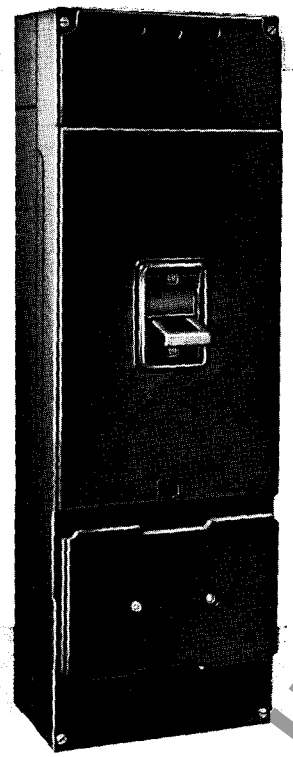
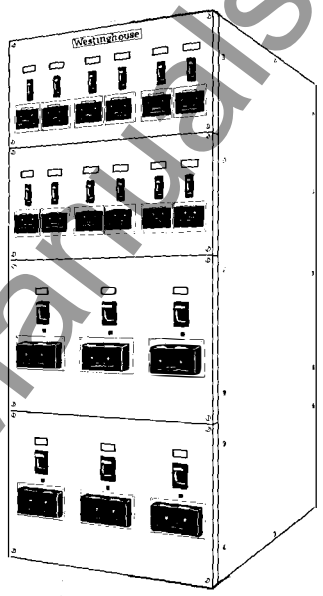
TRI-PAC® circuit breakers

current limiting protectors for lighting, power and distribution circuits

15 to 600 amperes • 600 v a-c, 250 v d-c
interrupting capacity 100,000 sym rms amps





description

The TRI-PAC breaker is essentially an AB De-ion® circuit breaker incorporating a current-limiting device which enables it to be used on distribution systems where fault currents up to 100,000 symmetrical rms amperes are available.

As the name implies, it is a TRIple PACkage of protection—1. time delay thermal trip, 2. instantaneous magnetic trip, and 3. current limiting protection—combined and coordinated in a single compact and economical device.

The current limiters are mounted in a removable molded housing. They are specially designed to coordinate with the breaker's thermal magnetic trip so that on overloads or short circuits below a predetermined value the circuit is cleared by the thermal magnetic tripping elements without affecting the limiters. However, on high magnitude short circuits the current limiting devices interrupt the fault.

application

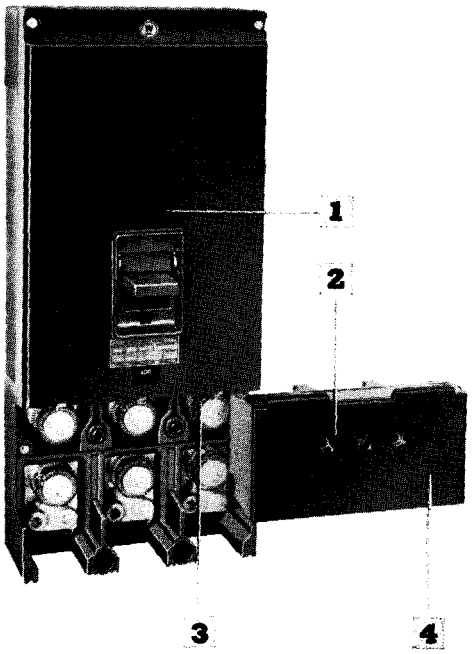
TRI-PAC breakers are used on low voltage distribution systems when the available fault current is above the interrupting ratings of standard molded case breakers but does not exceed 100,000 symmetrical rms amperes.

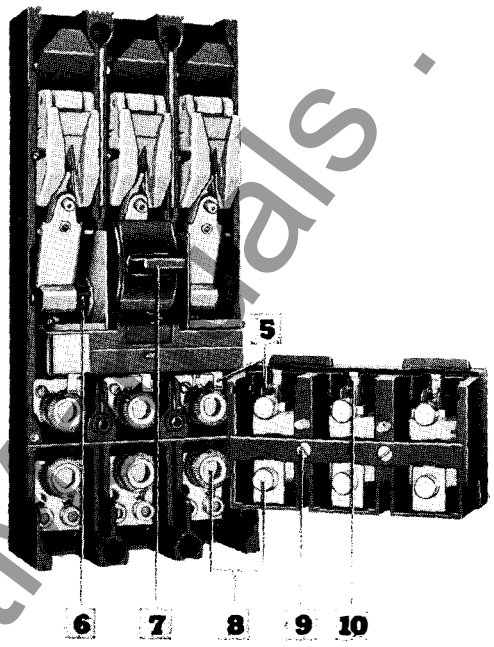
They are designed for use in switchboards, control centers, panelboards, combination starters, bus duct plug-in units and separate individual enclosures. In addition, they are suitable for application as main breakers and for protection of branch and feeder circuits and connected apparatus. When properly applied, TRI-PAC breakers may also be used for the back up protection of standard molded case breakers.

For more detailed application information see application data 29-161.

March, 1958
new information
mailed to: E/243/DB :D63-5C :C25-5Y

general design features





1 **retain all features of standard AB De-ion circuit breakers:** TRI-PAC breakers are built to the same exacting design standards and by the same methods as conventional Westinghouse molded case circuit breakers. They retain all the features of standard breakers including: De-ion arc quenchers, nonwelding silver alloy contacts, common trip and Moldarta case. (For complete details see descriptive bulletin 29-150.)

2 **compact, easy-to-remove current limiter housing:** Current limiters are contained in a single, compact Moldarta housing. It is front removable for easy access to current limiters when replacement is necessary. Limiters are correctly aligned and held in place by a retaining bar so that when the housing is pulled out all are disengaged from their receptacles simultaneously.

3 **limiter housing safety interlock:** When the limiter housing is removed a safety interlock trips the breaker **before** the limiter stabs disengage. Therefore, these terminals are **never** required to interrupt current. This interlock also prevents closing of the breaker while the limiter housing is removed so that it is impossible to come in contact with "live" parts.

advantages

- **provides complete protection in one compact device:** TRI-PAC breakers combine time delay thermal trip, instantaneous magnetic trip and current limiting protection in one compact device.
- **lower initial cost:** Since fault currents as high as 100,000 symmetrical rms amperes are common in many low voltage distribution systems, circuit interrupting devices larger and more expensive than the largest molded case breaker were often needed. Other methods, such as high impedance transformers or current limiting reactors have been used but are often unsatisfactory because of constant power loss, poor regulation and greater overall cost. Now, economical TRI-PAC breakers provide safe, adequate protection at far less cost.
- **lower installation cost:** Because TRI-PAC breakers are current limiting, peak available "let thru" currents are substantially reduced. Consequently, thermal and magnetic stresses are reduced and bracing of conductors for maximum available currents is not necessary.
- **averts single phasing:** Possibility of single phasing is eliminated because of common tripping of all poles when fault occurs. (See 6 under "general design features".)
- **minimum "down time":** Ordinary faults are cleared with no unnecessary outages and current limiter replacement (which is needed only on infrequent high current faults) is held to a minimum.
- **impossible to use improper limiters:** Since their current limiters are specifically designed for use with TRI-PAC breakers they are always properly coordinated. The danger of misapplication, such as is possible with separately mounted fuses, is eliminated.
- **indicates magnitude and location of fault:** An extended limiter plunger indicates on which phase a fault has occured. Cause of tripping is indicated as outlined under 7 in "general design features."
- **limiter housing completely safe . . . provides simple, visible disconnect switch:** An interlock insures opening of the breaker contacts **before** limiter housing can be removed so that no "hot" parts are ever exposed. Removal of housing also serves as visible disconnecting means. (See 4 in "general design features".)
- **thoroughly tested:** All published ratings for TRI-PAC have been verified by thorough testing at the Westinghouse High Power Laboratories at East Pittsburgh, Pa.
- **retains all advantages inherent in standard molded case AB De-ion circuit breakers:** TRI-PAC combines the advantages of economical molded case breakers and high interrupting capacity current limiters, while the disadvantages of separately mounted devices are eliminated.
- **no loss of unused limiters:** Limiters which have not operated are good indefinitely and need no replacement.

4 visible disconnecting means: Removal of the limiter housing simultaneously removes the limiters. With the limiters removed it can be readily observed that the limiter contacts are open and that the circuit is disconnected

5 specially designed current limiters: When a high fault current causes one or more limiters to function a spring-loaded plunger is instantly ejected from the end of the limiter. The plunger strikes a breaker tripping element which breaks contact the instant the fault occurs.

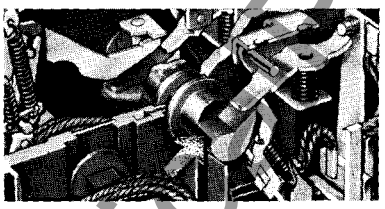
"good" limiter

plunger extended

An extended plunger on any limiter indicates, at a glance, on which phase the fault has occured so that testing of limiters is unnecessary. Presence of an extended plunger also prevents relatching of the breaker. Thus, "good" limiters must be used or the breaker cannot be operated. These limiters are not affected by the overloads or normal short circuits cleared by the thermal-magnetic action of the breaker, and unless they have cleared a high fault current, as evidenced by an extended plunger, they may be used without question.

Since these limiters are designed for use only with TRI-PAC breakers, safe, proper coordination is assured.

6 coordinated common trip to prevent single phasing: When a current limiter operates, the ejected plunger causes instant release of a common tripping bar inside of the breaker. All poles are opened simultaneously, eliminating the possibility of single phasing.



7 positive trip indication: When a breaker trips the handle always moves to the center "trip" position. In addition the **cause** of tripping is indicated in the following ways:

- If the breaker cannot be reset immediately after tripping but can be reset after a short period it indicates thermal tripping due to an overload or high resistance fault.
- If it can be reset immediately a "normal" fault current has been interrupted by instantaneous magnetic action.
- If the TRI-PAC cannot be reset, high fault interruption by the current limiter has taken place.

8 plug-in type limiter terminals: Studs on each current limiter engage "tulip" type connectors in the breaker base. Since the limiter housing provides perfect alignment this arrangement assures positive connection and easy removal of the limiters.

9 easy replacement of limiters: Loosening of two screws releases a retaining bar in the limiter housing and permits removal of limiters.

10 missing limiter interlock: This interlock, in the limiter housing, prevents the housing from being replaced unless all limiters are in place. Thus accidental single phasing is prevented, since the breaker cannot be reclosed when a limiter is missing.

11 choice of four terminal connections: TRI-PAC breakers are available with front connected pressure type terminals, panelboard connecting straps, bolted rear connected mounting studs and plug-in terminal mounting blocks.

12 accessories: TRI-PAC breakers accommodate many standard AB breaker accessories including: shunt trip, under-voltage trip and auxiliary contacts. Application of other accessories should be reviewed with Westinghouse.

typical specifications

When the interrupting ratings of standard AB breakers are less than the available fault current of the distribution system, TRI-PAC breakers as manufactured by Westinghouse shall be used.

These breakers shall be similar in construction to the standard Westinghouse AB breaker. On breakers with interchangeable, thermal, adjustable magnetic trip, the accessibility and position of the adjustment lever shall not be changed from those on the standard breaker. These breakers shall have continuous current ratings from 15 to 600 amperes; maximum voltage ratings of 600 volt a-c and 250 volt d-c; and interrupting ratings of 100,000 symmetrical rms amperes a-c and 100,000 amperes d-c.

The breakers shall combine time delay thermal trip protection, instantaneous magnetic trip protection and current limiting protection in one complete assembly. The above protective actions shall be so coordinated that overcurrents will be cleared by the thermal action; short circuits of relatively low magnitude will be cleared by the magnetic action; and high fault currents above a predetermined point will be cleared by the current limiters. The current limiters shall not be affected when the thermal and/or magnetic trip function to clear the circuit. Regardless of which tripping device serves to clear the circuit, all poles of the breaker shall open automatically.

The breaker must not be resettable until current limiters which have functioned have been replaced. The current limiters shall have a visual means to determine which one has operated and requires replacement.

The current limiters shall be mounted in a special housing, the cover of which shall be designed so that it is readily removable from the front. All limiters are to be removed simultaneously when the limiters housing cover is removed. A "missing limiter interlock" shall make reclosing of the breaker impossible when any current limiter is missing.

The following means of electrical connections shall be available:

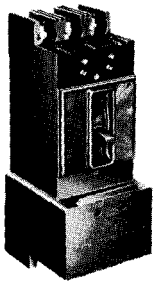
1. Front connected pressure type terminals.
2. Plug-in terminal mounting blocks.
3. Bolted rear connected mounting studs.
4. Panelboard connecting straps.

TRI-PAC circuit breakers
current limiting protectors for
lighting, distribution and power circuits

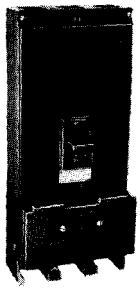
ratings and dimensions

type of TRI-PAC breaker

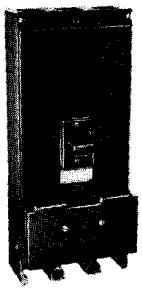
100 ampere type F



225 ampere type K



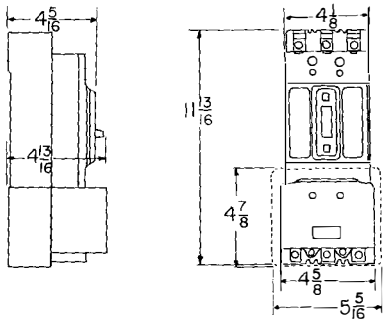
400 ampere type KL

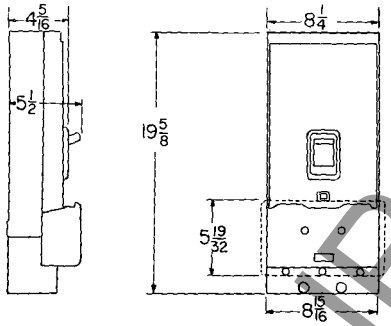


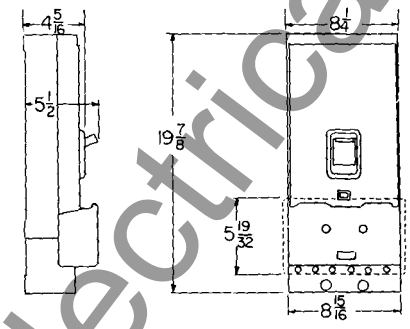
600 ampere type L

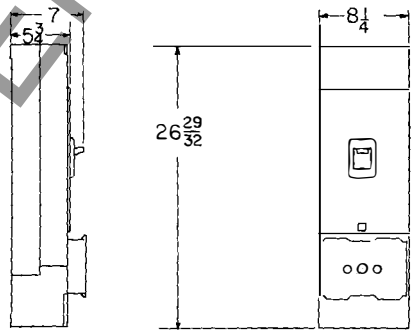
dimensions

(approximate inches)









ratings

all TRI-PAC breakers	a-c voltage	600 volts
	d-c voltage	250 volts
	interrupting rating	100,000 symmetrical rms amperes

ampere ratings

15
20
30
40
50
70
100

ampere ratings

125
150
175
200
225

ampere ratings

125
150
175
200
225
250
300
350
400

ampere ratings

125
150
175
200
225
250
300
350
400
500
600

further information:

prices:
price list 29-120

application:
application data 29-161

detailed dimensions:
dimension sheet 29-170

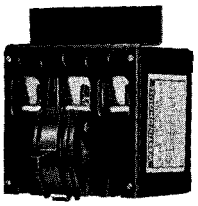
Westinghouse Electric Corporation
standard control division: Beaver plant • Beaver, Pa.
printed in U.S.A.

disconnect switches
Visi-Flex® De-ion and De-ion

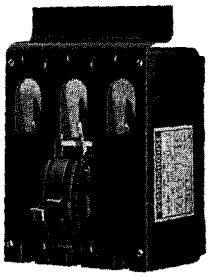
amperes: 30, 60, 100 and 200
maximum volts: 600 v a-c • 250 v d-c

De-ion switches

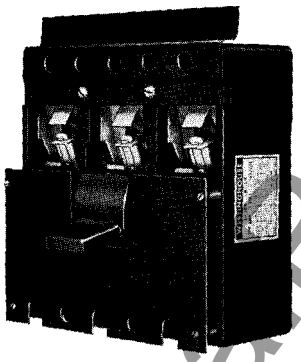
30-60 ampere



100 ampere

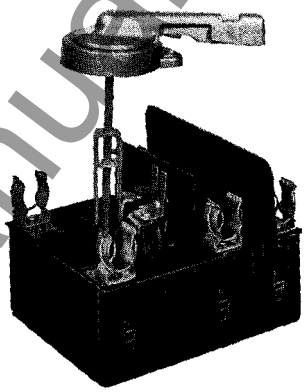


200 ampere

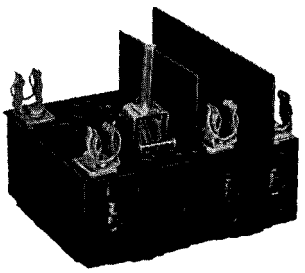


Visi-Flex De-ion switches

model A



model T



application

Westinghouse disconnect switches are designed for use as load break devices in combination starters, switchboards, separate enclosures and control panels for machine tools, motor generators and wiring equipment. Listed with Underwriters Laboratories, Inc.

advantages

visible contacts: Openings above the contacts enable one to see whether the contacts are open or closed. Fills the needs of industrial plants where safety codes require visible contacts as an additional safety precaution for maintenance personnel.

compact design: Visi-Flex De-ion switches and De-ion switches are of sturdy construction and yet are the most compact units available for devices of this type.

quick-make, quick-break mechanism: The quick-make, quick-break over center toggle mechanism provides quick, positive action in opening and closing circuits. It prevents "teasing" the contacts.

de-ion arc quenchers: Instantly confine, divide and extinguish arcs and insure maximum contact life.

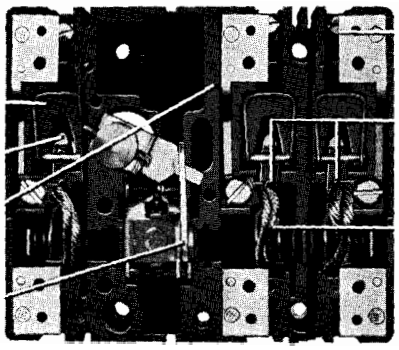
low watts loss: Silver alloy butt type contacts plus the use of electrically welded connections where possible, provide low resistance and low watts loss with increased economy of operation.

high interrupting capacity: Because these devices employ many construction features of AB breakers they are inherently high capacity load break switches.

January, 1961
new information
mailed to: E/243/DB; D63-5C; C/308/DB; C/312/CB

Visi-Flex De-ion switch

model A: Has a built-in adjustable depth mechanism and includes the Vari-Depth handle.



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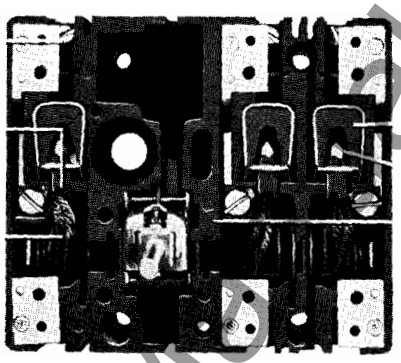
model T: Has a toggle handle and may be used with a Westinghouse slide plate handle mechanism.



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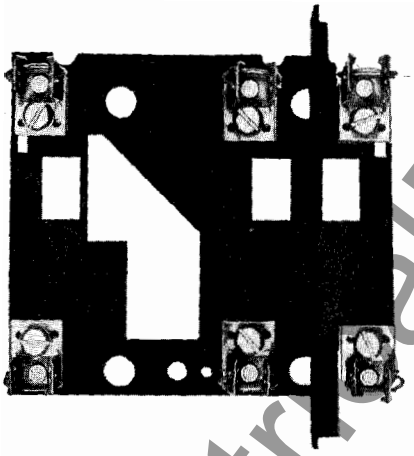
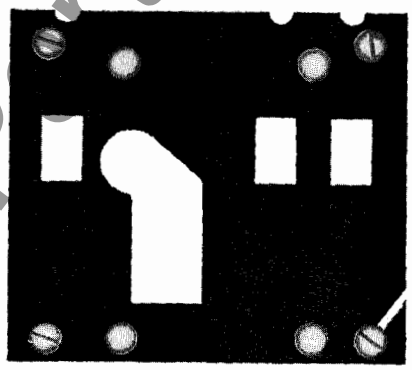
fuse kit



9

no-fuse kit



10
11

De-ion switch

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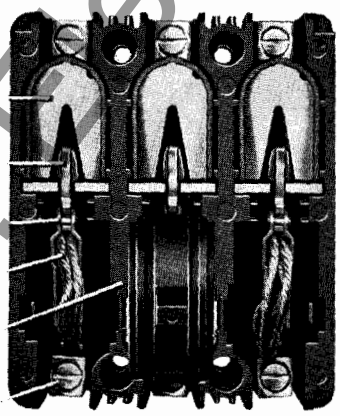
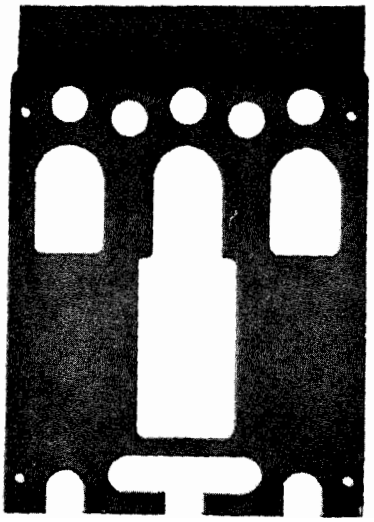




8a

Visi-Flex De-ion switch

The Westinghouse Visi-Flex De-ion switch is a compact load break disconnect of circuit breaker type construction. When fused it takes a minimum of mounting because the fuses are on top of the device. As the name implies contacts are visible and flexibility is achieved with various kits used on the basic switch.

Visi-Flex switches are available in two models and except for the handle mechanism, both models are the same and use the same supplemental kits and hardware. All mounting hardware is included with the basic switch. All switches have provision for auxiliary switch.

De-ion switch

The Westinghouse De-ion switch is a compact load break disconnect of circuit breaker type construction. These switches may be used with separately mounted fuses, if desired, as a fused motor circuit switch. To correspond to standard switches, ratings have been conservatively established at 30, 60, 100 and 200 amperes. Horsepower ratings, listed below, show that these devices have the highest capacity and smallest size of any comparable device. Switches have provision for auxiliary switch.

ratings

volts a-c	max. hp. 3-phase			
	30 amp	60 amp	100 amp①	200 amp①
120	5	7½	20	30
240	10	20	40	75
480	20	40	75	125
600	25	50	100	150
250 V. d-c	5	10	20	40

① De-ion switch nameplate shows no ratings above 50 hp to conform to maximum U/L listings. However, the De-ion switch design permits these maximum hp ratings to be applied.

construction

1 molded cases: Moldarta® and/or glass polyester cases combine built-in ruggedness and high dielectric strength in a compact design that is both space-saving and attractive.

2 De-ion arc quenchers: Consists of a series of grid plates mounted in parallel between supports of insulating material. The slots in the steel plates extend directly over the contacts and draw the arc from the moving contact up into the divided chamber. The arc is thus confined, divided and extinguished in less than ½ cycle.

3 silver alloy contacts: For increased contact life and enduring low resistance, special alloys prevent sticking and welding.

4 free bearing surfaces: These are of dissimilar metals, which prevents bearing wear, allowing long service life.

5 corrosion-resistant: All parts are especially treated or selected to resist corrosion encountered in normal applications.

6 complete interpole barriers: Provide high dielectric strength and makes possible the small compact design.

7 firm connectors: Pressure type connectors are standard in all ratings and make efficient dependable connections.

8 screw driver slot (model A only): Added to operating mechanism on model A to give easier "on" or "off" operation when enclosure door is open.

8a Micarta® shield: A protective Micarta shield is provided to prevent contact with live parts or incoming lead lines.

9 fuse kit: Fuse kits mount atop switch minimizing space requirements and the cost of separate fuse blocks.

10 nylon screw: Single-piece nylon screws with large head and screw driver slot, pre-assembled on no-fuse shield. Screws are captive and self-threading.

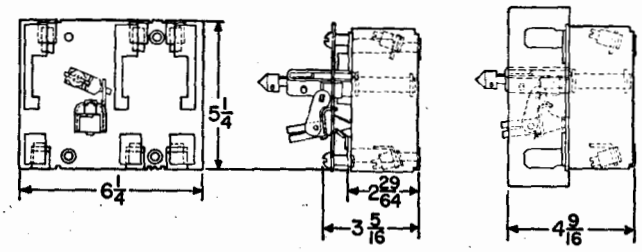
11 no-fuse kit: For use as a no-fused disconnect, a safety shield without fuse clips is available in all ampere ratings to prevent accidental contact with live parts or incoming leads.

dimensions, inches

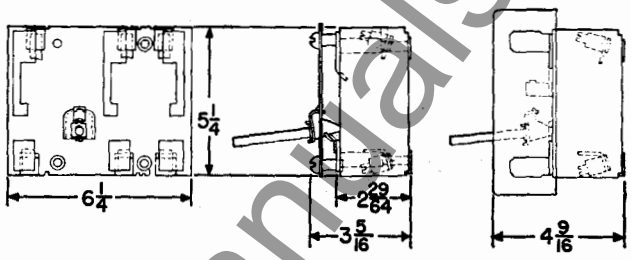
not to be used for construction purposes unless dimensions are approved

Visi-Flex De-ion switch • 30, special 60 and 60 amperes

model A

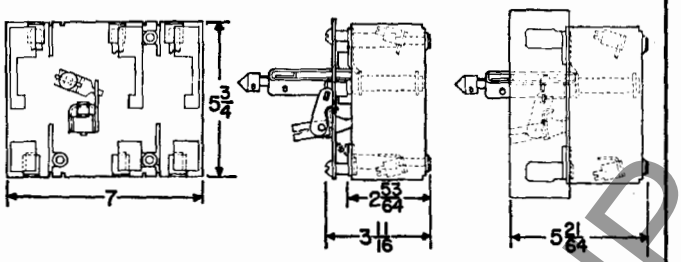


model T

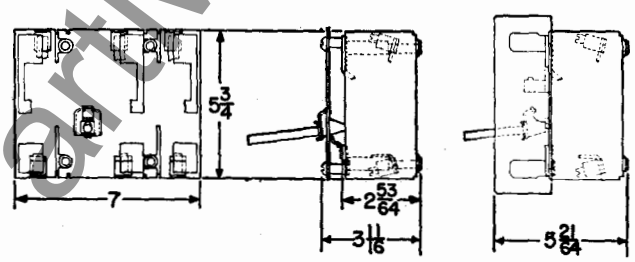


Visi-Flex De-ion switch • 60 and 100 amperes

model A

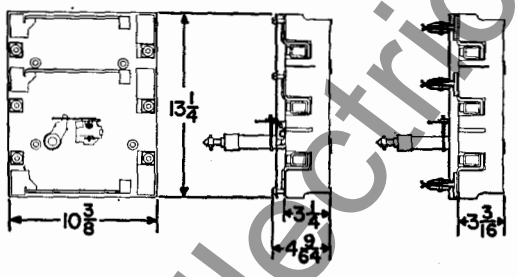


model T

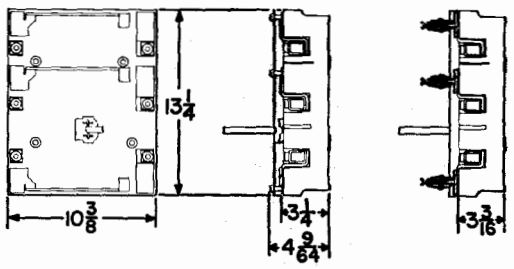


Visi-Flex De-ion switch • 200 ampere

model A

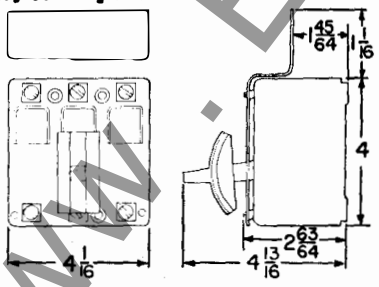


model T

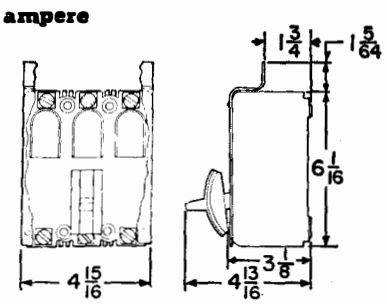


De-ion switch • 30, 60, 100 and 200 amperes

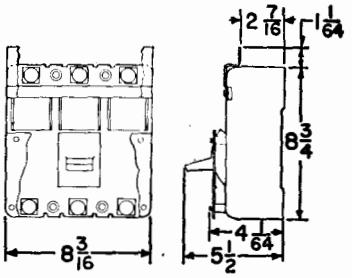
30, 60 ampere



100 ampere



200 ampere



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