power circuit breakers

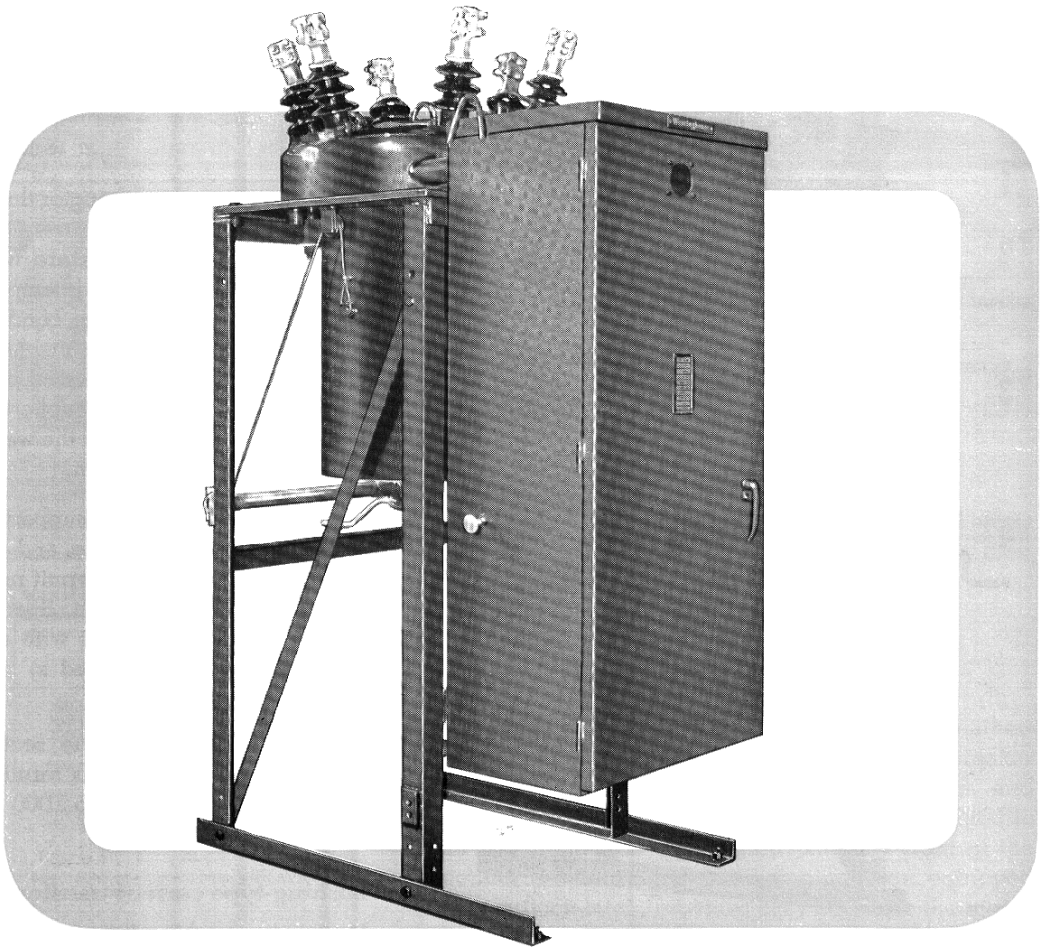
outdoor oil breakers

type GC • single tank

14.4 kv • 100, 250 and 500 mva
23 kv • 250 mva

descriptive bulletin

33-251



application

Westinghouse type GC outdoor oil filled circuit breakers combine efficient interrupting capacity with low maintenance and short arcing time.

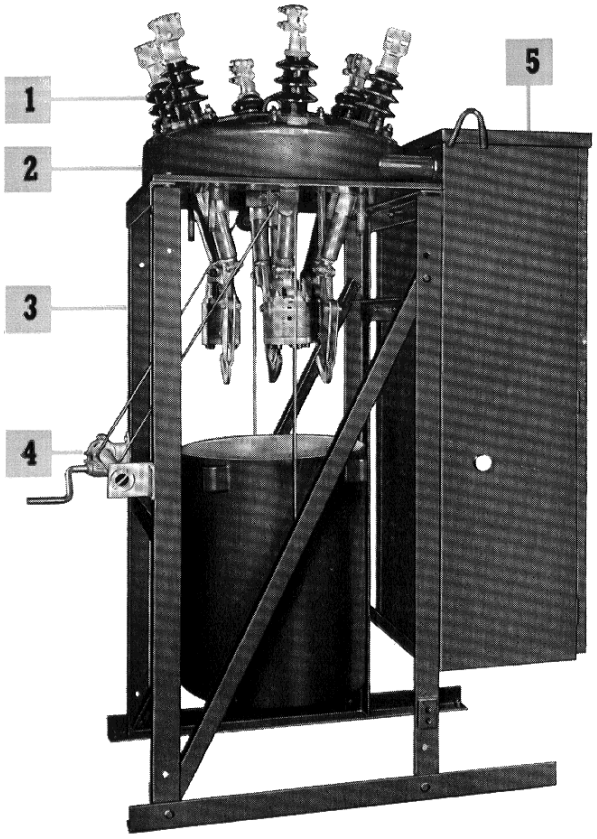
The three phases of these breakers are mounted on a common top and enclosed within a single tank. DE-ION® grid control reduces fault clearance time, contact burning and oil deterioration. High speed reclosing systems are available as optional equipment.

advantages

- single DE-ION® grid per pole
- condenser bushings
- solenoid operating mechanism
- longer oil life
- low maintenance

October, 1959
supersedes db 33-251 dated November, 1956
mailed to: E/275,279/DB; D64-5C; C26-5Z,b

design features



breaker with tank lowered for maintenance and inspection

The type GC breaker is designed to provide large "power type breaker" features in a unit with distribution substation ratings. It is completely factory assembled, tested, and when shipped is ready for installation.

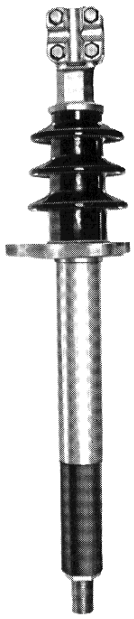
DE-ION® grid operation combines efficient interrupting capacity with low maintenance and short arcing time.

1 condenser bushings

This design provides weatherproof construction with ample insulation, high mechanical strength, light weight.

In each bushing the conductor through the center has a liberal current-carrying capacity. Around this are wound layers of treated paper interspersed with metal foil to form the condenser insulating member. After machining, the mounting flange is pressed on the condenser to form a rigid support. The outer end is protected from the weather by a single-piece porcelain.

The porcelain is flexibly supported at its base by a copper ring and at its top by a copper cap to permit normal expansion and contraction. Space inside the porcelain is filled with a soft plastic. All joints are sealed to assure a weatherproof casing.



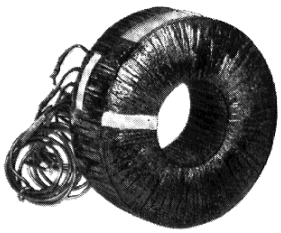
type S condenser bushing

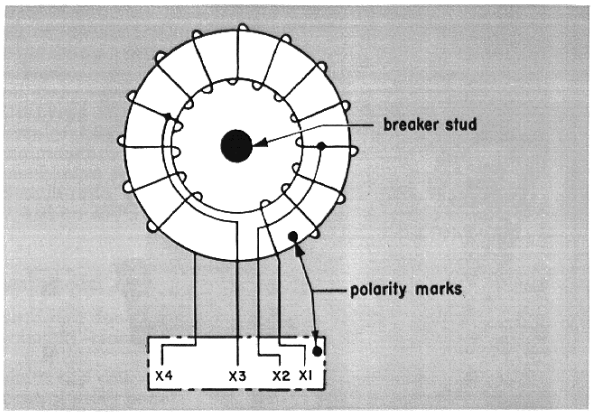
The top casting forms one section of the two-piece clamp type terminal. This terminal will handle conductors from no. 2 wire to 1000 MCM cable and also bolted on bus bar.

bushing-type current transformers:

Multi-ratio bushing-type current transformers with Hipersil® cores meet all NEMA and ASA requirements for relay and indicating instrument applications. One transformer per phase is supplied as standard on 14.4 kv breakers, two per phase can be supplied if required (two per phase are standard on 23-kv breakers). Single-ratio transformers with Hipernik® cores are also available for metering applications which require greater accuracy.

The transformers are mounted in the breaker top and leads are carried to the mechanism housing through a short connecting nipple. Pressure-type gas seal prevents breaker gas from entering the mechanism housing.





current transformer characteristics

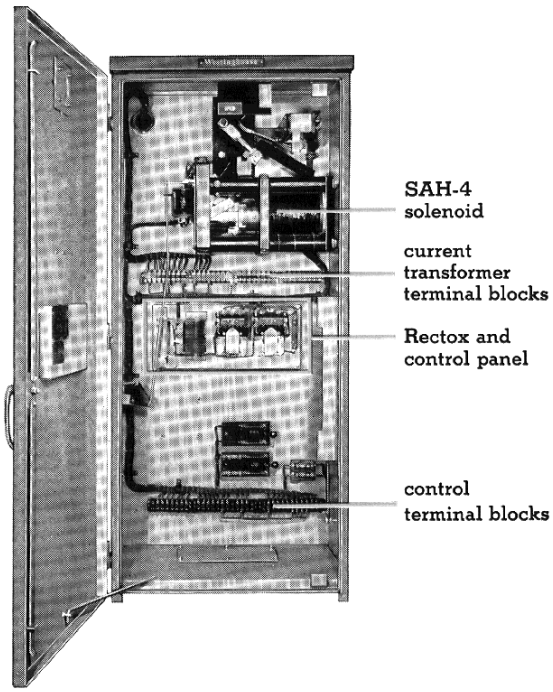
maximum transformer rating in amperes	transformer turn ratio	transformer marked ratio	transformer secondary taps	minimum primary amperes for relay+ pick-up
600	20 to 1	100 to 5	X1-X2	90
	40 to 1	200 to 5	X3-X4	165
	60 to 1	300 to 5	X2-X3	245
	80 to 1	400 to 5	X1-X3	325
	120 to 1	600 to 5	X1-X4	485
1200	40 to 1	200 to 5	X1-X2	165
	80 to 1	400 to 5	X3-X4	325
	120 to 1	600 to 5	X2-X3	485
	160 to 1	800 to 5	X1-X3	645
	240 to 1	1200 to 5	X1-X4	965

+ minimum trip values based on one transformer per phase with shunt trip or capacitor-trip and with type CO relay on the 4-ampere setting.

2 pressed steel breaker top: All phases are mounted in a common top, and enclosed in a single cylindrical tank. Pressed-steel breaker top supports the terminal bushings and contact assemblies and houses the operating shaft which connects the mechanism to the contact lift rods. A float-type oil gauge provides visual indication of the oil level, and a filling pipe provides a means for filling the tank with oil.

3 welded steel framework: Welded steel framework supports the circuit breaker and its operating mechanism housing. A removable tank lifter and pulleys are provided, by which the tank can be raised or lowered.

4 tank lifter: A portable windlass tank lifter is available to raise and lower the breaker tank for maintenance and inspection. Lifter may be operated by one man with a minimum of effort.



5 solenoid operating mechanism: Weatherproof mechanism housing mounted on the breaker framework encloses the operating mechanism and control relays. Reclosing equipment can be added to the mechanism on a swinging panel in front of the rectifier assembly, page 8. Swinging door, equipped with padlock latch, provides easy access to the mechanism. A heater prevents condensation of moisture. The hexagonal operating shaft enters the top of the housing through a sealed corrosion-resistant bearing.

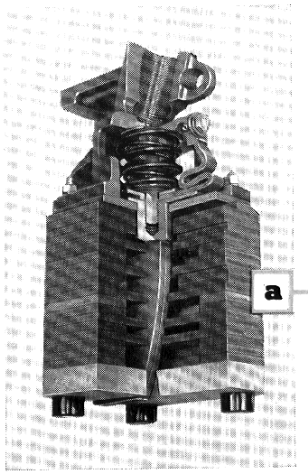
Type SAH-4 mechanism is mechanically trip-free—breaker can be tripped in any position whether closed manually or by the solenoid. Standard arrangement has cutoff switch, 9-pole rotary type auxiliary switch, 125-volt closing coil, shunt trip coil, and control relay panel. Mechanism can be furnished with four tripping coils, three for tripping from current transformers and one for shunt trip.

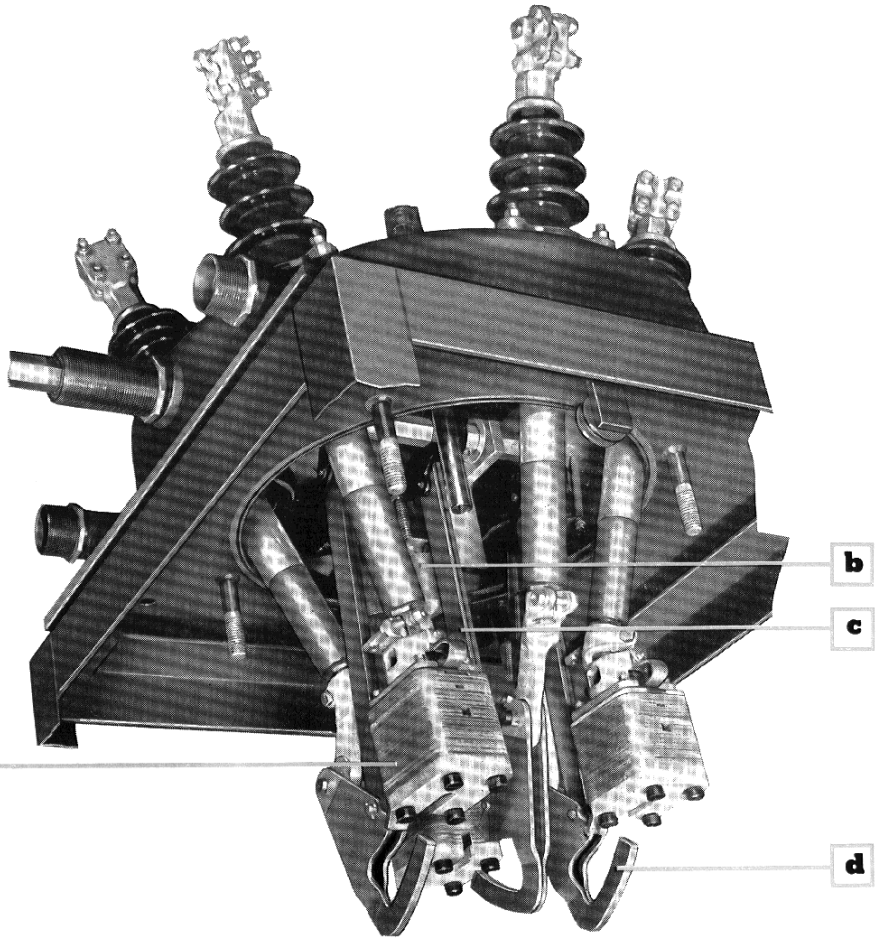
Rectox® rectifier: A plate-mounted selenium rectifier can be included for operation of the solenoid closing mechanism from an a-c supply. Shunt trip coil can be provided for 48 or 24-volt battery operation.

capacitor trip device: When only a-c control power is available for both closing and tripping, a capacitor trip device can be supplied for operation of a shunt trip coil. Thus, the same flexibility of relaying may be obtained as with d-c shunt trip coil, which makes capacitor tripping superior to transformer overload tripping.

design features

internal construction
DE-ION® grids





a **DE-ION® grids:** The use of a single DE-ION® grid interrupter per phase results in several advantages, such as hinged moving contacts for double contact speed, simple operating linkage and greater electrical clearance between phases. The grid stacking and exhaust vent configuration controls the pressure and turbulence in the arcing zone which results in fault interruption times of less than 5 cycles over the complete range of interrupting currents. The grids, supported from the condenser bushings, consist of a stack of insulating plates which form oil pockets to de-ionize the arc quickly. While passing through the zero point in the current wave, the dielectric strength of the arc stream builds up so rapidly that the current remains at zero to interrupt the circuit. This fast arc extinction minimizes contact burning, oil deterioration, and breaker maintenance. The 23 kv breaker utilizes a slightly different interrupter.

b **hydraulic bumper:** A single oil dashpot operated by the center lift rod lever absorbs the shock of opening and prevents rebound of the moving contacts.

c **lift rods:** Micarta® lift rods are operated by levers on the operating shaft. Because the moving contacts are held permanently in alignment, lift rod guides have been eliminated, and the opening in the DE-ION® grid for the moving contact has been made smaller for more efficient arc control.

d **contacts:** The moving contact consists of a hinged bridging member attached to the foot of the condenser bushing. Contact pressure at the hinge joint is maintained by the use of self-aligning cupped spring washers.

A butt-type stationary contact is used which is backed up by heavy biasing springs in order to get good contact pressure and the fast contact parting time required for 5 cycle interruption. The moving and stationary contacts are both tipped with silver tungsten for good arc resistance combined with high conductivity. When 1200 ampere continuous rating is required, an additional silver surfaced contact of the "tuning fork" type is mounted outside the interrupter. Sufficient contact area, mass, and pressure are used to keep operating temperatures within safe limits.

specifications

standard circuit breaker includes:

Wemco "C" oil
welded structural steel frame
six condenser bushings
connecting nipple and pressure-type seal for transformer leads
oil drain valve, and filling pipe
float-type oil gauge
accelerating spring
maintenance closing device (one per station)
mechanism with weatherproof housing (see page 3)
3-multi-ratio bushing-type current transformers (6 standard on 230GC250)

solenoid mechanism housing includes:

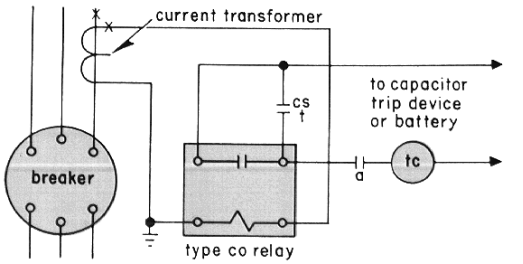
swinging door equipped with padlock latch
solenoid closing mechanism: 125 or 250 volt d-c, 230 volt a-c
shunt trip coil: 48, 125, or 250 volt d-c or capacitor trip
control relay panel
necessary terminal blocks
cutoff switch
operation counter
space heater
fused knife switch for control circuit
9-pole rotary type auxiliary switch

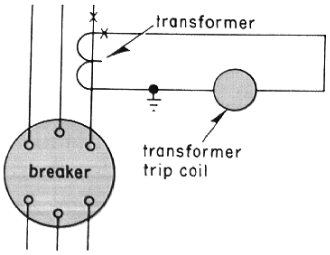
optional equipment available at extra cost:

(for details see price list 33-240)

reinforced grids for capacitor switching: see t.d. 33-063
extra creepage bushings
high altitude bushings
linear couplers for bus differential relaying
metering accuracy bushing current transformers
windlass-type tank lifter
automatic reclosing equipment (see page 8)
special relays, meters, instruments and cabinets

wiring diagrams

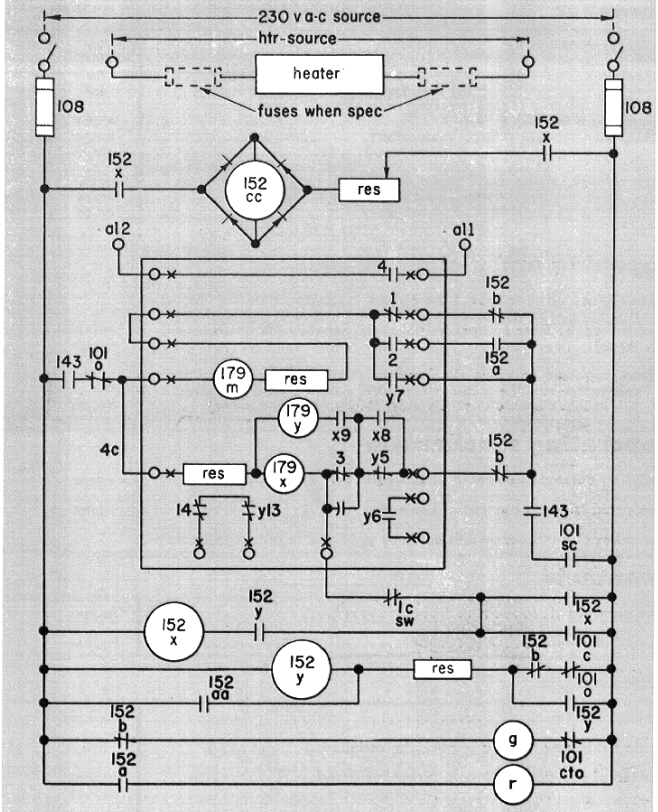




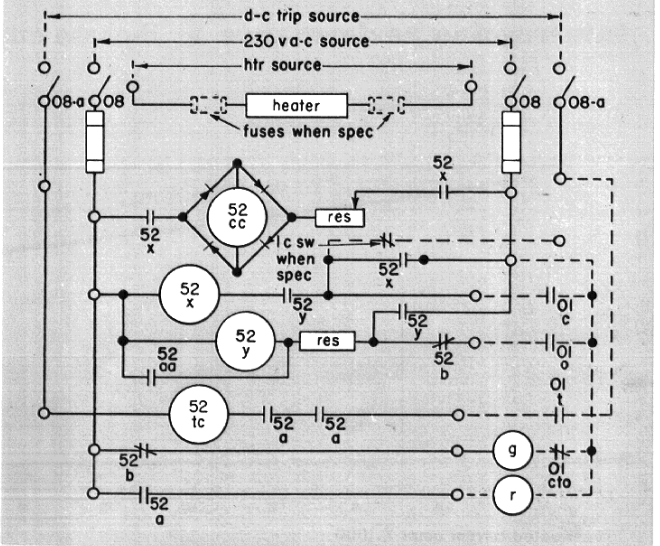
schematic diagrams

diagrams in accordance with AEIC-NEMA industry standard

Rectox close d-c trip reclosing



Rectox close d-c trip non-reclosing

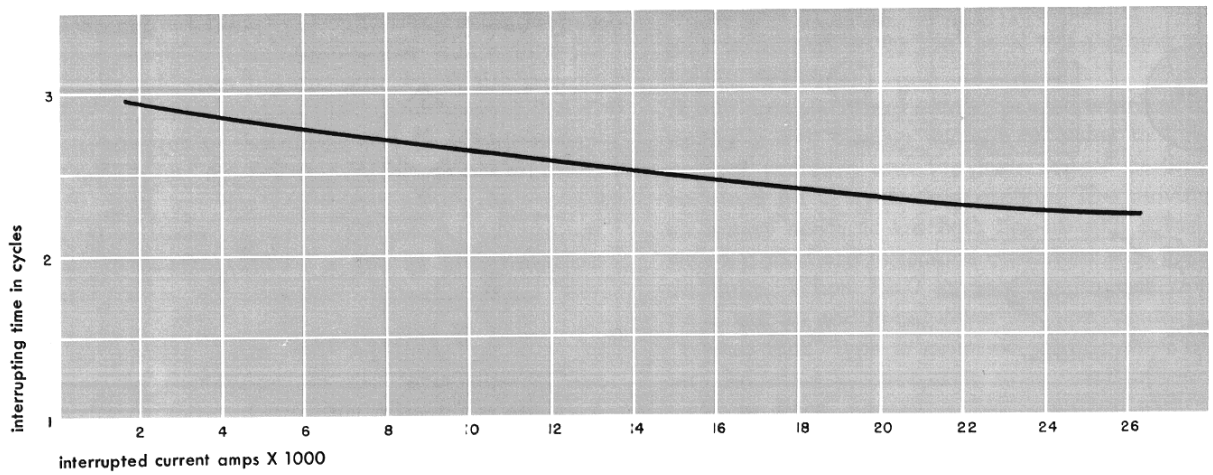


ratings

	units	breaker type					
		144GC100	144GC250	144GC250	144GC500	144GC500	230GC250
breaker							
maximum design kv	kv	15.5	15.5	15.5	15.5	15.5	25.8
rated voltage	kv	14.4	14.4	14.4	14.4	14.4	23
insulation level ratings, 60-cycle 1 minute withstand kv	kv	50	50	50	50	50	60
1.5 x 40 impulse withstand kv	kv	110	110	110	110	110	150
continuous current rating	amps	600	600	1200	600	1200	600
short time current ratings, momentary	amps	24000	40000	40000	40000	40000	19000
four-second	amps	15000	25000	25000	25000	25000	12000
interrupted ratings, rated three phase mva	mva	100	250	250	500	500	250
ampere @ rated voltage	amps	4000	10000	10000	20000	20000	6300
maximum amperes	amps	15000	25000	25000	25000	25000	12000
minimum kv for rated mva	kv	3.85	5.8	5.8	11.6	11.6	12
opening and closing times							
Time required to interrupt the circuit, measured from the instant the trip coil is energized with normal voltage to the final interruption, at 25 to 100 percent of rated capacity (60-cycle timing wave)	cycles	5	5	5	5	5	5
Time required to close the breaker at normal control voltage, measured from the instant the control switch contacts meet until the breaker arcing contacts meet (60-cycle timing wave)	cycles	18	18	18	18	18	18
operating mechanism							
closing current of solenoid at 125 volts	amps	35	35	35	35	35	35
solenoid tripping current at 125 volts	amps	11	11	11	11	11	11
number of auxiliary switch contacts provided to open trip circuit		2	2	2	2	2	2
contacts							
contact travel	inches	8	8	8	8	8	8¼
break distance	inches	7	7	7	7	7	7¼
bushings							
phase spacing	inches	15½	15½	15⅜	15⅜	15⅜	16⅞
safe cantilever loading of bushing, installed	lbs	100	100	100	100	100	100
external creepage distance, phase-to-ground	inches	11.5	11.5	11.5	11.5	11.5	17
phase-to-phase	inches	23	23	23	23	23	34
external striking distance, phase-to-ground	inches	6⅝	6⅝	6⅝	6⅝	6⅝	11¼
phase-to-phase	inches	12⅜	12⅜	12⅜	12⅜	12⅜	13¾

interrupting performance

3-phase ungrounded tests

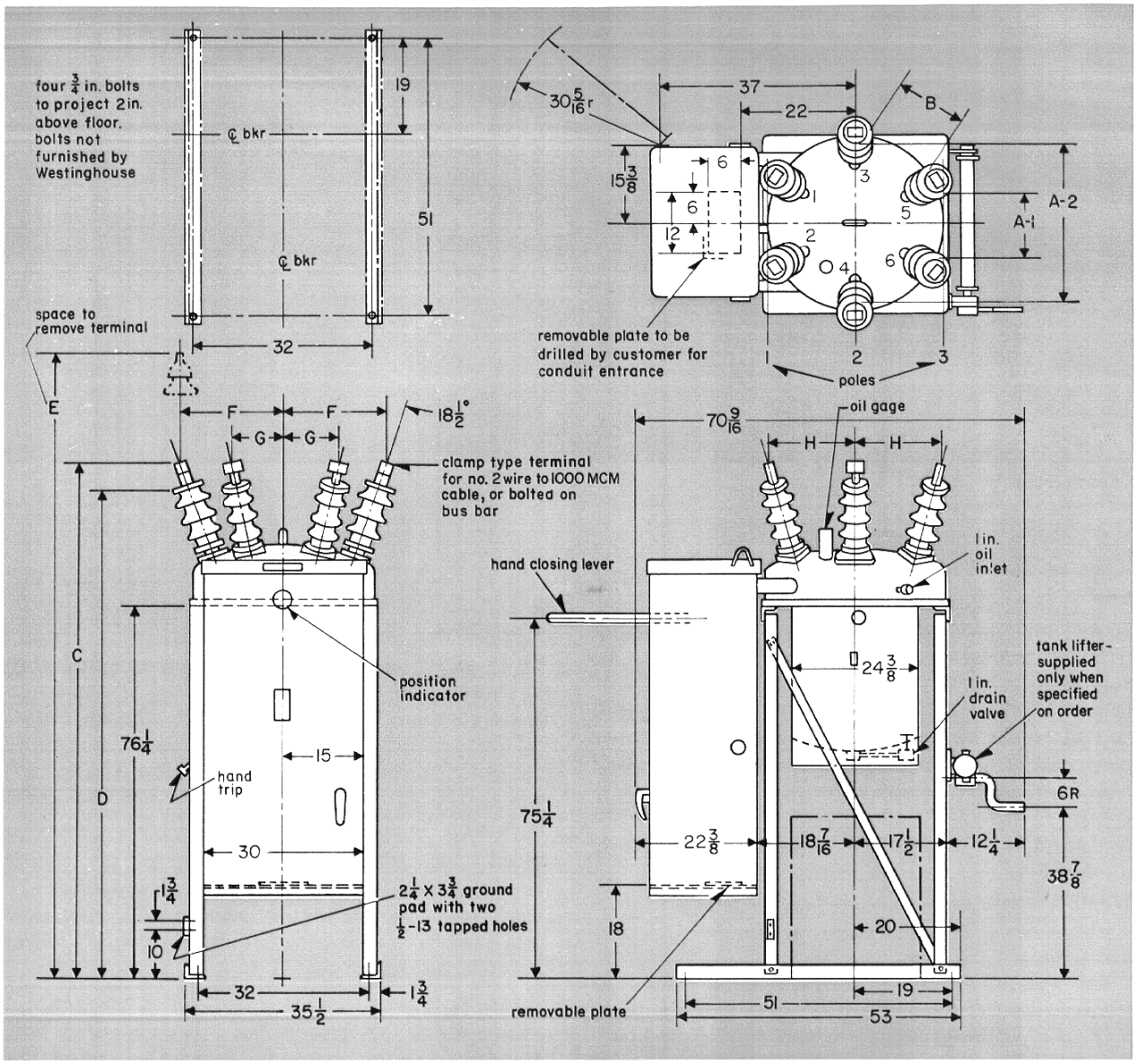


outdoor oil breakers

type GC • single tank

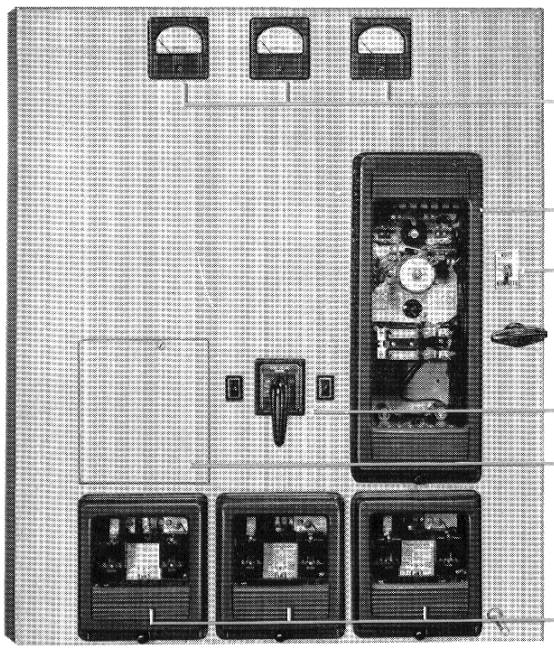
14.4 kv • 100, 250 and 500 mva
23 kv • 250 mva

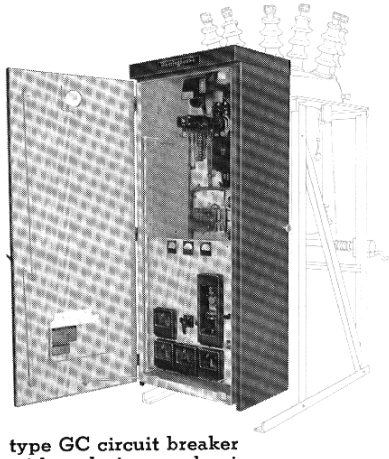
dimensions in inches



breaker type	kv	amp	mva	outline dimensions A-1	A-2	B	C	D	E	F	G	H	weight bkr lbs	wt bkr less oil lbs	oil gals.
144GC100	14.4	600	100	12⅝	28½	12⅝	97⅞	92	120	17½	8¾	15⅛	2440	2100	45
144GC250	14.4	600	250	12⅝	28½	12⅝	97⅞	92	120	17½	8¾	15⅛	2440	2100	45
144GC250	14.4	1200	250	12⅝	28½	12⅝	97⅞	92	120	17½	8¾	15⅛	2500	2160	45
144GC500	14.4	600	500	12⅝	28½	12⅝	97⅞	92	120	17½	8¾	15⅛	2440	2100	45
144GC500	14.4	1200	500	12⅝	28½	12⅝	97⅞	92	120	17½	8¾	15⅛	2500	2160	45
230GC250	23.0	600	250	13¾	31¾	13¾	100⅞	96	125	19 7/16	9 11/16	16⅞	2540	2200	45

automatic reclosing equipment





type GC circuit breaker with reclosing mechanism

To restore service automatically after fault clearance, type GC circuit breakers may be equipped with an automatic reclosing package.

Reclosing equipment is mounted on a hinged panel housed in the operating mechanism cabinet. Complete factory assembly, inspection and testing minimize installation time and expense.

included in the standard automatic reclosing package

Weatherproof cabinet mounted on the breaker frame contains the following apparatus, completely wired and tested:

- one type RC recloser in Flexitest® case
- three type CO overcurrent relays in Flexitest cases
- three type RA-35 miniature ammeters (5 amperes full scale)
- one type W control switch
- two indicating lamps, red and green
- one two-pole fused knife switch
- one toggle switch for automatic operation cutoff
- terminal blocks
- type CO ground relay (optional)
- instantaneous trip on type CO relays (optional)
- instantaneous initial trip with time-delay, subsequent trip (optional)

operation

The type RC recloser is normally arranged for a total of three reclosures. The first may be immediate or time-delay with automatic reset if the breaker stays in, or lockout if the breaker trips immediately after the third reclosure. After lockout, the breaker will not reclose automatically and hence must be closed manually.

If the breaker is tripped manually by the control switch, a contact in the control switch is opened and the breaker will not reclose automatically. Automatic operation is restored by manually closing breaker through the control switch.

rating factors: All ratings are based on the standard duty cycle (2-CO-15 sec.). For duty cycles other than standard, breaker should be derated in accordance with technical data 33-060.

instantaneous initial trip: For instantaneous initial tripping followed by delayed subsequent tripping, an integral contact of the RC reclosing relay is used in conjunction with CO relays with instantaneous trip contacts brought out to separate studs.

further information prices: price list 33-220
price list 33-240

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