

INDOOR OIL CIRCUIT BREAKERS—TYPE F-100, are compact breakers of moderate ratings for indoor service in generating stations and industrial plants. Standard ratings include:

VOLTAGE—7.2 kv
CURRENT—600, 1200, and 2000 amperes
INTERRUPTING RATING—100 mva
INTERRUPTING TIME—8 cycles

These breakers are of three-pole, single-throw design for remote control operation by means of a solenoid operating mechanism

or a manually-operated coverplate containing the latch and necessary trip coils. Single tank of rectangular shape makes this breaker very small in size for its rating. This usually permits it to be installed in locations occupied by breakers of lower ratings.

Floor-mounting welded steel frame supports the breaker at proper height for easy maintenance. Without this frame the breaker can be readily mounted in cell structures or can be adapted for mounting in metal-clad switchgear.

WESTINGHOUSE SPECIAL FEATURES

1

DE-ION GRID ARC CONTROL reduces fault clearance time, contact burning, and oil deterioration, with resultant lower maintenance costs.

3

CONDENSER BUSHINGS, made up of alternate layers of metal foil and Micarta® insulation, provide uniform voltage stress, light weight, and high mechanical strength.

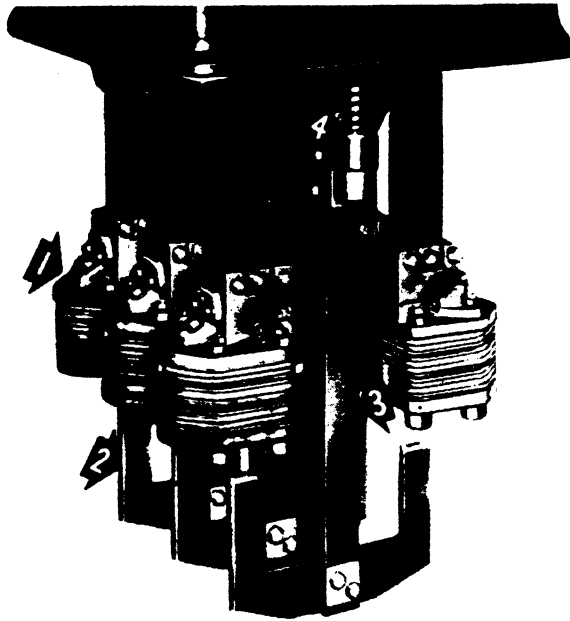
2

SINGLE TANK CONSTRUCTION reduces size and usually allows installation of larger breaker ratings in space available.

4

STEEL FRAME MOUNTING and shipment as a complete unit after factory testing simplifies installation.

DE-ION GRID ARC EXTINCTION



600-ampere De-ion grid and contact assembly.

1 DE-ION GRIDS

De-ion grids utilize the de-ionizing effect of the gases produced by the arc during interrupting to provide efficient arc extinction. The grids, supported from the terminal bushings, consist of a series of insulating and magnetic plates with vents which direct the arc laterally into oil pockets. The arc vaporizes the oil, forcing the un-ionized

gases back through the arc stream to de-ionize the arc path and extinguish the arc in minimum time and with minimum oil deterioration. This reduces arc energy, tank pressure, contact burning, and breaker maintenance.

2 CONTACTS

The 600-ampere breaker has a blade-type moving contact that engages with fingers on the stationary contact. These contacts have sufficient contact area and pressure to keep operating temperatures within safe limits. Special alloy tips on the moving elements and arcing horns on the stationary contacts protect the main contacts.

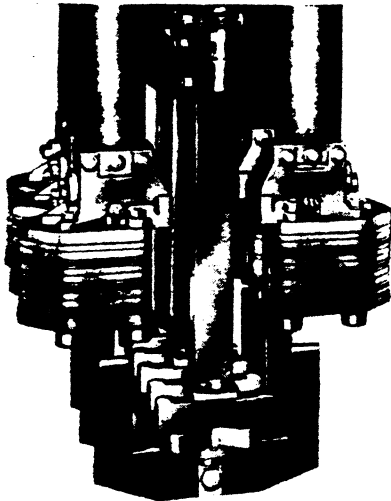
The 1200-ampere and 2000-ampere breakers have additional butt-type main contacts with silver-to-silver surfaces.

3 LIFT RODS

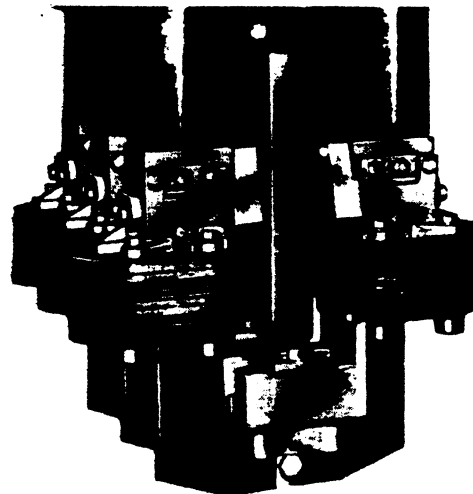
Lift rods are of wood-base Micarta to provide maximum mechanical and electrical strength. Lift rod guides align the moving contacts properly.

4 HYDRAULIC BUMPERS

Hydraulic bumpers absorb the shock of opening and prevent rebound of moving contacts.



1200-ampere De-ion grid and contact assembly.



2000-ampere De-ion grid and contact assembly.

5 TERMINAL BUSHINGS

Condenser terminal bushings are made up of alternate layers of metal foil and insulating Micarta wound concentrically over the conducting core. Because the operating voltage is divided equally across several layers of insulating material, the stress is uniformly distributed. The bushing has high inherent mechanical strength.

Protection against moisture is insured by several coats of varnish, each thoroughly dried before application of the next.

The bushing mounting flange is brazed to a brass sleeve with an accurately machined inside diameter. The sleeve is pressed on to the bushing and secured there by the tightly pressed fit and a shellac bond. The flange provides the surface for fastening the bushing to the top of the breaker.



6 RELIEF VENT

A vent relieves internal pressures built up in the breaker during short circuit interrupting without permitting oil to escape. The air is forced out in advance of the arc gasses rising through the oil, minimizing the possibility of a secondary explosion due to the mixture of air and arc gasses.

7 AIR EXPANSION CHAMBER

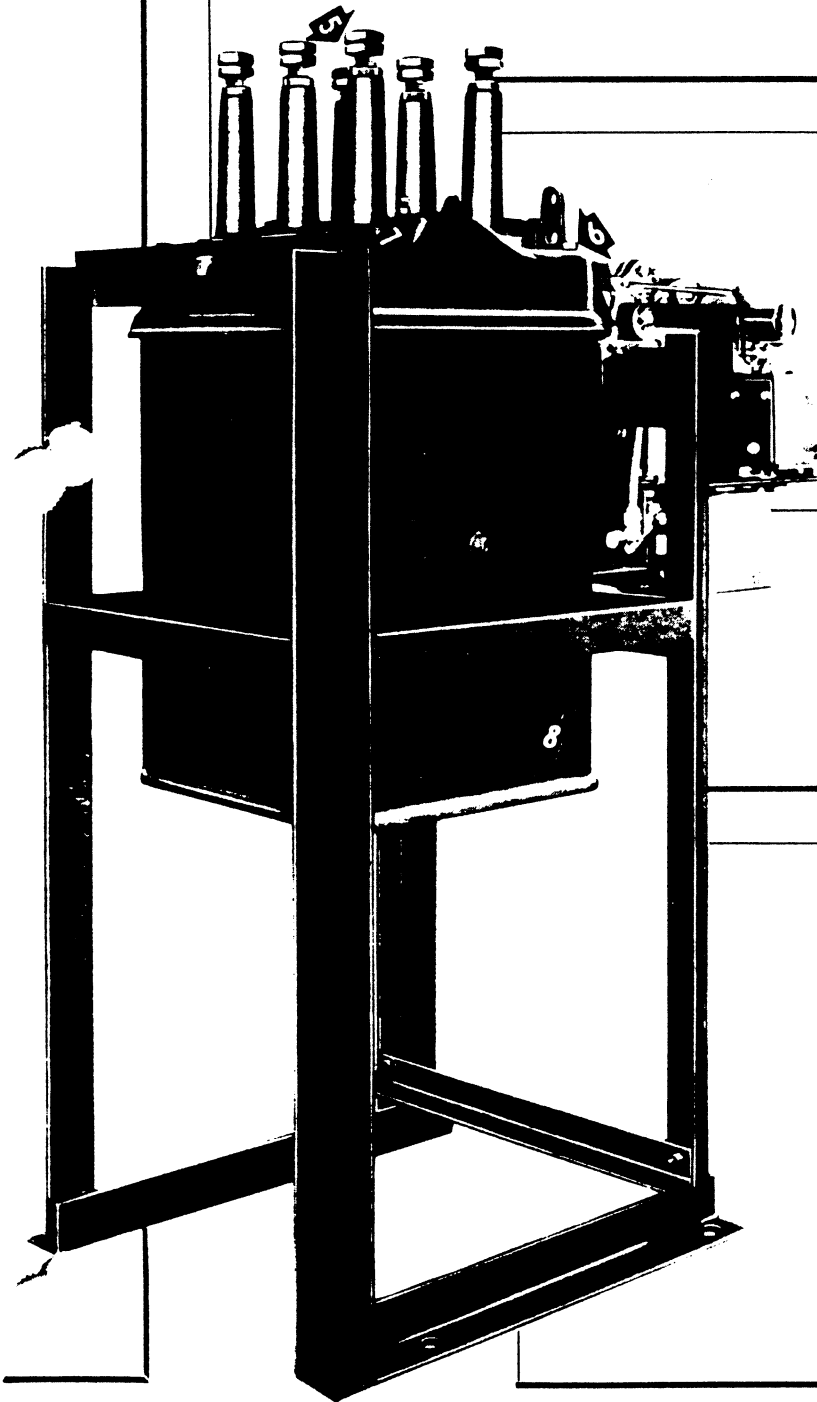
The drawn-steel top of the breaker serves as a gas expansion chamber. It also is the base on which the complete breaker is assembled. The main operating lever system is mounted within this base, which provides a rigid mounting support for the operating mechanism.

8 TANKS AND OIL

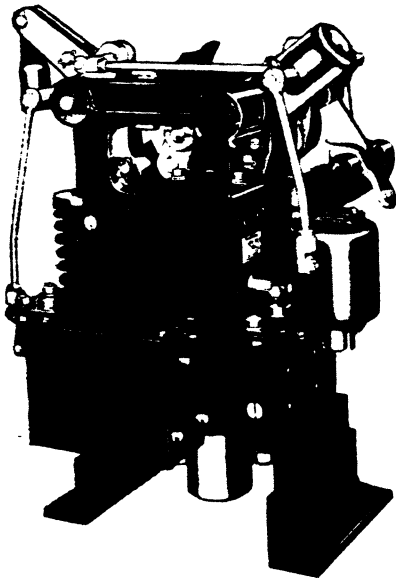
TANKS are fabricated from heavy sheet steel and have sufficient strength to withstand pressures developing on interrupting short circuits within the breaker ratings. All tanks are thoroughly tested for the possibility of leaks and imperfect welds. They are lined with insulating barriers for added protection.

The tank is drawn up against a resilient packing or gasket which fits into a groove on the underside of the top. The gasket seals the joint and prevents oil throw. An oil gauge and drain plug are supplied on tanks of all breakers.

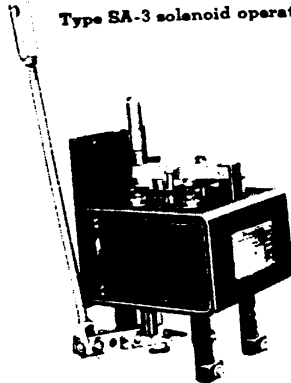
WEMCO C OIL is supplied as standard.



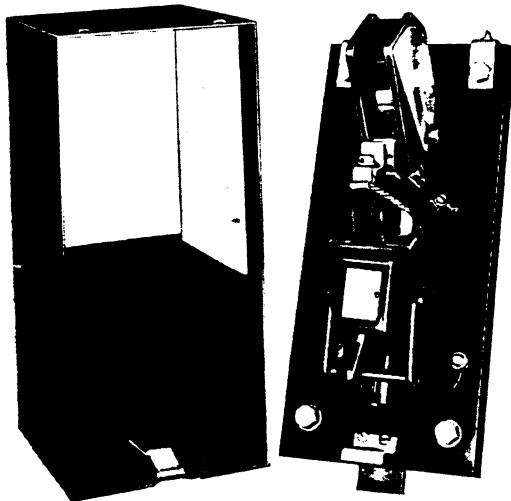
OPERATING MECHANISMS



Type SA-3 solenoid operating mechanism.



Four-coil
light-trip
attachment.



Control panel and cover.

SOLENOID OPERATING MECHANISM—The three-inch Type SA-3 solenoid mechanism is mechanically trip-free in all positions and is equipped with direct current shunt trip and Veeder counter. A light trip attachment can be added to the mechanism for transformer trips, either instantaneous or with time delay, capacitor shunt trip, and undervoltage.

Operation of the mechanism is smooth and positive. The bell crank lever is linked to the main lever. This in turn connects to the automatic lever and to the solenoid through a trigger. Operation of any trip coil breaks the connection between the automatic and main levers and permits the breaker contacts to open even though the solenoid remains energized or the manual lever is held down. This action can take place at any point of the closing stroke. A heavy accelerating spring assists the force of gravity in opening the contacts rapidly.

TRIP-FREE CONTROL PANEL—Each electrically operated breaker is supplied with a control panel on which is mounted a trip-free control relay to energize the breaker closing coil, and then open the circuit to this coil as soon as the breaker reaches the closed position. The trip-free action keeps the breaker from pumping even though the control switch is held in the "close" position.

MANUAL OPERATION—A separately mounted coverplate, bell crank, and accelerating device are supplied for manual operation. The coverplate contains the latch, trip coils, and mechanically trip-free closing handle. Space is provided for a maximum of three trip coils plus an undervoltage device. The trip coils available are transformer trips either instantaneous or time delay, shunt trip, or capacitor trip. The undervoltage device may be instantaneous or have capacitor time delay.

AUXILIARIES

RECTOX® RECTIFIERS—Where direct current is not available, these breakers can be closed by means of a Rectox unit. The Rectox unit and an adjustable resistor are mounted on a steel plate. The resistor permits adjustment of current to suit the requirements of the solenoid mechanism.

TANK LIFTERS—Windlass-type tank lifters are available for Type F-100 breakers. One is required for each installation. For some installations, truck-type tank lifters are more suitable and are available.

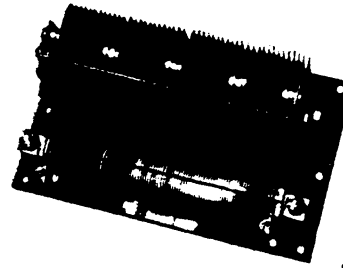
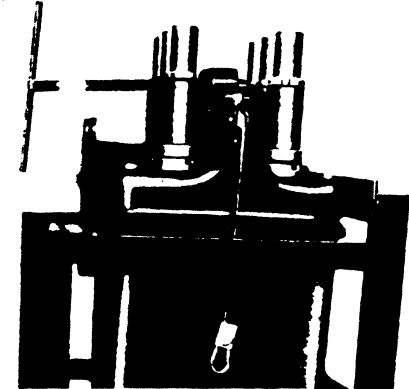


Plate-mounted Rectox for a-c operation.

Windlass-type tank lifter.



RATINGS—TYPE F-100 INDOOR OIL CIRCUIT BREAKERS

TYPE	VOLTAGE RATINGS			INSULATION LEVELS		CURRENT RATINGS IN AMPERES			INTERRUPTING RATINGS			
	RATED KV *	MAXIMUM DESIGN KV *	MIN. KV. FOR RATED MVA	WITHSTAND TEST		CONTINUOUS 60 CYCLE†	SHORT TIME*‡		3-PHASE RATED MVA	AMPERES AT RATED VOLTAGE §	MAXIMUM AMPERES	TIME IN CYCLES #
				LOW FREQUENCY RMS	IMPULSE CREST†		MOMENTARY	FOUR-SECOND				
F-100	7.2	8.25	2.3	26	75	600	40000	25000	100	8000	25000	8
F-100	7.2	8.25	2.3	26	75	1200	40000	25000	100	8000	25000	8
F-100	7.2	8.25	2.3	26	75	2000	40000	25000	100	8000	25000	8

* Voltage Ratings based on recommendations of EEI-NEMA Joint Committee on Preferred Voltage Ratings for A-C Systems and Equipment.

† 1.5 x 40 MS Positive or Negative. All impulse values are phase-to-phase and phase-to-ground and across the open contacts.

‡ The 25-cycle continuous current ratings in amperes are given herewith following the respective 60-cycle ratings: 600-700; 1200-1400; 2000-2250.

§ For the definitions of short time current ratings, see American Standard for Alternating Current Power Circuit Breakers in C37.4-1945, page 16.

§ To obtain the rated interrupting current of a breaker at an operating voltage other than the rated voltage of the circuit breaker, the following formula should be used:
Amperes at operating voltage

$$= \text{amperes at rated voltage} \times \frac{\text{rated voltage}}{\text{operating voltage}}$$

For calculated values use the nearest 100-ampere step.

If the value so calculated exceeds that of the rated maximum interrupting current, then the latter rating must be used as the interrupting rating of the breaker.

(6) The rated interrupting time of the breakers listed in this table shall be not more than the number of cycles given in column headed "Time in Cycles". Time shall be measured at 60 cycles per second.

WEIGHTS AND OIL REQUIREMENTS—TYPE F-100 INDOOR OIL CIRCUIT BREAKERS

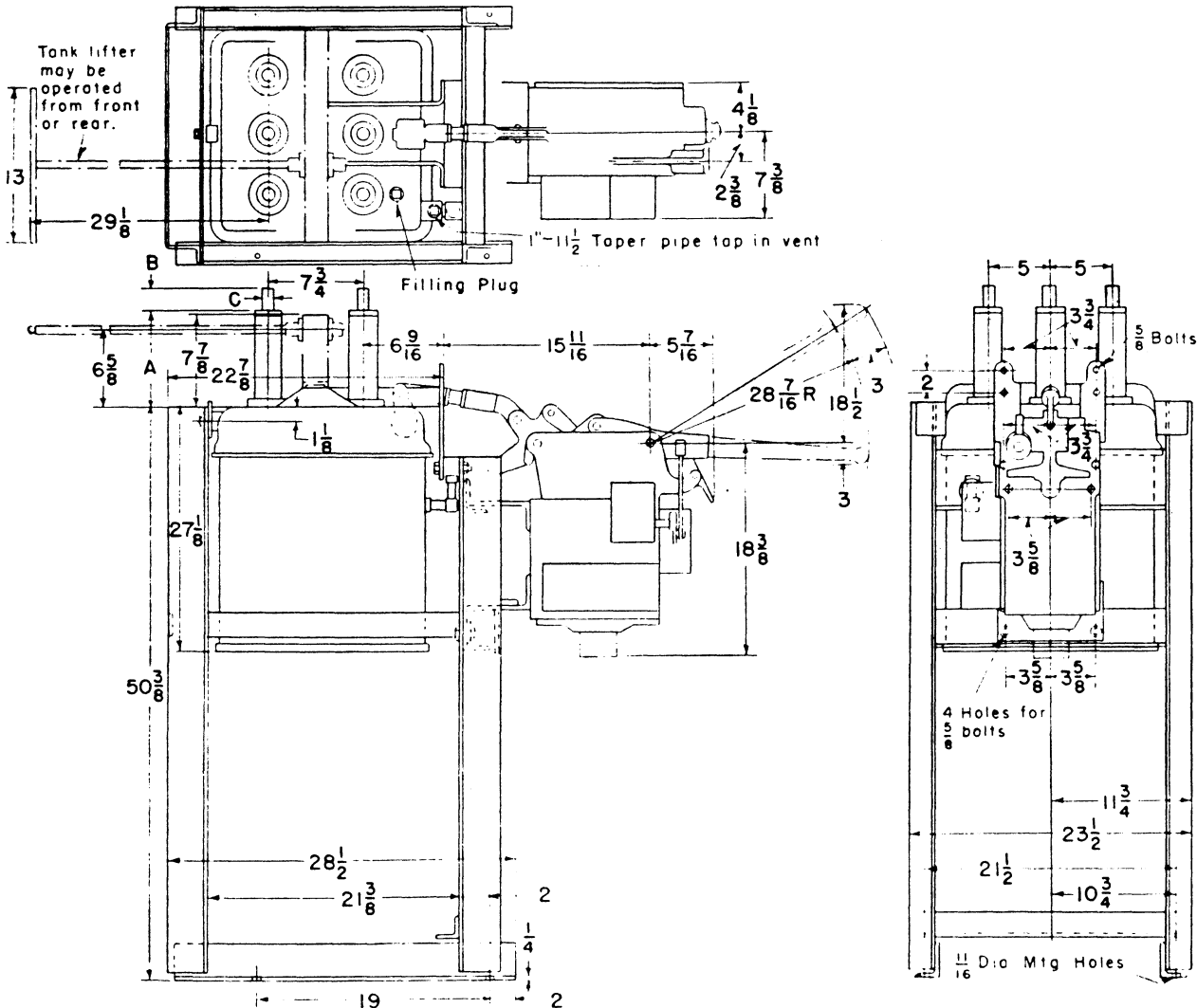
TYPE	RATED AMPERES		RATED KV	GALLONS OIL	WEIGHTS WITH OIL			
	60 CYCLE	25 CYCLE			MANUAL MECHANISM		TYPE SA-3 SOLENOID MECHANISM	
					NET†	SHIPPING*	NET†	SHIPPING*
F-100	600	700	7.2	20	575	700	850	1000
F-100	1200	1400	7.2	20	625	750	900	1050
F-100	2000	2250	7.2	20	750	900	1030	1180

† Net weight of oil is approximately 7½ pounds per gallon.

* Shipping weight of oil is approximately 9 pounds per gallon.

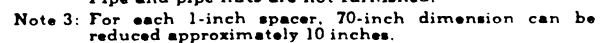
OUTLINE DIMENSIONS IN INCHES—TYPE F-100 SOLENOID OPERATED BREAKERS

Approximate Only. Do Not Use for Construction Purposes.



TYPE	RATED KV	60-CYCLE AMPERES	DIMENSIONS IN INCHES		
			A	B	C
F-100	7.2	600	8 $\frac{5}{16}$	1 $\frac{7}{8}$	1 — 14 Threads
F-100	7.2	1200	8 $\frac{1}{4}$	2 $\frac{1}{2}$	1 $\frac{1}{2}$ — 12 Threads
F-100	7.2	2000	7	3 $\frac{3}{4}$	2 — 12 Threads

Approximate Only. Do Not Use for Construction Purposes.



† Required to remove tank when breaker is open.
Allows one inch clearance.

LITERATURE REFERENCE

PRICES—See Price List 33-030

CONDENSER BUSHINGS—See Descriptive Data 33-155

DE-ION GRIDS—See Descriptive Data 33-160



WESTINGHOUSE ELECTRIC CORPORATION
EAST PITTSBURGH PLANT • SWITCHGEAR DIVISION • EAST PITTSBURGH, PA.

Printed in U.S.A.