

SF6 gas Circuit breakers



Rated Voltage : 7,2 kV to 36 kV
Rated Current : 630 A to 2500 A
Rated Breaking Current: 16 to 25 kA
Standard : IEC 60056

 **elimson**
THE PIONEER OF SWITCHGEAR TECHNOLOGY

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 switchgears. Some of the outstanding properties of SF₆ making it desirable to use in power applications are:

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

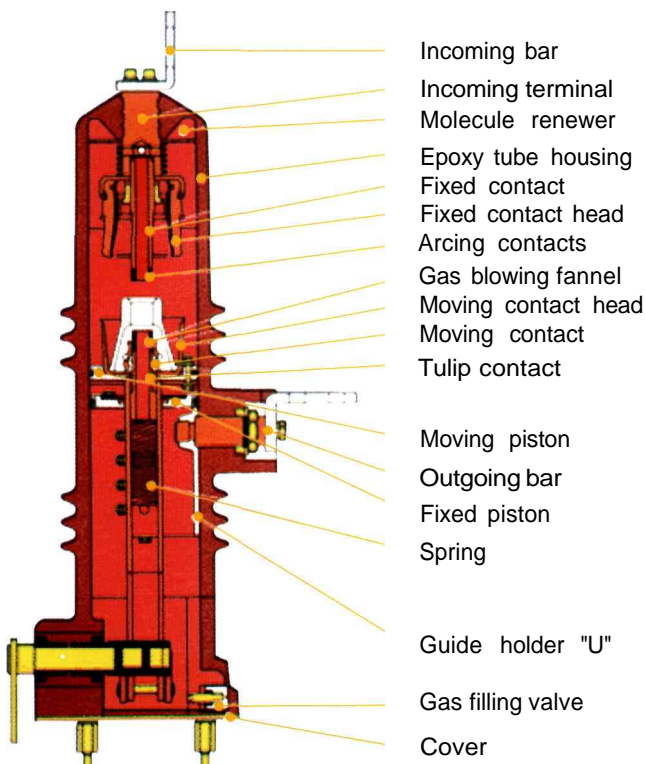
General Information

Elimsan SF₆ circuit breaker is equipped with separated poles each having its own gas. In all types of the circuit breakers, 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 due to 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 spilling 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 ELIMSAN Arcing Products and Safety Instruction for Working on SF₆ Circuit Breakers)

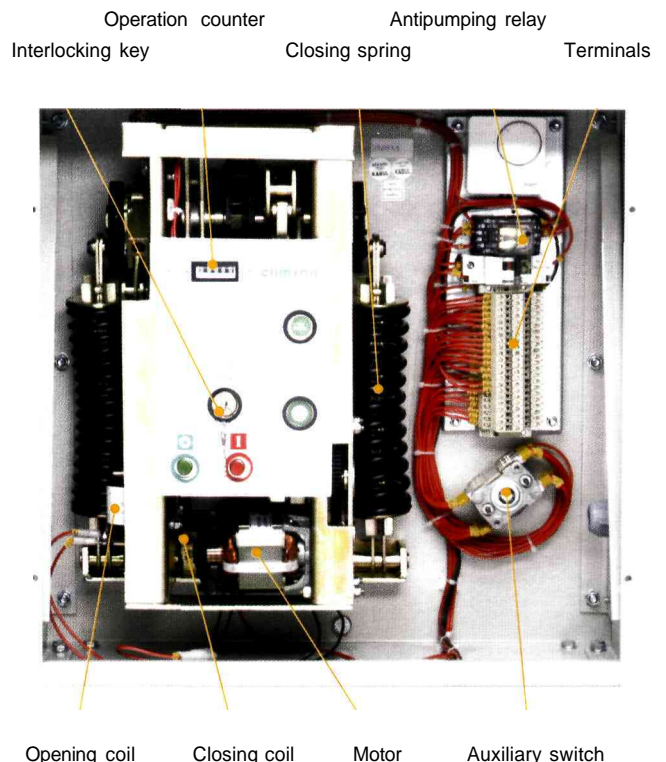
Operation of Circuit Breaker

In general, the circuit breakers consist of two main parts, the poles and the mechanism. The poles consist of contact and arc-extinguishing devices. The mechanism is the part to open or close the contacts in the poles at the same time instantaneously (with max. 5 milisec. 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 get charged while the contacts get 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 that case, 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



Mechanical Life and Maintenance of The Mechanism

Elimsan 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, lubrication once a year or after every 1000 operations is sufficient. In dusty and damp environment, the mechanism should be lubricated once every 3 - 6 months or after every 250 - 500 operations.

Thin machine oil and grease with molybdenum must be used for lubricating. Owing to mechanism's capability of operating between -5°C and + 40 °C, it does not require a heater.

Auxiliary Switch

The auxiliary switch 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 Reclosing

The circuit breaker which opens due to a short circuit failure, can be re-closed automatically after a pre selected time by arc closing relay, assuming the fault is temporary. Thus, we avoid long time power loss in case of temporary short circuits. But, if the fault lasts after re-closure, the protection relay will trip to open the circuit breaker again.

What to Specify on The Order

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

RANGE OF TYPES AND TECHNICAL FEATURES

TYPE		S																											
		EGB 1 20-06F		EGB 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		EGB 2 25-06F		EGB 2 25-12F		EGB 3 12-06F		EGB 3 12-12F		EGB 3 16-06F		EGB 3 16-12F	
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	1250	630	1250	630	1250	630	1250	630	1250	630	1250	630	1250	630	1250
Rated short circuit breaking current	kA	20		28		12,5		16		25		12,5		16		25		12,5		16		25							
Rated short circuit making current	kA	50		70		31,5		40		63		31,5		40		63		31,5		40		63							
Rated cable-charging breaking current	A	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																											

TYPE		SL						S						LM															
		EGB 4 12-06F		EGB 4 12-12F		EGB 4 16-06F		EGB 4 16-12F		EGB 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	
Rated voltage	kV	24						36																					
Rated lightning impulse withstand voltage 1,2/50 μs	kV	125						170																					
Rated power frequency withstand voltage 1 min	kV	50						70																					
Rated normal current	A	630	1250	630	1250	630	1250	630	1250	630	1250	630	1250	630	1250	1600	2500												
Rated short circuit breaking current	kA	12,5		16		20		8		12,5		16		25															
Rated short circuit making current	kA	31,5		40		50		20		31,5		40		63															
Rated cable-charging breaking current	A	31,5						50																					
DC component	%							32																					
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																											

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 actuated pressing the closing button located on the circuit breaker. It is recommended to close it using remote control system for secure operations. 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 preventing the re-closing and opening of the circuit breaker more than one cycle (O - C - O) and for preventing possible troubles created by remote closing button.

Commissioning

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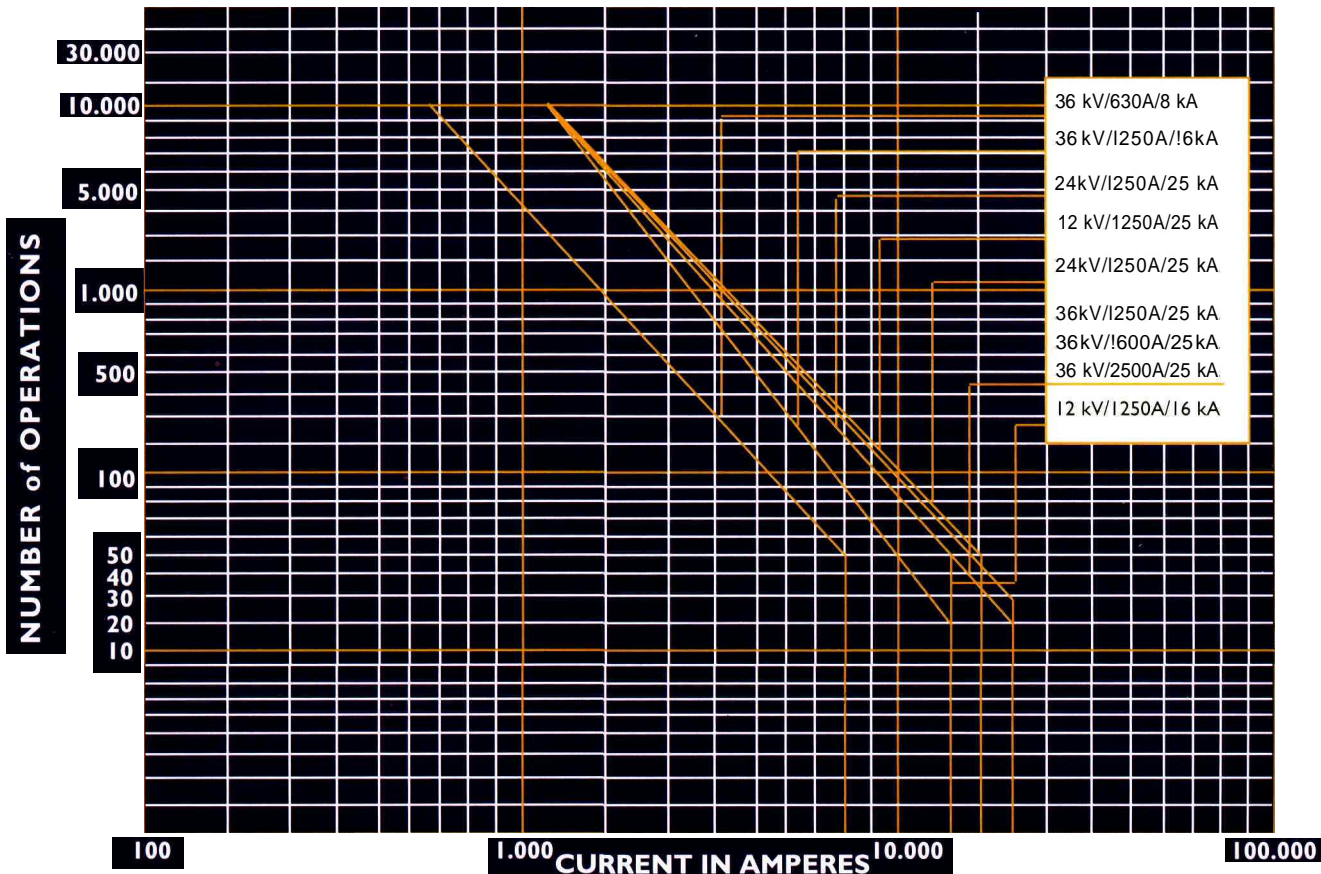
The outer surfaces of epoxy insulating tubes of the poles are to be wiped out with a clean and dry cloth. The wiring and connections of the auxiliary circuit are to be carefully examined. DC voltage should be checked to see whether it is suitable for coil and motor or not (if equipped). The opening-closing coils are to be operated 15-20 times and the accuracy of the relay circuit is to be checked before energizing the circuit breaker. The circuit breaker is to be mounted with two M12 bolts through its anchoring shoes. It should not move during operation. No excessive load should be exerted to the poles and if possible flexible cables should be used. The incoming and outgoing contacts must have clean surfaces and their contact resistance should be as low as possible. 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 mm steel tape (by cable shoe). After all, the following procedure must be performed:

1. Open the isolator of circuit breaker,
2. Prepare the circuit breaker for closing operation by driving mechanism,
3. Close the isolator of circuit breaker firmly,
4. Send the closing signal to the circuit breaker,

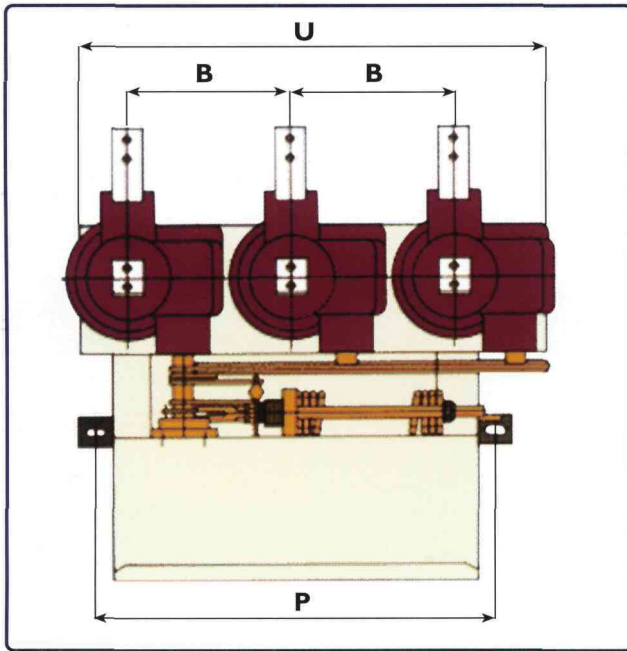
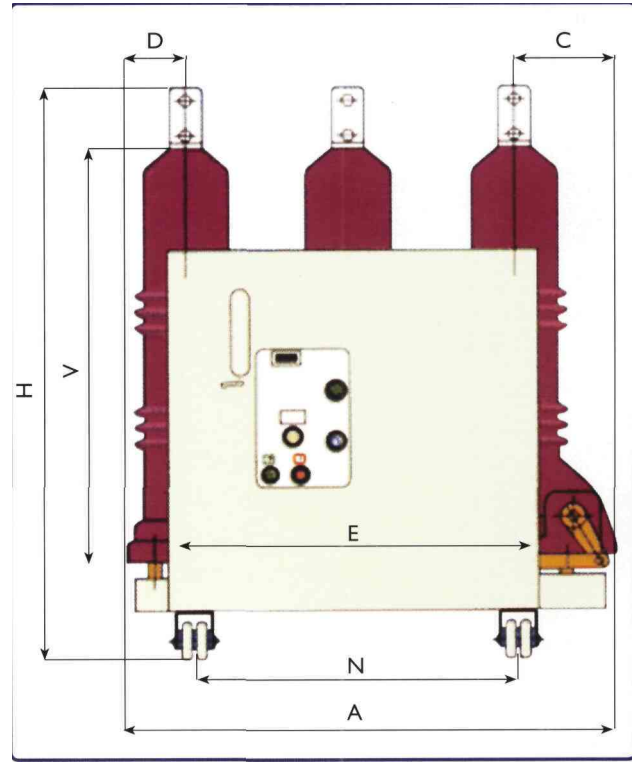
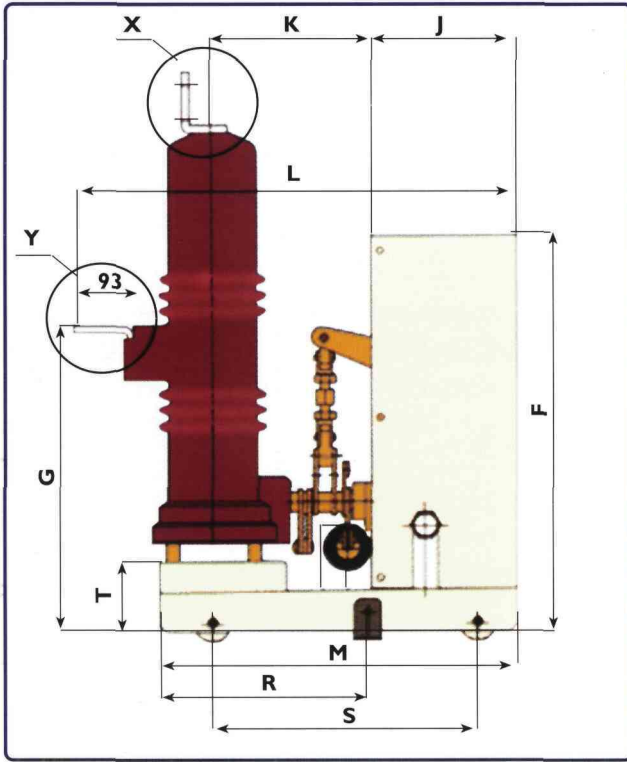
The Maintenance Of Circuit Breaker During Operation

Normally, at least once a year or after every 500 operations, the circuit breaker must be maintained. During maintenance, the moving parts of the mechanism must be lubricated carefully. The insulating parts are to be wiped out by a clean and dry cloth. When maintaining, the circuit breaker should be open and high voltage sides must be grounded. Auxiliary power supply should also be disconnected. On saline areas near seaside, the insulating parts of the circuit breaker must be carefully cleaned, at least once every two months. If not, the microscopic salt particles drawn by wind from the sea will create conductive layers on the insulating surfaces and may cause surface flashover. Before maintenance, first circuit breaker, then isolator should be opened and grounded carefully. The maintenance of circuit breaker must be done after checking the open position of isolator contacts by eye.

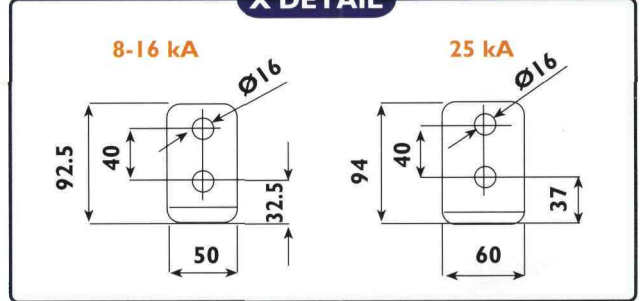
ELECTRICAL LIFE OF A SF6 GAS CIRCUIT BREAKER POLE



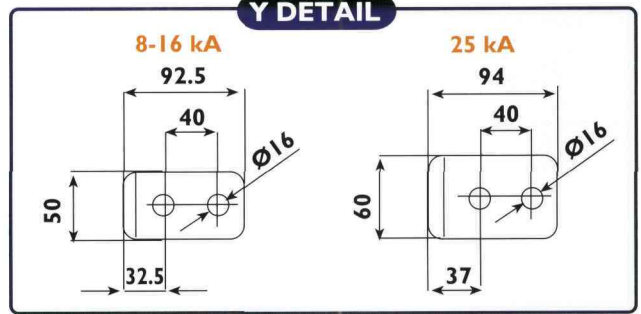
MAIN DIMENSIONS (in mm)



X DETAIL

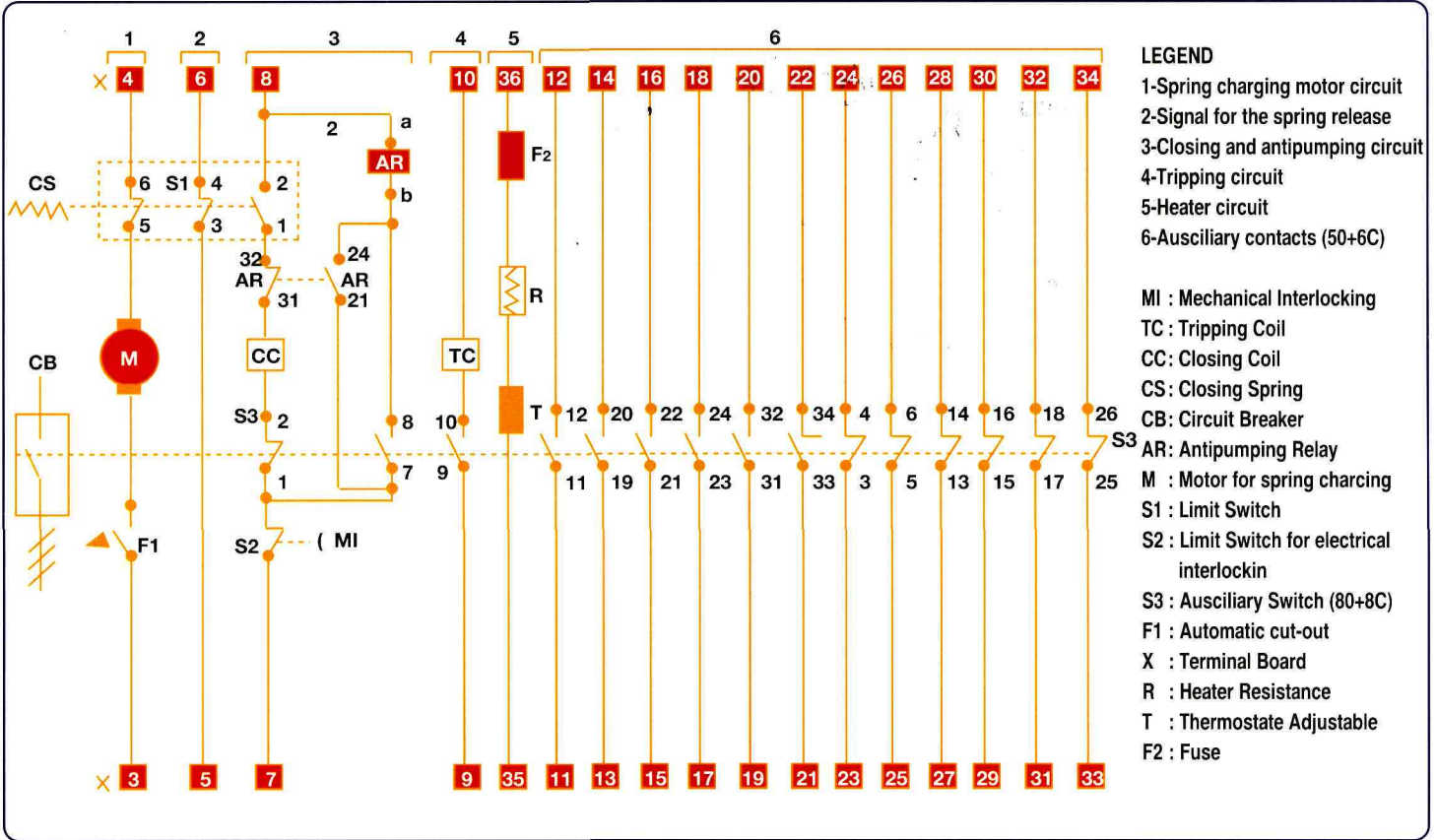


Y DETAIL



TYPE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	U	Y
EGB5 25-25 F	1065	400	159	107	705	705	510	1038	230	257	708	578	630	735	350	350	137	1020	772
EGB5 25-12 F	985	360	159	107	705	705	510	1038	230	257	708	578	630	735	350	418	137	940	772
EGB5	968	360	155	96	570	640	495	895	225	243	683	549	504	625	320	409	130	930	640
EGB4	758	255	155	96	570	640	495	895	225	243	683	549	504	625	320	409	130	720	640
EGB3	758	255	155	96	570	640	495	895	225	243	683	549	504	625	320	409	130	720	640
EGB2	758	255	155	96	570	640	495	895	225	243	683	549	504	625	320	409	130	720	640
EGB1	758	255	155	96	570	640	495	895	225	243	683	549	504	625	320	409	130	720	640

ELECTRICAL CONNECTION DIAGRAM



ELIMSAN Electro-mechanic plant has been built on 550.000m² area and is one of the biggest companies all over the world which satisfies all the requirements placed on power plants and distribution systems.

ELIMSAN has a very developed computer controlled high voltage test laboratory, and its products are manufactured with CMC controlled machines under convenient ISO 9001 quality standards & ISO 14000 environmental standards.

ELIMSAN is the symbol of contemporary and reliability for power plants and distribution systems.

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