power circuit breakers

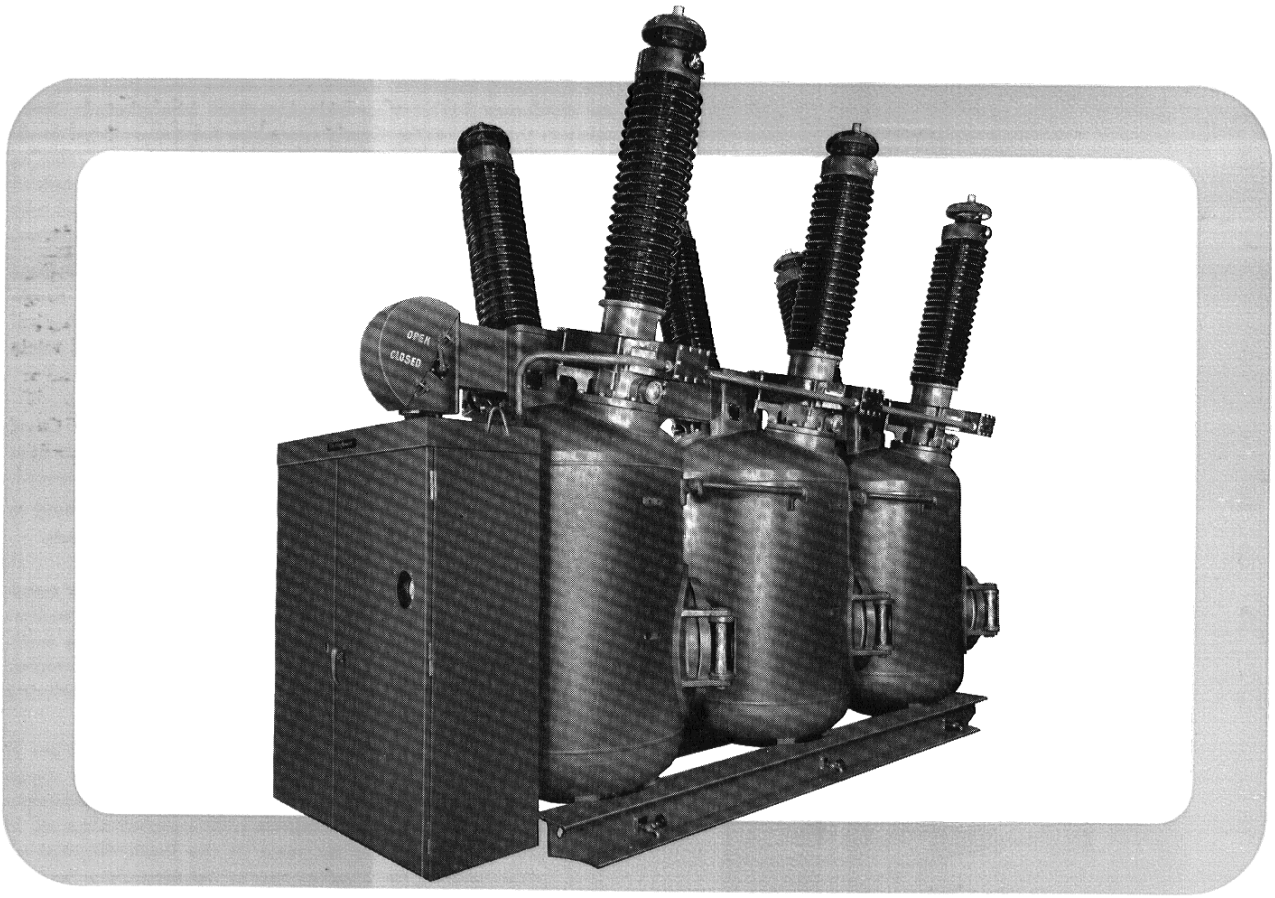
compressed air breakers

outdoor type 1380CA10,000

10,000 mva • floor mounted • 1600 amperes
dead tank construction • 3 cycles

descriptive bulletin

33-457



application

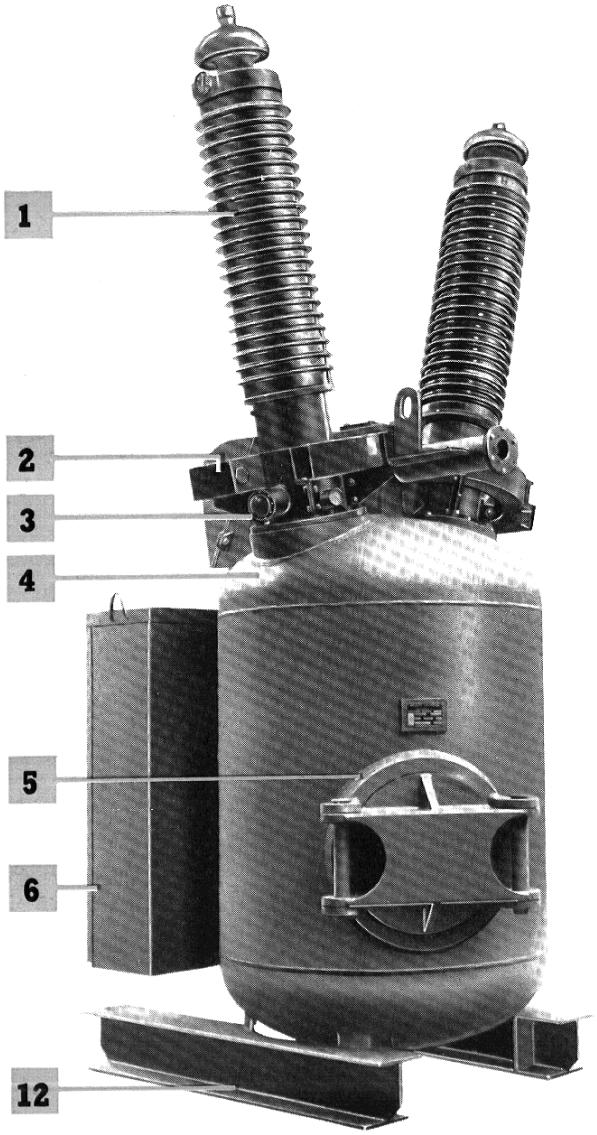
Type 1380CA10,000 compressed air circuit breaker is applicable when the use of a compressed air breaker is indicated, and certain design features of the oil circuit breaker are also required. This design incorporates all the advantages of the high-voltage compressed air breaker with those of the high-voltage oil breaker.

advantages

- **dead tank construction:** Inherently safe, sturdy, compact
- **bushing type current transformers:** Mounting space available for 12 transformers, a maximum of two per bushing
- **bushing taps for potential devices**
- **compact design:** Dimensions approximately match 138 kv oil breaker
- **single pneumatic mechanism (mechanically trip-free):** All three poles are mechanically tied together to insure simultaneous operation of the three poles, both for opening and closing of the breaker.
- **unit base mounting:** Three-pole units welded to common steel base for complete factory assembly and testing . . . may be shipped and installed in the field as a single three-pole breaker unit

April, 1958
new information
mailed to: E/277/DB; C26-5X

design features



The Westinghouse outdoor compressed air circuit breaker rated 138 kv, 10,000 mva interrupting capacity is of the dead-tank construction with all 3 poles rigidly mounted on a steel unit base. The operating mechanism is mounted on the no. 1 pole unit, and six condenser bushings provide the main insulation. In these respects the air breaker closely resembles the conventional dead-tank oil breaker. In fact, dimensions are essentially the same as 138 kv oil breakers, permitting air breakers to be located in stations already designed to accommodate oil breakers. The dead-tank breaker requires no elevation above the conventional foundation.

It has been the fundamental aim in designing the high-voltage compressed air circuit breaker to have a simple type of mechanism . . . the minimum number of valves . . . all mechanical details and contacts as accessible as possible . . . and still retain the highest degree of reliability of operation.

1 **bushings:** The bushings are Westinghouse type O oil impregnated. This design has been proved in service over the past 15 years with an outstanding performance record.

The bushing conductor is a hollow tube which is used to exhaust the air to atmosphere when the breaker opens.

2 **bushing current transformers:** The breaker is nominally equipped with six multi-ratio bushing type current transformers—one per bushing. Space, however, is available for mounting two per bushing or 12 per breaker. These may be any combination of relaying and metering CT's or linear couplers for bus differential relaying.

Locating CT's on both sides of the breaker permits use of all conventional relaying schemes. The current transformers are mounted in aluminum cases, completely moisture-proofed with Fosterite and mounted external to the tank eliminating air seals on the leads. Conduit on either side of the breaker carries the secondary leads to terminal blocks in the mechanism housing.

Current transformers may be removed over the bushing without disturbing any internal parts or adjustments.

3 **bushing potential devices:** The type O condenser bushings are equipped with potential taps to accommodate standard bushing potential devices. The potential device housings mount on the side of the breaker tanks. Six per breaker may be used if desired.

4 **tanks:** The tanks are heavy wall steel plate construction, conforming to the code requirements for unfired pressure vessels. They are shaped to provide maximum strength together with adequate electrical clearances.

5 **manhole:** A manhole in the side of each tank permits ready access to the contacts. A unique re-usable self-sealing gasket permits rapid entry into the pole unit when air is exhausted. The manhole cover is double hinged and may be opened merely by removing one hinge pin—no clamping bolts.

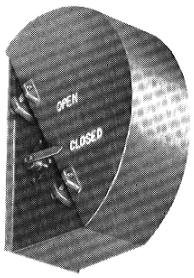
Each tank is charged with air at approximately 250 pounds per square inch and acts as a storage reservoir. Sufficient air is available for two interruptions without replenishing air. A drain valve in the bottom of each tank is used to exhaust the air when entrance into the breaker is desired.

Ground level inspection may be made without the need of scaffolding.

6 **operating mechanism:** The operating mechanism is the Westinghouse type AA-10 mechanically trip free, pneumatic type, proved by years of experience on large oil breakers.

The mechanism housing is mounted on the no. 1 pole unit, and operating rods to each pole open and close the contacts in all three poles simultaneously. This coordination of contact closing simplifies relay systems as compared to three single poles.

7 **mechanical position indicator:** Positive indication of contact position is obtained from the mechanically operated indicator located directly over the mechanism housing.



8 **pole unit levers:** The pole unit lever system is designed to produce straight line motion of the lift rod and moving contact cross bar, and to provide contact speed and closing forces necessary to handle the 10,000 mva rating.

9 **contacts:** Two sets of contacts and interrupting devices are mounted in each pole unit, supported by the type O condenser bushings.

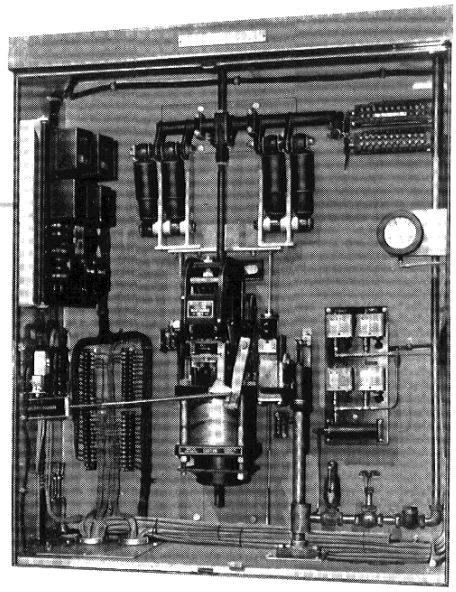
10 **moving contact cross bar:** The moving contact cross bar bridges between the two interrupters and is carried on a wood base Micarta lift rod.

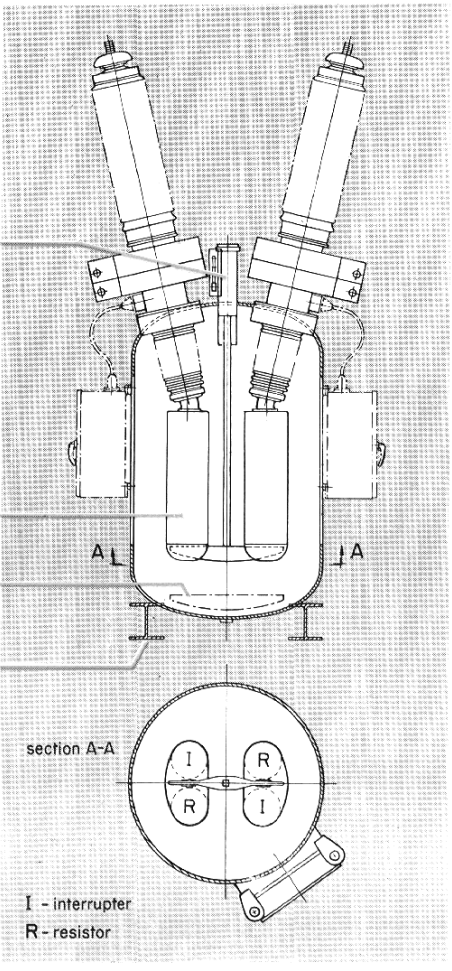
In the open position a positive disconnecting break is maintained by gravity—contacts are **not** held open by air pressure.

11 **controlled noise level:** Exhaust chamber is built within breaker to limit velocity of exhaust gases. (Not illustrated)

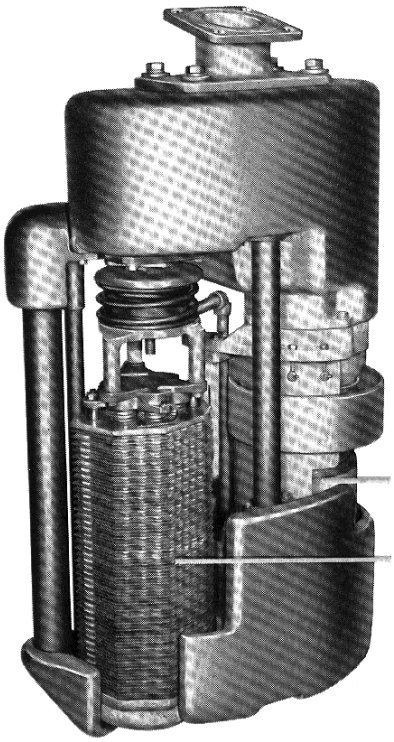
12 **unit base mounting:** The three-pole units are welded to a common steel, skid-type base. This permits complete factory assembly and testing of the three-pole units and operating mechanism as "one" assembled piece of apparatus and customer installation in that same "one unit" form.

For most locations, shipment as a complete unit is possible. This may be limited by rail clearances in certain areas and should be checked before shipment as a unit is assumed. However, clearances for this breaker are equal to or less than those required for other breakers of same rating. Dismantling for shipment will be required where proper rail clearance is not available.





operation



By using a low ohmic resistance and step method of interruption, the breaker interrupts independently of circuit constants, i.e., the breaker may be applied on any circuit within its current, voltage, and interrupting ratings regardless of rate of rise of system recovery voltage. The low ohmic resistor limits the rate of rise of recovery voltage that appears across the orifice, thus allowing application of this breaker to a system with any rate of rise without derating.

The downward movement of the crossarm isolator causes the main control valve to open. The opening of this valve exhausts the air from the underside of the main blast valve.

This causes a pressure differential across the valve which is greater than the spring pressure tending to keep it seated. Thus the valve opens and draws the main arc.

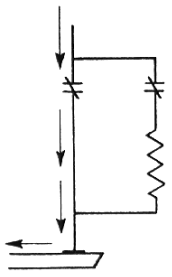
The resulting arc is blown immediately to the arc centering device and the arcing contact of the main blast valve. Air flow physically disperses the arc core and prevents re-establishment of the arc after a current zero.

Extinguishing the main arc diverts current flow to the 12-ohm resistor. The main blast valve continues to open because of pressure differential, opening the resistor control slide valve which dumps the air from under the resistor blast valve. Again, pressure differential opens the resistor blast valve, causing air flow to interrupt the resistor current arc, thus giving complete interruption.

The crossarm moves downward through lap-type sliding contacts until interruption in the orifices has been obtained. Then its motion causes

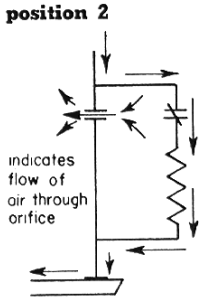
sequence of operation

position 1



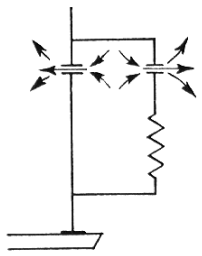
(Closed) The closing operation consists of raising the moving contact cross bar and bridging the two interrupters — circuit initiated through the already-closed interrupting contacts. No air is used over contacts on closing.

position 2



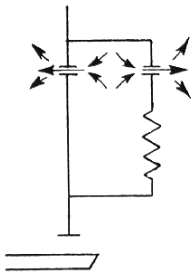
Main contact opens — air interrupts arc Current transferred through resistor

position 3



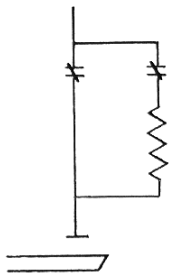
Resistor contact opens. Air interrupts resistor current. Circuit interruption complete.

position 4



Moving contact cross bar breaks away from interrupter, initiating disconnect break and action to shut off air from interrupting contacts.

position 5

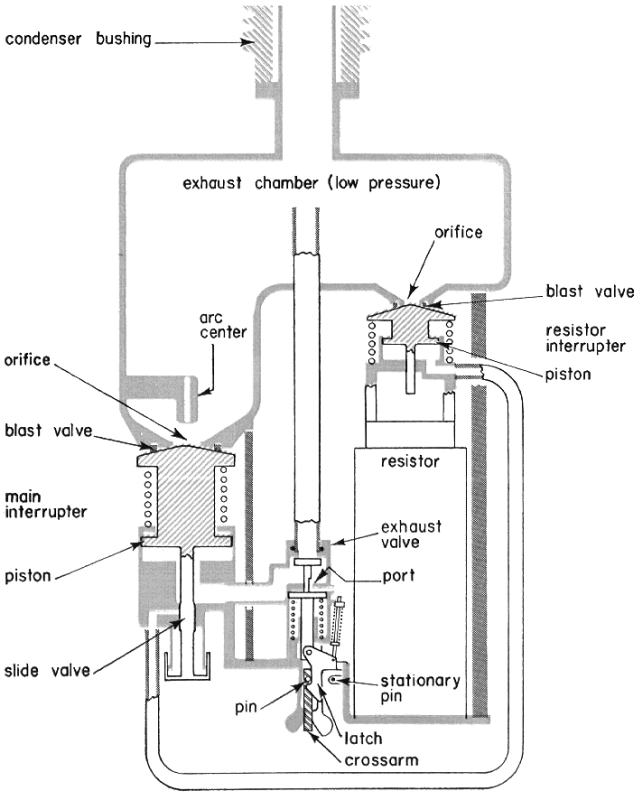


(Open) Cross bar maintains disconnect position by gravity. Interrupting contacts closed and air shut off.

reseating of the blast valves and disengages it from the sliding contacts. This provides for proper duration of the air blast, yet limits the amount of air used for circuit interruption, and provides a high pressure air gap between the interrupters and the crossarm isolator when the interrupter contacts reclose. The crossarm then moves to its full-open position.

The exhaust chamber has sufficient volume to collect the air from one interruption. It is normally at atmospheric pressure, but during the interruption its pressure builds up due to the limited exhaust area through the hollow condenser bushing. The back pressure reduces the air flow immediately following an interruption until the interrupting contacts reclose, thus conserving air.

Collecting the air in the exhaust chamber and exhausting it through the condenser bushing reduces the energy level of the exhaust air, thereby reducing the noise of breaker operation.



controls

In addition to conventional controls for the pneumatic closing mechanism, the breaker is equipped with:

1. Safety valves to limit tank pressure to a safe value
2. Low pressure alarm relays on each tank
3. Low pressure trip out or lock-in relay
4. Low pressure cutout on closing control

The breaker is designed to withstand standard ASA test voltages with full pressure in the tank—650 kv impulse full wave 1½—40 ms, 310 kv, 60 cycle, 1 minute dry withstand. With air in the tank at atmospheric pressure only, the insulation level is 200 kv impulse and 120 kv, 60 cycle dry, a safe margin.

No bleed air is required to keep insulation dry, resulting in low power costs for air supply.

air supply

Air supply requirements will vary with the number of breakers and frequency of operation.

Compressors supplying air at 1000 psi are recommended. Air will be stored in bottles at this pressure and supplied to the breakers through a reducing valve at 250 psi. Air drying is obtained from expansion of the high pressure storage air to the lower pressure breaker operating air. This reduction in pressure reduces the relative humidity to approximately 16 percent and reduces the dew point by 40° F.

Air storage capacity is recommended such that, when supplemented by compressor operation, the three tanks per breaker can be completely filled in approximately 20 minutes.

typical specifications

Type 1380CA10,000 compressed air circuit breaker, 3-pole, single-throw, 1600 amperes, 138 kv, pneumatically operated, mechanically and electrically trip-free mechanism, dead tank, I-beam base mounted for outdoor service.

The published interrupting capacity of this breaker is 10,000 mva or 42,000 arc amperes at 138 rated kv, based on the standard 2-CO duty cycle with 15-second interval. The four-second rating is 44,000 amperes, momentary rating 66,000 amperes.

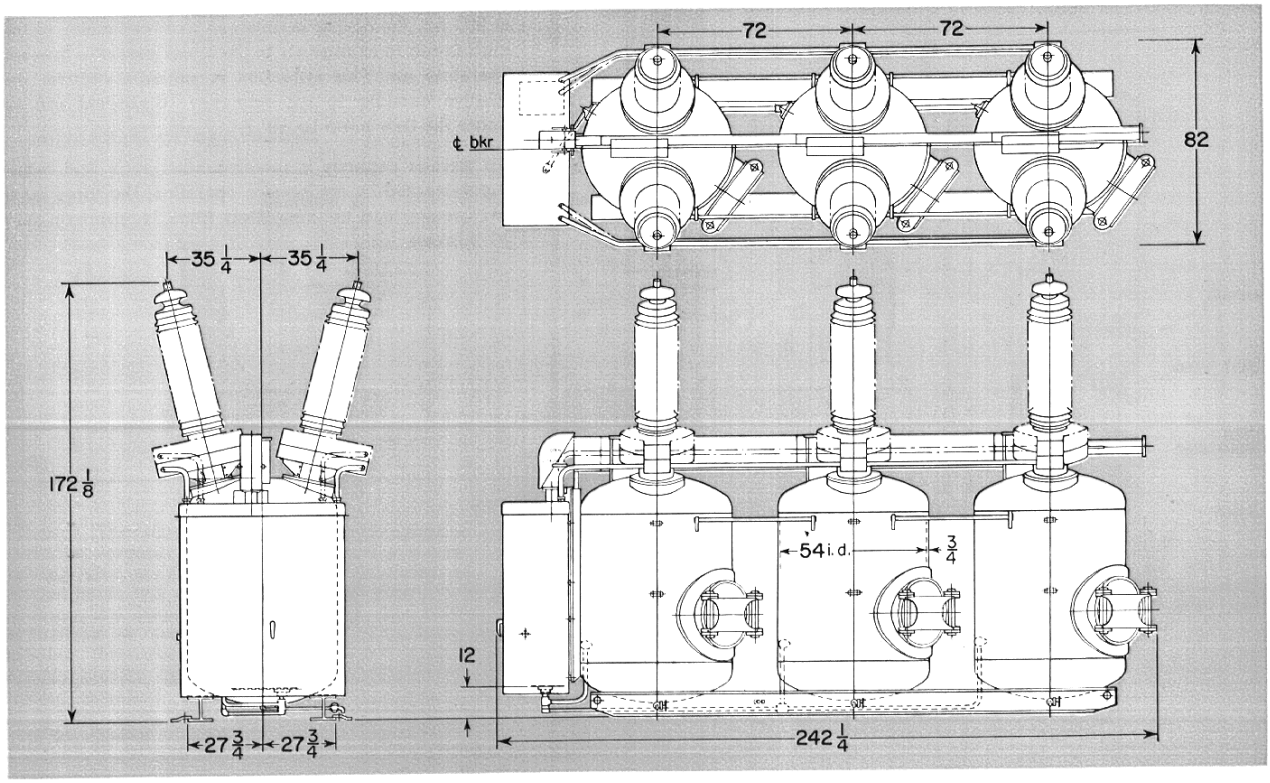
With this circuit breaker are included:

1—Welded structural steel I-beam base
1—Set of type O condenser bushings, each with potential tap for use with bushing potential device
1—Set of line terminals when specified by Purchaser as to type (clamp or tube) and size
1—Set of weatherproof metal conduit for transformer leads
6—Bushing current transformers, multi-ratio, 2000-5 amperes maximum, with cases (space is available for 12 BCTs)
1—Air drain valve per tank
1—Mechanical indicator to denote whether breaker is "open" or "closed"
1—Weatherproof mechanism housing attached to the end tank and within which is mounted:
  1—125-volt d-c controlled pneumatic closing mechanism (AA-10)
  1—125-volt d-c shunt trip coil
  1—Control relay panel upon which will be mounted electrically trip-free control relay and two 2-pole fused knife switches, one for control circuit and one for heaters.
  1—Complete set of pneumatic pressure switches, including low pressure alarm, low pressure trip or lock-in, and low pressure cutout on closing control
  1—set of terminal blocks
  1—type W rotary auxiliary switch, 11-pole
  1—type W cutoff switch, 2-pole
  1—latch-checking switch
  1—operation counter
  1—set of heaters
  1—set of valves for control of air supply to breaker

accessories

1—maintenance closing device
1—set of tools for contact inspection and maintenance
1—air supply system, including compressors and storage units, as required for the particular installation

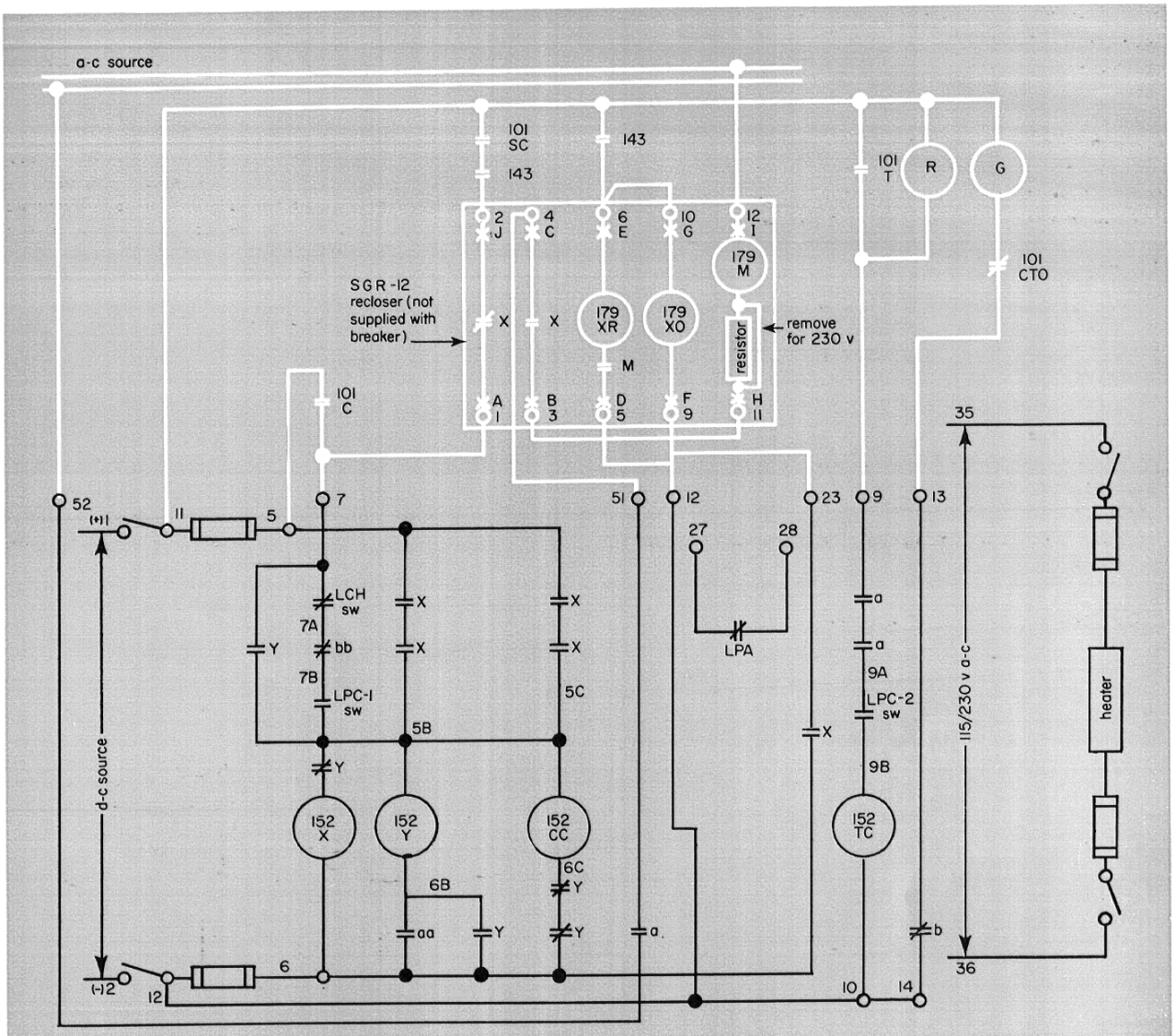
dimensions in inches



compressed air breakers
outdoor type 1380CA10,000

10,000 mva • floor mounted • 1600 amperes
dead tank construction • 3 cycles

wiring diagram

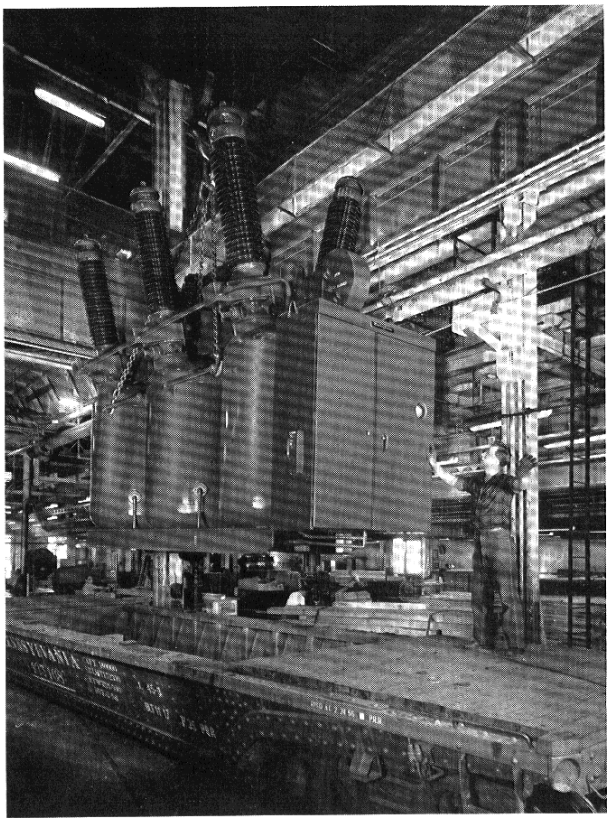


legend:

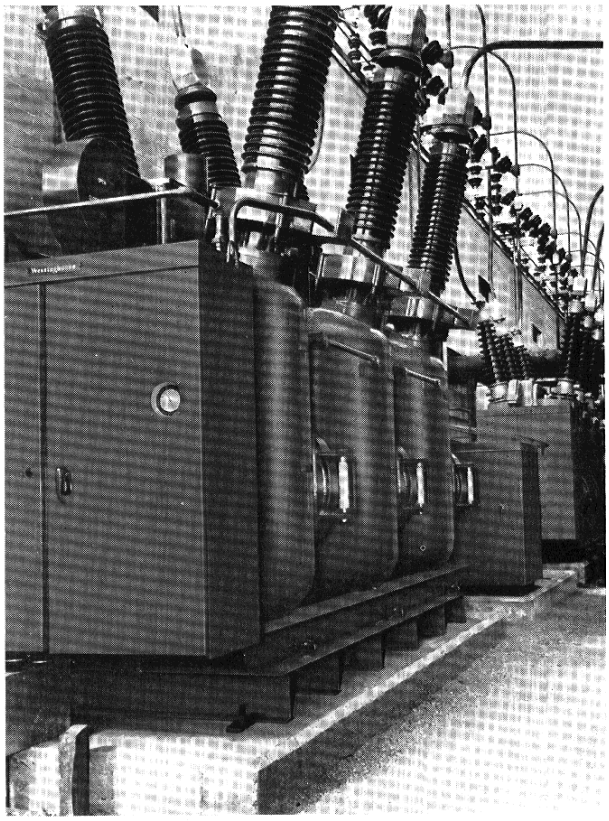
note: 1. auxiliary switches shown for open breaker
2. relay contacts shown de-energized
3. pressure switch shown for low pressure

⊣⊢ open contacts	LCH	latch check switch	X test switch
⊣/⊢ closed contacts	LPA	low pressure alarm (closed on low pressure)	143 toggle switch
152CC intake magnet valve coil	LPC	low pressure cut-out (open on low pressure)	-O- accessible terminals
152TC trip coil	101	control switch	— external control circuits
			— breaker control circuits

shipping and installation



Type 1380CA10,000 Breaker being loaded for shipment into a wellcar at the East Pittsburgh Plant. Note the ease of handling of the completely assembled three-pole breaker.



Type 1380CA10,000 Breaker as installed in the customer's power station. These breakers were installed on existing foundations for 3500 and 5000 mva, 138 kv oil circuit breakers.

further information

prices	price list 33-420
AA-10 mechanisms	descriptive bulletin 33-350
condenser bushings	descriptive bulletin 33-354
current transformers	descriptive bulletin 33-356
potential devices	descriptive bulletin 33-357

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