



TYPE FK OIL CIRCUIT BREAKERS

HISTORICAL BACKGROUND

General Electric is continually developing and improving interrupting technology methods to assure circuit breaker users the correct circuit breaker technology for each application. The first installation of an "oil switch" was made in a New Jersey oil refinery. That first "switch" was the forerunner of today's modern line of power circuit breakers.

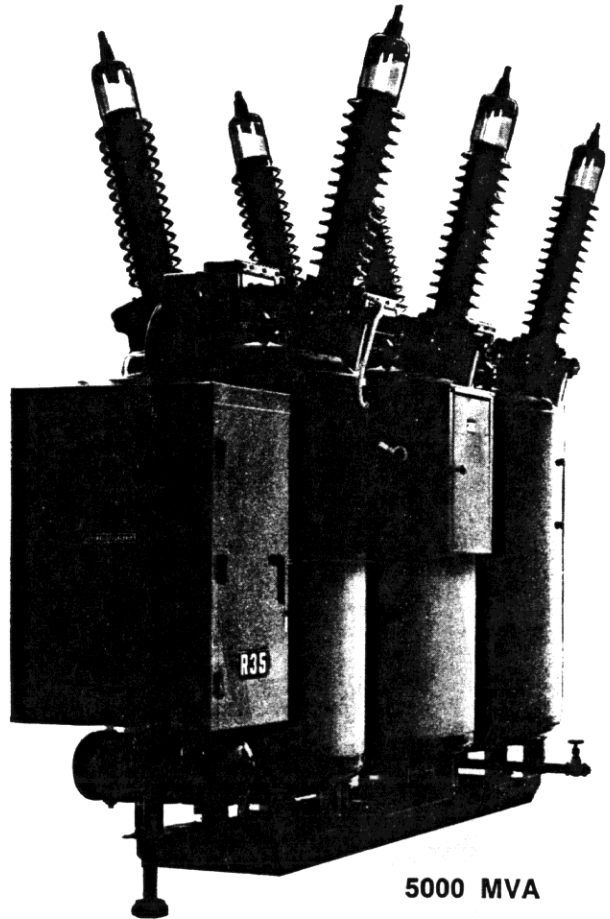
Improved designs and increased oil circuit breaker capacities by General Electric since that time have been made to keep pace with the ever-increasing demands of today's growing utility requirements.

Laboratory testing, extensive field tests, and experience have proven the adequacy of GE designs. For example, the multi-break interrupter, heart of the FK breaker, has been subjected to extensive laboratory and field tests to prove its ability to perform under varied operating conditions. Fast interruption keeps arcs short. These shorter arc lengths mean less oil deterioration, less arcing waste products, and less contact erosion. This results in longer intervals between service inspections.

Factory assembled GE FK breakers are shipped with all components in place. You only need to position the breaker and make necessary service preparations. These quality features mean added safety for your electrical system.

This power circuit breaker has provided outstanding service for many years. No other circuit breaker of one basic design has recorded as much successful field experience.

Installations in almost every state in the country as well as many foreign countries underscore the design superiority of these circuit breakers and their highly dependable performance.



5000 MVA

Nearly 20 years of experience make these FK breakers completely proven for your circuit protection needs.

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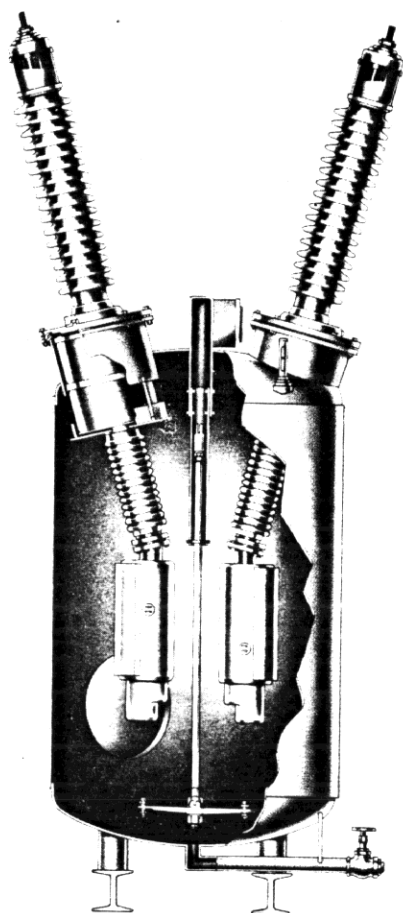
GENERAL FEATURES

Type FK Oil Circuit Breakers rated 5000 MVA feature the same basic oil breaker design that has been experience-proven by nearly 30 years of service.

Consistent 3-cycle interruption of fault currents to 5000 MVA is assured with multi-break interrupters. Use-tested, the interrupter is designed to withstand repeated, severe short-circuit currents.

Easy access to inside the breaker is made possible by a large manhole—speeding and easing infrequent inspection and maintenance. All internal breaker components can be removed through this extra large manhole. Float-type oil gages in each breaker unit indicate tank oil levels.

Easy breaker installation is facilitated by sturdy unit base mounting.



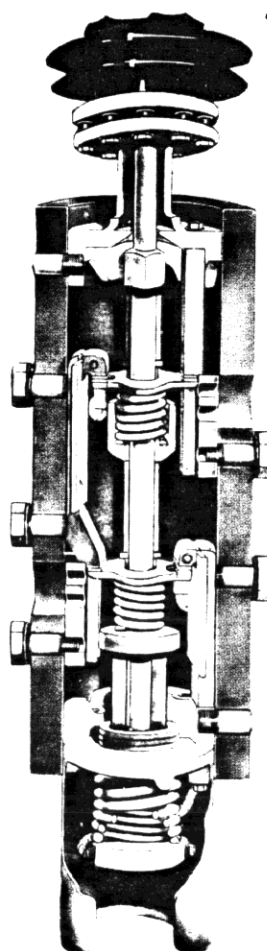
5000 MVA

Large clearances assure operating reliability with these FK Oil Circuit Breakers.

INTERRUPTERS

General Electric Type FK Oil Circuit Breakers rated 5000 MVA are equipped with two performance-proven oil-blast interrupters per phase. For optimum reliability, each interrupter is resistor-shunted so that interrupting duty is equally divided between the two units. Of relatively low ohmic value, the resistors help modify the rate of rise and limit the recovery voltage when switching capacitive currents.

Two sets of series contacts operate simultaneously in each interrupter assembly. These contacts provide the dual function of current carrying and current interruption. Within the arcing zone of each set of contacts is an insulation structure which directs oil flow into the arc to obtain maximum utilization of the arc generated pressure.



5000 MVA

FK multi-break interrupter.

Here's how the interrupters operate to assure consistent fault protection: First an arc is drawn between each of the internal moving contact rods and an arcing tip on one of the stationary fingers. The pressure generated by the arc forces clean oil past the arcing area, at the same time forcing the arc into the baffle structure in the direction of the port openings.

The arc products are then carried away from the contacts and out of the interrupter. Thus, by rapidly cooling and lengthening the arc, the arc's resistance is increased until—at an early current zero—the arc cannot re-establish itself. Interruption thus takes place when the dielectric strength of the gap prevents re-establishing the arc by the recovery voltage.

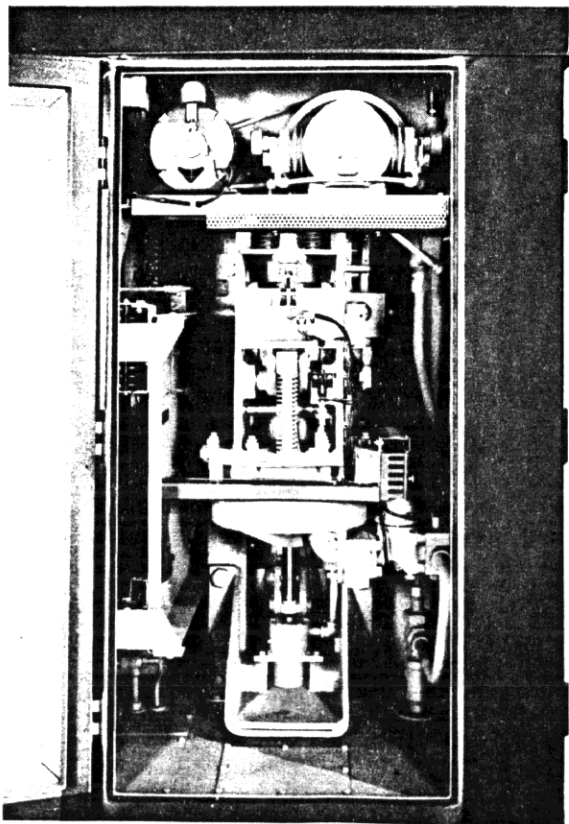
PNEUMATIC OPERATOR

General Electric's Type MA-13 pneumatic mechanism is mechanically and electrically trip-free and designed specifically for high-speed operation.

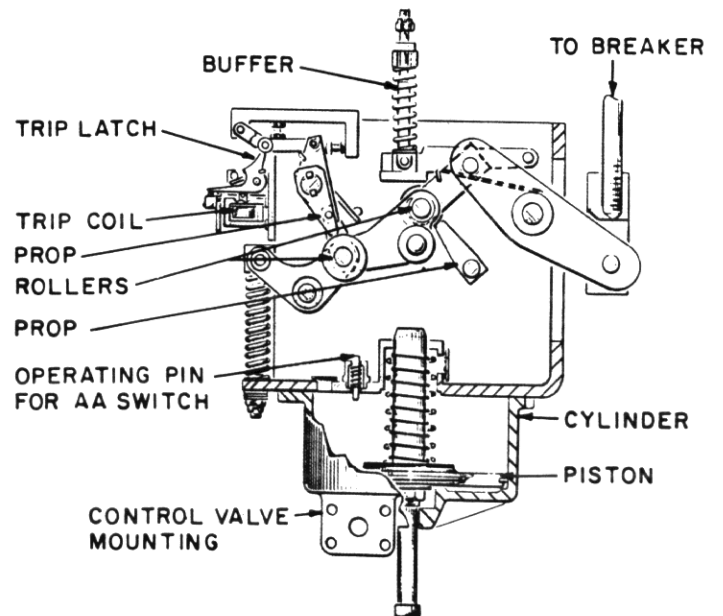
The MA-13 will be used on all FK 5000 MVA breakers.

All working parts possess an adequate margin of strength for safety and durability.

These mechanisms assure high-speed, dependable performances and operating economy.



The mechanically trip-free Type MA-13 pneumatic mechanism is shown in the front view.

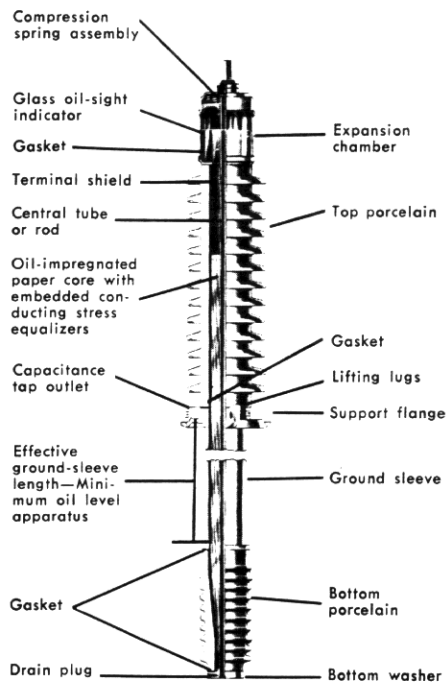


Basic design of MA-13 pneumatic mechanism is shown in this sectional view.

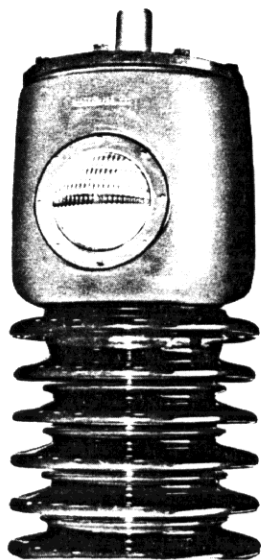
INSULATORS-BUSHINGS

The basic design principle of GE's Type U bushing is the proper combination of voltage stress equalizers and oil-impregnated paper on a central metal tube. This produces a core of high dielectric strength and makes possible the smaller diameter and lighter weight of the bushing.

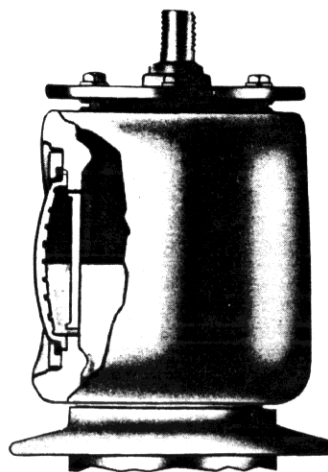
The bushing porcelains, along with a metal expansion chamber and bottom washer, are held in position by center clamping. This construction provides an oil-tight enclosure for the core and places the upper and lower porcelain parts under compressive stress where porcelain is strongest. The bushing is kept pressure-tight and moisture-proof by specially compounded, synthetic rubber gaskets.



Design features of the glass-top bushing used on all 121- and 145-kV oil circuit breakers are shown in this cutaway.



Top of bushing shows expansion chamber and the leak-proof, prismatic oil-level indicator of the bushing used in 169-kV oil circuit breaker.



This cutaway view shows the prismatic oil-level indicator of the bushing used in 169-kV oil circuit breakers.

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RATINGS

The large volume of transmission line oil-filled

breakers are designated Type FK. These are available in 121, 145, and 169 KV, 5000 MVA interrupting capacity.

Breaker Type			Rated Values						Related Required Capabilities				Total Oil Gallons Required	Net Wt. Incl. Oil in Lbs	Shipping Wt. Less Oil in Lbs
	Voltage		Insulation Level		Current		Inter-rupting Time Cycles	Nominal 3-phase MVA Class	Max. kV Divided by K kV, rms	Current Values					
	Max kV rms	Range Factor K	Withstand Test Voltage		Cont. Current at 60 Hertz Amp, rms	Short-Circuit Current (At Rated Max kV) Ka, rms				Max. Symmetrical Interrupting Capability	3-Sec. Short-Time Current Carrying Capability	Closing and Latching Capability 1.6K Times Rated Short-Circuit Current Ka, rms			
			Low Frequency kV, rms	Impulse kV, Crest											
FK-121-22000	121	1.10	260	550	1200	22	3	5000	110	24	24	39	1740	27125	14125
FK-145-18000	145	1.21	310	650	1200	18	3	5000	120	22	22	35	2400	34275	17400
FK-169-16000	169	1.13	365	750	1200	16	3	5000	150	18	18	29	3135	44825	21498

§ Net weight of oil is 7.45 lb per gallon; the shipping weight, in drums, is 9 lb per gallon.

NOTES ON INSTALLATION

The Type FK-121 oil blast circuit breakers are covered by specific instructions which describe erection and checkout procedures. These are high voltage and heavy duty equipments. In addition to the electrical safety requirements for work on a unit such as clearance of the power circuit and grounding of the breaker bushings, it should be noted that inspection and checking of adjustment require entry into the breaker tanks. It is important that precautions be established so that the per-

sonnel in the tank will not experience either the sudden movement of the operating rod resulting from tripping of the breaker mechanism or from closing of the breaker mechanism. Normal inspection on breakers of this class utilize a travel curve to obtain the pertinent data on the breaker close and trip operations. These curves are really a part of the movement of the breaker vertical operating rod against time. The normal method of obtaining the skill in making the adjustment checks and in taking the travel recorder curves on breakers in this class is to work with an experienced field engineer.