration is prevented against temporary short circuits. But, if the fault lasts after re-closure, the protection relay will trip to open the circuit breaker again.

### What to be specified when ordering?

- 1. Rated voltage of the circuit breaker
- 2. Rated current of the circuit breaker
- Rated short circuit breaking current
- 4. Voltages of opening and closing coils
- 5. Motor supply voltage (if equipped)

### RANGE OF TYPES AND TECHNICAL FEATURES

	s s															
TYPE		EGB 1 20-06F	E08 1 20-12F	EGB 1 28-06F	EGB 1 28-12F	EGB 2 12-06F	EGB 2 12-12F	EGB 2 16-06F	EGB 2 16-12F	EC8 2 25-06F	EG8 2 25-12F	EC8 3 12-06F	EGB 3 12-12F	ECB 3 16-06F	E683 16-12F	25-125
Rated voltage	kV	7,2				12						17,5				
Rated lightning impulse withstand voltage 1,2/50 µs	kV	60				75						95				
Rated power frequency withstand voltage 1 min	kV	22				28						38				
Rated normal current	A	630	1250	630	1250	630	1250	630	1250	630	1250	630	1250	630 12		250
Rated short circuit breaking current	kA	20		28		12,5		16		25		12,5		16		25
Rated short circuit making current	kA	50		70		31,5		40		63		31,5		40		63
Rated cable-charging breaking current	Α	10				25						31,5				
DC component	×	30 31														
Rated no-load transformer breaking current	A	20														
Rated single capacitor bank breaking current	A	500														
Rated operating sequence		0 - 0.3 s - CO - 3 min CO / CO - 15 s - CO														

			SL SL						\$						
TIPE		EGB 4 12-12F	EGB 4 15-06F	EG8 4 16-12F	EGS 4 20-12F	EGB 5 08-06F	EGB 5 08-12F	EGB 5 12-06F	EGB 5 12-12F	EGB 5 16-06F	EGB 5 16-12F	EGB 5 25-12F	EGB 5 25-16F	EGB 5 25-25F	
W			24							36				VIII.	
kV	1		125		-	170									
KV	50					70									
A	630	1250	630 1250		630	1250	630	1250	630	12	250	1600	2500		
kA	12	,5	16		20	8		12,5		16		25			
kA	31,5		40		50	20		31,5		40		63			
A	31,5					50									
%	32														
A	20														
A	500														
	0 - 0.3 s - C0 - 3 min C0 / C0 - 15 s - C0														
	KV AV kA kA	KV KV AV 630 KA 12 KA 31 A	KY KY KY KY KY KA 630 1250 KA 12,5 KA 31,5 A	NY   24   125	NY   24   125   16   17   17   17   17   17   17   17	NY	No	NY							

## Closing and Opening Operation Of the Circuit Breaker

When manual or motor -drive is used the circuit breaker will be ready to close. The closure can be made by pressing the closing button located on the circuit breaker. It is recommended to close it via a remote control system from the viewpoint of operation security. The opening can be performed either by opening button or remote-controlled opening coil. In case of a fault the relay signal actuates the opening coil and circuit breaker opens. (This is mechanically a primary protection system). In addition, there is an anti-pumping relay for protecting the re-closing and opening of the circuit breaker more than the cycle, to avert the possible trouble the remote closing button.

### Commissioning

The outer surfaces of epoxy insulating tubes of the poles are wiped out with a clean and dry cloth. The wirings and connections of the auxiliary circuit are carefully examined. The DC voltage is checked to see whether it is suitable for coil and motor or not (if equipped). The opening-closing coils are operated 15-20 times and the correctness of the relay circuit is checked before energizing the circuit breaker. The circuit breaker is mounted through its anchoring shoes and two M12 bolts. It should not be shifted its place during operation. No excessive load should be exerted to the poles and the connection must be made by flexible cables if possible. The incoming and outgoing contacts must have clean surfaces and their contact resistances must be minimum. When connecting the circuit breaker to protection system and auxiliary

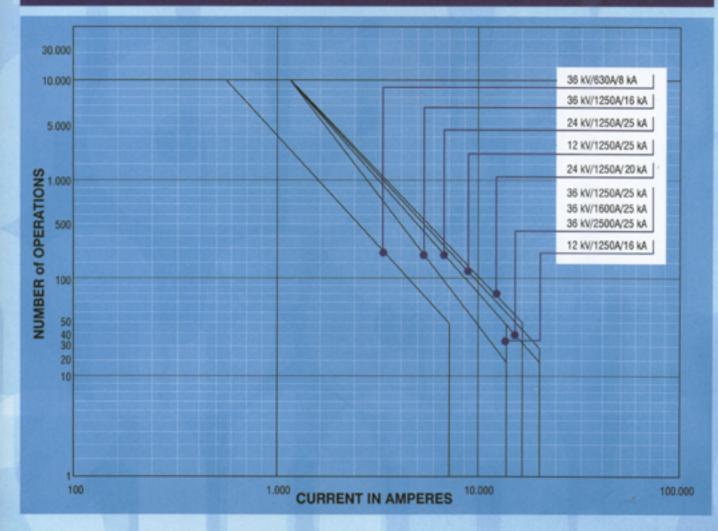
supply, the cable cross sections should be according to the table given. The circuit breaker must be grounded through at least 16 mm2 steel tape (by cable shoe). After all, the following procedure must be performed:

- 1. The isolator of circuit breaker is opened,
- The circuit breaker is prepared for closing operation by driving mechanism,
- 3. The isolator of circuit breaker is firmly closed,
- The closing command is given to the circuit breaker.

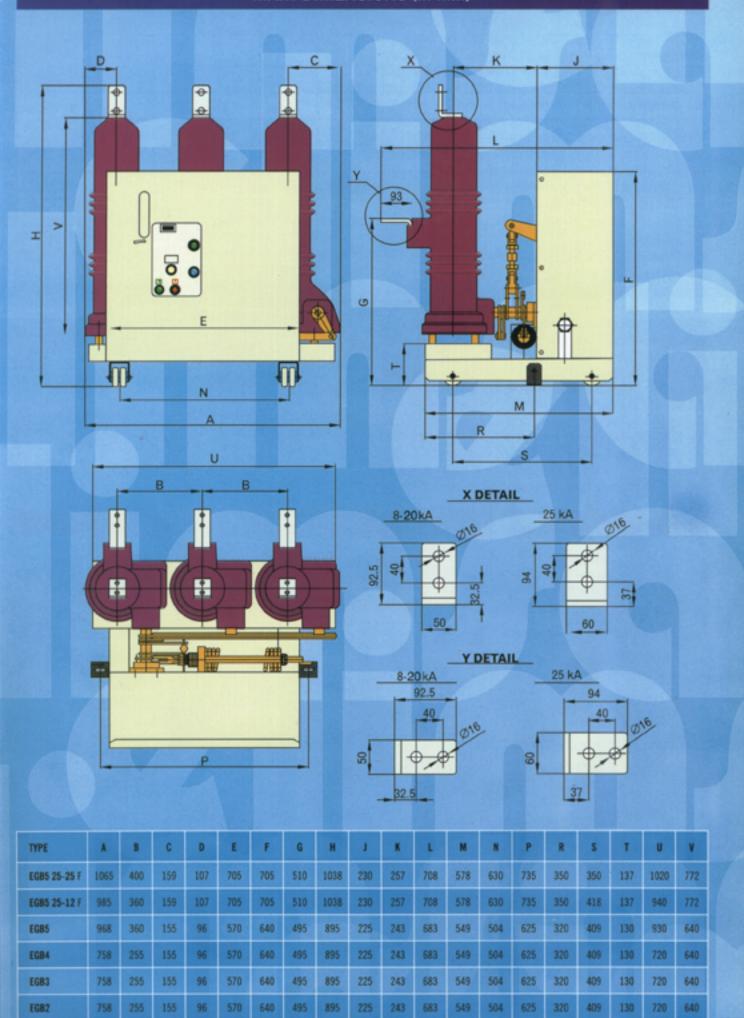
### The Maintenance Of Circuit Breaker During Operation

Normally, minimum once a year or after 500 operations, the circuit breaker must be maintained. During maintenance, the moving parts of the mechanism must be lubricated carefully. The insulating parts are wiped out by a clean and dry cloth. When maintaining, the circuit breaker should be open and high voltage sides must be grounded. The auxiliary supply circuit must also be disconnected. On saline areas near the sea coast, the insulating parts of the circuit breaker must be carefully cleaned, at maximum two months period. If no cleaning, the microscopic salt particles drawn by the wind from the sea, will make conductive layers on the insulating surfaces and may cause surface flash-overs. Before the beginning of maintenance firstly the circuit breaker and then isolator is opened and grounded carefully. The maintenance of circuit breaker must be done after checking the open position of isolator contacts by naked eye.

### **ELECTRICAL LIFE OF A SF6 GAS CIRCUIT BREAKER POLE**

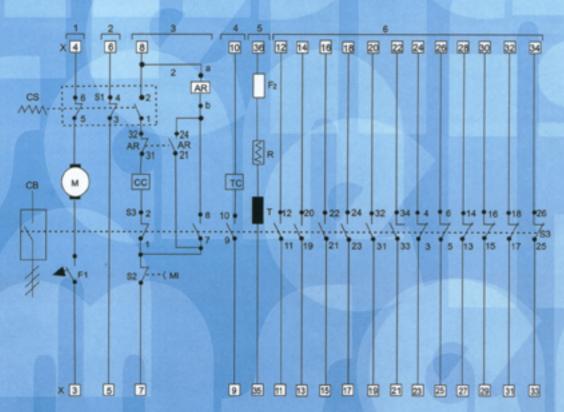


### MAIN DIMENSIONS (in mm)



EG81

### **ELECTRICAL CONNECTION SCHEMA**



### LEGEND

- 1- Spring charging motor circuit
- 2- Signal for the spring release
- 3- Closing and antipumping circuit
- 4- Tripping circuit
- 5- Heater circuit
- 6- Auxiliary contacts (60+6C)
- MI: Mechanical Interlocking
- TC: Tripping Coil
- CC: Closing Coil
- CS: Closing Spring
- CB: Circuit Breaker
- **AR: Antipumping Relay** M: Motor for spring charcing
- S1: Limit Switch
- \$2: Limit Switch for electrical interlocking
- \$3: Auxiliary Switch (80+8C)
- F1: Automatic cut-out
- X: Terminal Board
- R: Heater resistance
- T: Thermostate adjustable
- F2: Fuse

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### MANUFACTURER:

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