power circuit breakers

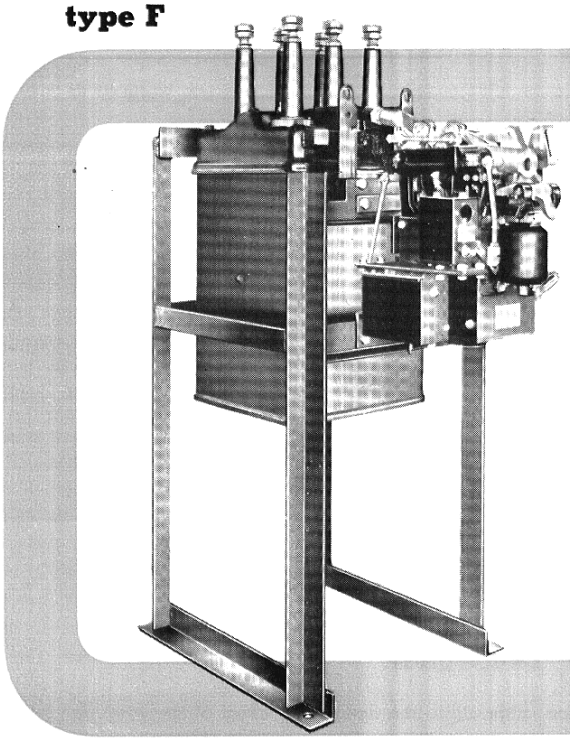
indoor oil breakers

types: F-100 • 138-F-150 • 138-B-250 • 138-B-500
frame mounted • De-ion grid

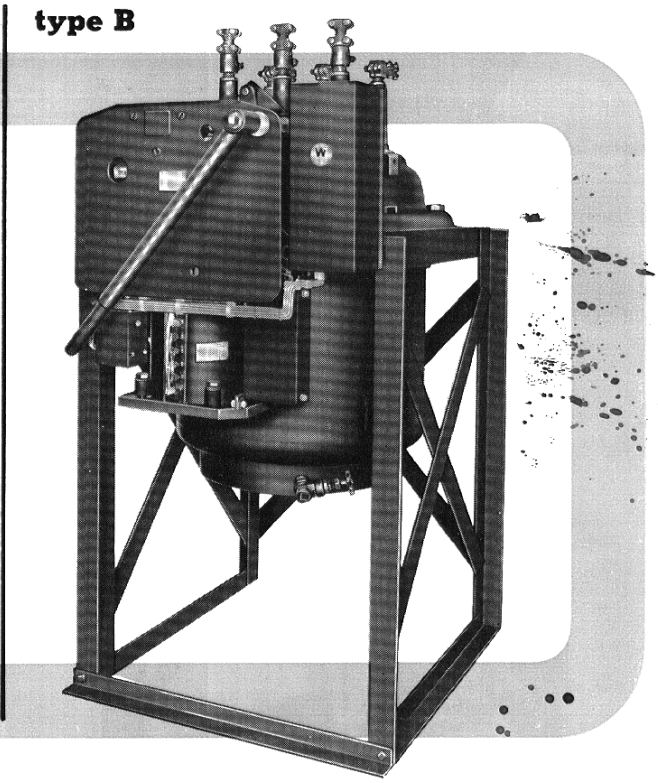
descriptive bulletin

33-152

type F



type B



application

ratings

voltage
7.2 and 13.8 kv

current
600, 1200, and 2000 amperes

interrupting rating
100, 150, 250, and 500 mva

interrupting time
8 cycles

Indoor oil circuit breakers types F-100, 138-F-150, 138-B-250 and 138-B-500 are compact breakers providing medium interrupting capacity ratings at low voltages. Designed for indoor service, they are especially adaptable for use in industrial plants and generating stations where minimum space is available.

These circuit breakers are three-pole, single-throw, primarily for remote control only, to meet AIEE recommendations that circuit breakers for use on circuits of more than 2500 volts be mounted away from the switchboard.

Standard mounting for these breakers is angle-iron floor-mounted framework; however, since all three poles are enclosed in a single tank, the breakers can be arranged for steel cell housing, or can be adapted for mounting in metal-clad switchgear.

advantages

De-ion grid arc control reduces fault clearance time, contact burning, and oil deterioration, with resultant lower maintenance costs.

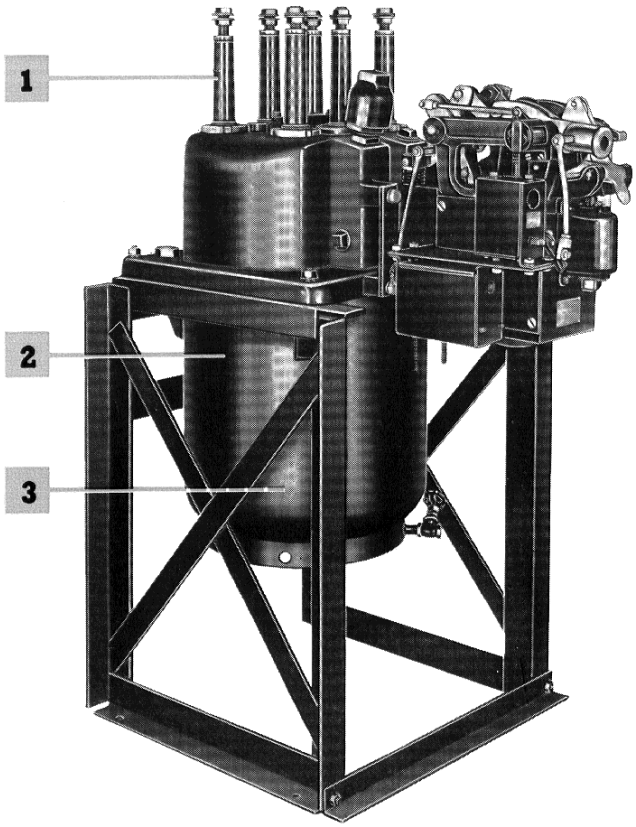
condenser bushings, made up of alternate layers of metal foil and Micarta® insulation, provide uniform voltage stress, light weight, and high mechanical strength.

single tank construction reduces size and usually allows installation of larger breaker rating in space available.

steel frame mounting and shipment as complete unit after factory testing simplifies installation.

April, 1959
supersedes descriptive bulletin 33-153 dated May, 1958 and descriptive bulletin 33-560 dated December, 1949
mailed to: E/276/DB; C26-5Y

design features



1 terminal bushings

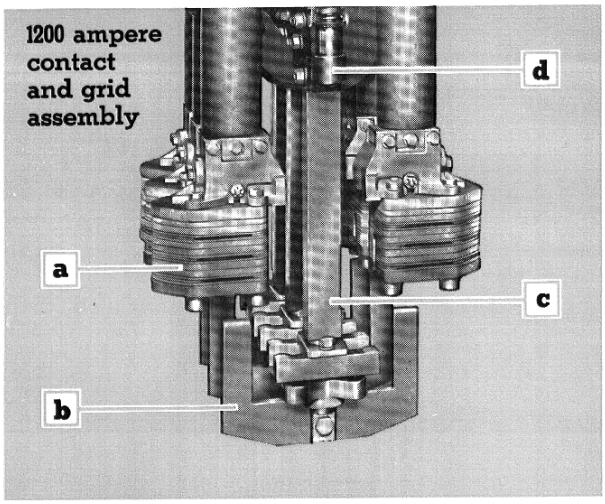
Condenser terminal bushings are made up of alternate layers of metal foil and insulating Micarta wound concentrically over the conducting core. Because the operating voltage is divided equally across several layers of insulating material, the stress is uniformly distributed. This bushing has high inherent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

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

2 tanks and oil

Tanks are fabricated from heavy sheet steel and have sufficient strength to withstand pressures developed 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. An oil gauge and drain are supplied on all breakers. WEMCO "C" oil is supplied as standard.

3 internal construction



a De-ion grids

De-ion grids utilize the de-ionizing effect of the gases produced by the arc during interruption to provide efficient arc extinction. The grids, supported from the terminal bushings, consist of a series of insulated magnetic plates with vents to direct the arc laterally into oil pockets. The arc vaporizes the oil, forcing the gases back through the arc stream to de-ionize the arc and extinguish the arc in minimum time and with minimum oil deterioration. This reduces arc energy, tank pressure, contact burning, and breaker maintenance.

b contacts

The 600-ampere breakers have a blade-type moving contact which engages the fingers on the stationary contact. These contacts have sufficient contact area and pressure to keep operating temperature within safe limits. Special alloy tips on the moving elements and arcing horns on stationary contacts protect the main contacts. The 1200 and 2000-ampere breakers have additional butt-type main contacts with silver-to-silver surfaces.

c lift rods

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

d hydraulic bumpers

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

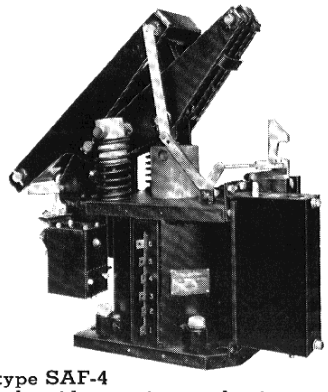
operating mechanisms

solenoid operating mechanism

The type SA-3 solenoid mechanism is supplied for types F-100, 138-F-150 and 138-B-250 breakers and the type SAF-4 mechanism for type 138-B-500 breakers. Both mechanisms are mechanically trip-free in all positions. They are equipped with direct current shunt trip. A light-trip attachment can be added to the mechanisms for capacitor trip, undervoltage and 5-ampere overload coils either instantaneous or with time delay.

The operation of the mechanisms is smooth and positive. When the mechanism is closed the main lever is held down by the holding latch to hold the breaker in the closed position.

When the mechanism is tripped, the trigger releases the trip-free lever from the main lever, and a heavy accelerating spring, assisted by gravity, forces the breaker to open rapidly. A removable hand closing lever is provided to operate mechanism manually for maintenance purposes.



type SAF-4
solenoid operating mechanism

trip-free control panel

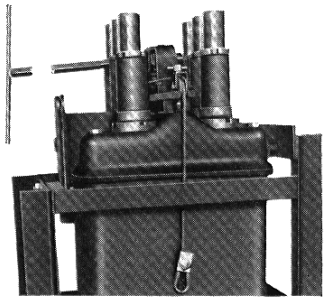
Each electrically operated breaker is supplied with a trip-free control relay panel. It is trip-free in action and keeps the breaker from pumping, even if the control switch is held in the "closed" position.

manual operating mechanism

A coverplate, mechanically trip-free in all positions of the stroke, can be supplied for manual operation of the types F-100 and 138-F-150 breakers. Manual operation of larger breakers is not recommended due to the possibility of closing into a heavy fault.

Trip-free action is obtained by a trip lever latched to the main operating handle and arranged so that when automatic tripping attachments are used it is impossible to hold the breaker in the closed position under a predetermined condition of overcurrent on the circuit.

The coverplate can be supplied with two or three overload trip coils, either instantaneous or time delay. Capacitor trip, shunt trip and undervoltage attachments can be added.



tank lifter—windlass type
mounted on type F

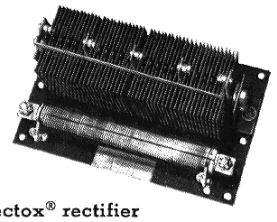
auxiliaries

tank lifters

Windlass-type tank lifters are available for these breakers. One is required for each installation. For some installations, truck-type tank lifters are more suitable and can be supplied.

Rectox® rectifiers

Where direct current is not available, these breakers may be closed from a 230 volts a-c source by means of a Rectox unit. The Rectox unit consists of a full-wave selenium rectifier and adjustable series resistor mounted on a steel plate. For all practical purposes the selenium rectifier is not affected by aging or temperature changes, and the resistor is used to adjust the current to suit the requirements of the solenoid mechanism and variations in supply voltage.



Rectox® rectifier
plate-mounted
for a-c operation

ratings ▲

type	voltage ratings			insulation levels		current ratings in amperes			interrupting ratings			
	rated kv	maximum design kv	minimum kv for rated kva	withstand test: low frequency rms	withstand test: impulse crest	continuous 60 cycle	short time: momentary	short time: four-second	3-phase rated kva	amperes at rated voltage ✣	maximum amperes	time in cycles
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
138-F-150	13.8	15.0	4.0	36	95	600	35000	22000	150	6300	22000	8
138-F-150	13.8	15.0	4.0	36	95	1200	35000	22000	150	6300	22000	8
138-B-250	13.8	15.0	4.0	36	95	1200	60000	36000	250	10600	36000	8
138-B-500	13.8	15.0	6.6	36	95	1200	70000	44000	500	21000	44000	8
138-B-500	13.8	15.0	6.6	36	95	2000	70000	44000	500	21000	44000	8

▲ All ratings in accordance with ASA-AIEE-NEMA Standards. For definitions see American Standard for alternating current power circuit breakers C37.4.

✣ 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:

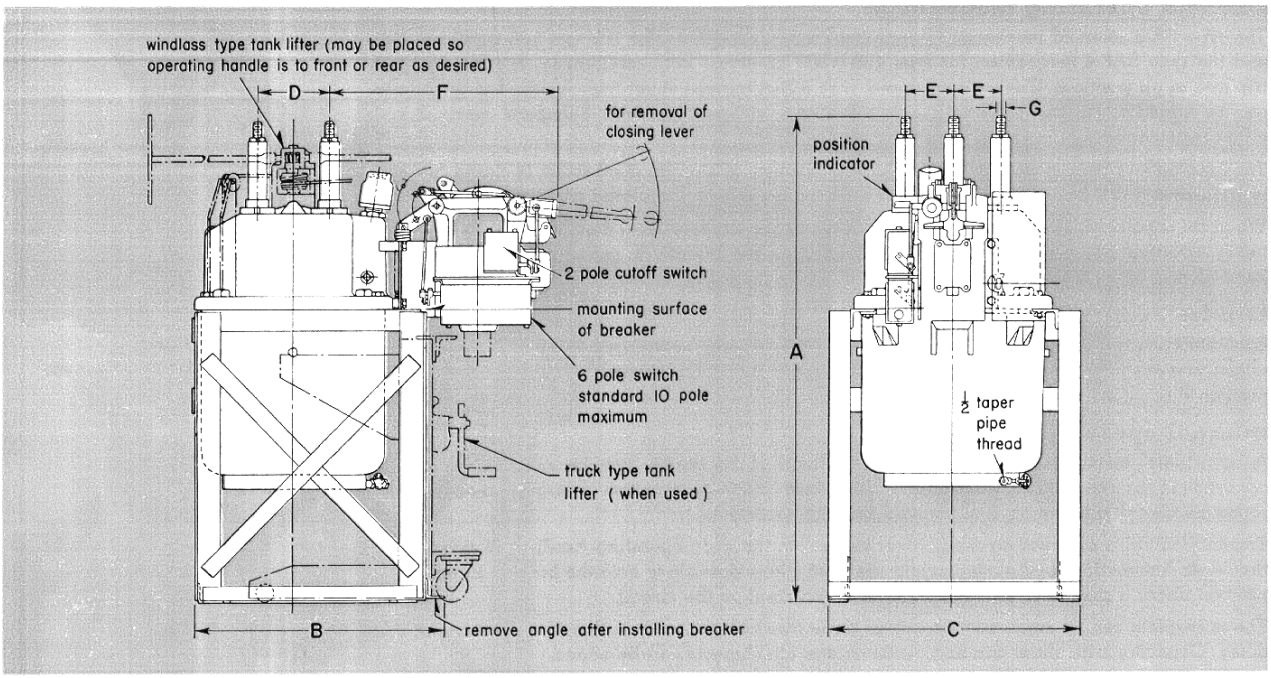
$$\text{amperes at operating voltage} = \text{amperes at rated voltage} \times \frac{\text{rated voltage}}{\text{operating voltage}}$$

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.

indoor oil breakers
types F-100, 138-F-150, 138-B-250, 138-B-500

dimensions in inches — solenoid operated breakers



type	kv	60-cycle amperes	A	B	C	D	E	F	G
F-100	7.2	600	60 9/16	28 1/2	23 1/2	7 3/4	5	27 1 1/16	1 —14 threads
F-100	7.2	1200	61 1/8	28 1/2	23 1/2	7 3/4	5	27 1 1/16	1 1/2—12 threads
F-100	7.2	2000	60 3/4	28 1/2	23 1/2	7 3/4	5	27 1 1/16	2 —12 threads
138-F-150	13.8	600	60 9/16	28 1/2	23 1/2	7 3/4	5	27 1 1/16	1 —14 threads
138-F-150	13.8	1200	61 1/8	28 1/2	23 1/2	7 3/4	5	27 1 1/16	1 1/2—12 threads
138-B-250	13.8	1200	59	28 1/2	28	8	5 1/4	26 1 3/16	1 1/2—12 threads
138-B-500	13.8	1200	69 1/8	38	38	10 1/2	7	24 1/2	1 1/2—12 threads
138-B-500	13.8	2000	69 7/8	38	38	10 1/2	7	24 1/2	2 —12 threads

weights and oil requirements

type	rated kv	rated amperes 60-cycle	gallons oil	weights with oil			
				manual mechanism		solenoid mechanism	
				net‡	shipping◉	net‡	shipping◉
F-100	7.2	600	20	575	700	850	1000
F-100	7.2	1200	20	625	750	900	1050
F-100	7.2	2000	20	750	900	1030	1180
138-F-150	13.8	600	20	575	700	850	1000
138-F-150	13.8	1200	20	625	750	900	1050
138-B-250	13.8	1200	21	...	...	960	1150
138-B-500	13.8	1200	60	...	...	1990	2250
138-B-500	13.8	2000	59	...	...	2090	2350

‡ Net weight of oil is approximately 7½ lbs. per gallon.
◉ Shipping weight of oil is approximately 9 lbs. per gallon.

further information:

prices: price lists 33-120 and 33-320
De-ion grids: descriptive bulletin 33-355
condenser bushings: descriptive bulletin 33-354

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