



AB De-ion[®] circuit breakers

descriptive
bulletin

29-150

page 1

amperes: 15 to 2000

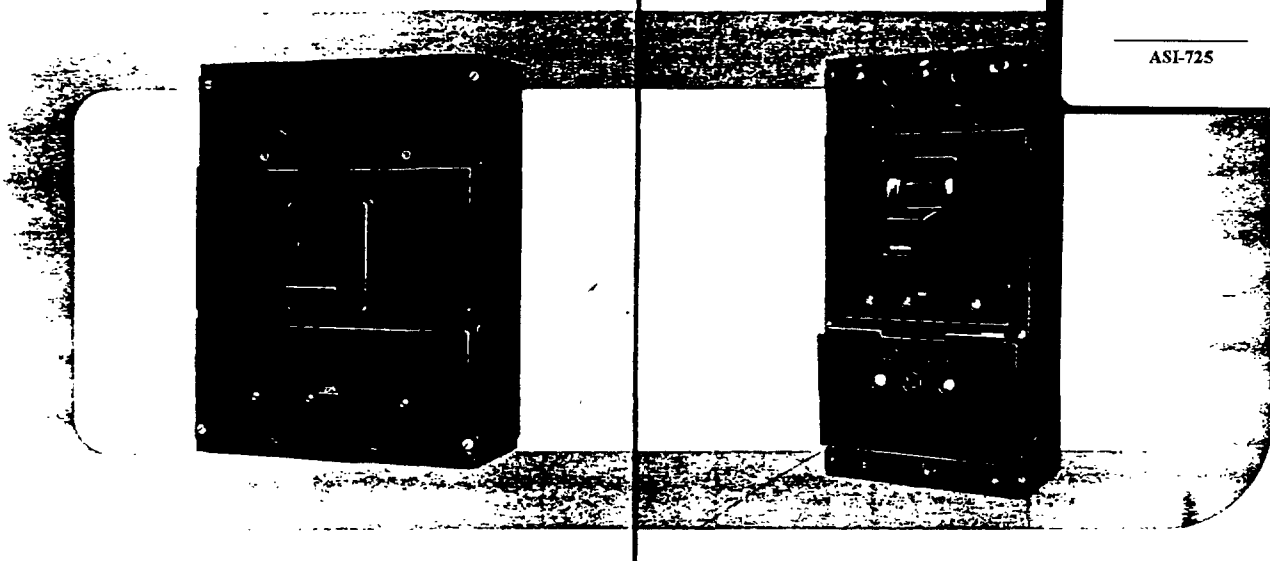
maximum volts: 600 volts a-c • 250 volts d-c

thermal magnetic

TRI-PAC[®]

PLAINTIFF'S EXHIBIT

ASI-725



application

Westinghouse molded case breakers are designed for circuit protection of low voltage distribution systems. They are suitable for application as main breakers and for protection of branch and feeder circuits and connected apparatus. These breakers provide overload protection for conductors and short-circuit protection for all circuit elements such as conductors, motors and starters.

They are designed for use in switchboards, control centers, panelboards, combination starters, bus duct plug-in units and separate individual enclosures. In these various enclosures they are applicable to the requirements of lighting, distribution and other power circuits.

Standard current ratings of AB De-ion circuit breakers correspond in general to the standard ratings in the N.E.C. Paragraph 240-7b. These breakers are primarily designed for the protection of conductors, both aluminum and copper.

advantages

accurate reliable protection: In a controlled temperature the overload element in each pole of every breaker is individually calibrated and tested to meet Underwriters' Laboratories, Inc. requirements. Especially hardened, ground and polished trip latches assure continuous and accurate tripping characteristics.

De-ion arc quenching: Using De-ion arc quenchers, developed by Westinghouse, AB De-ion circuit breakers positively extinguish

dangerous arcs in a fraction of a second. Coupled with a positive action quick-make, quick-break toggle mechanism, burning and pitting of contact surfaces is minimal and long circuit breaker life is assured.

reduced downtime and maintenance costs: Designed for repetitive duty, circuit breakers are long-lived, maintenance-free and prevent costly and unnecessary shutdowns. Because the breaker is a resettable device, downtime amounts to only a matter of seconds after the overload or fault has been corrected.

reduced operation cost: Incorporating welded internal parts, high contact pressure, and silver alloy butt type contacts, a circuit breaker offers considerably less resistance to electrical current than the fuse clips, bolted joints and hinge joints of a fusible device. With a lower watts loss, electrical power cost savings result when breakers are used.

single-phase protection: A fault or overload on any one phase opens all poles of the breaker minimizing the possibility of single-phasing polyphase motors.

dual protective elements: Bi-metallic thermal elements protect on overloads where inverse time tripping is desirable, magnetic trip elements operate the breaker instantly on dangerous fault currents. Trip-free, the breaker cannot be held closed under fault conditions.

maximum safety: Molded case circuit breakers are dead front and personnel are not exposed to "live" parts. Line terminal shields are available for additional protection when required.

tamperproof: The complete breaker or trip unit is sealed at the factory to prevent tampering and alteration of its rating.

March, 1965

supersedes descriptive bulletin 29-150, pages 1-16, dated August, 1960
mailed to: E/1136, 1137/DB; D/806/DB; C/308/DB; C/312/CB

21408



selection guide

type	Quicklag [®] P & B ^①	Quicklag [®] C	QCC	E and EA ^①	EH ^①	F and FA ^①
incl—Included in all cases. add—Accessory or modification available, price additions on respective breaker pages. spec—Specify when required.						
	1, 2, 3 poles 10-100 amps @ 40°C	1, 2, 3 poles 10-100 amps @ 40°C	2, 3 poles 125-225 amps @ 40°C	1, 2, 3 poles 15-100 amps @ 40°C	1, 2, 3 poles 15-100 amps @ 40°C	2, 3 poles ^① 15-100 amps @ 40°C
dimensions, inches • 3-pole						
height	27 $\frac{3}{8}$	33 $\frac{3}{8}$	7	6	6 $\frac{1}{2}$	FA 6 $\frac{1}{2}$ F 9 $\frac{1}{8}$
width	3	3	4 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{4}$	4 $\frac{1}{4}$
depth	2 $\frac{3}{4}$	2 $\frac{3}{4}$	2 $\frac{1}{16}$	3 $\frac{3}{8}$	3 $\frac{3}{8}$	3 $\frac{3}{8}$
a-c ratings						
max. voltage	120/240, 240	120/240, 240	120/240, 240	120, 240/277 ^①	277, 480	600
interrupting ratings U/L NEMA	5,000 5,000	5,000 5,000	10,000 10,000	5,000 7,500	10,000 ^② 10,000 ^②	10,000 240v 480v 600v
						20,000 15,000
d-c ratings						
max. voltage	①	①	①	125, 125/250	125 250	250
interrupting ratings U/L NEMA				5,000 5,000	5,000 10,000	10,000 10,000
features						
De-ion arc chutes	incl	incl	incl	incl	incl	incl
quick-make, quick-break	incl	incl	incl	incl	incl	incl
thermal magnetic trip	incl	incl	incl	incl	incl	incl
adjustable magnetic trip	no	no	no	no	no	spec ^③
interchangeable trip unit	no	no	no	no	no	no
accessories or modifications^{③④}						
drawout frame	no	no	no	no	no	no
magnetic trip only	no	no	no	no	no	spec
non-automatic	no	no	spec	spec	spec	spec
shunt trip	no	no	no	add	add	add
undervoltage trip	no	no	no	no	no	add
auxiliary switch	no	no	no	add	add	add
alarm switch	no	no	no	no	add	add
mechanical interlock	no	no	no	add	add	add
field discharge contact	no	no	no	no	no	no
center studs	no	no	no	add	add	add
rear connecting studs	no	no	no	add	add	add
ground current limiter	no	no	no	no	no	add
reverse current trip	no	no	no	no	no	no
575 volt d-c arc chutes	no	no	no	no	no	no
moisture-fungus treatment	add	add	add	add	add	add
motor operator	no	no	no	add	add	add
enclosure handle mechanism	no	no	no	add	add	add
parallel connections	no	no	no	add	add	add
handle lock devices	add	add	add	add	add	add
ambient compensation	no	no	no	add	add	no

① Changed or added since previous issue.

② On magnetic interrupters only.

③ Single pole 15 and 20 amp ratings for 277/480 volt a-c circuits.

④ Not U/L listed.

⑤ 2-pole unit supplied in 3-pole frame.

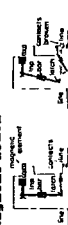


protective action

thermal action



magnetic action



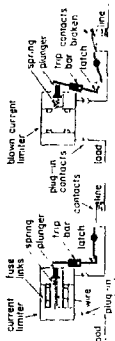
thermal magnetic action



thermal (ambient-compensating) magnetic action



current limiter action in TRIPAC circuit breakers



A thermal element is generally best suited for conductive overload protection because its rating changes in about the same ratio as the average conductor rating changes with ambient temperature variations. The thermal element consists of two bonded strips of metal having different rates of thermal expansion. The heat of an overcurrent causes the thermal element to bend, the metal having the greater rate of expansion bending more than the metal having the lower rate of expansion. This bending causes the thermal element to move and open the contacts, thus providing a long time delay on light overloads and instant response on heavy ones.

In the action an electromagnet element is used. When a predetermined current flows through the coil, the armature is attracted, causing the magnetic element to move and open the contacts. Magnetic trip settings of conductors can be adjusted by varying the air gap. Magnetic trip settings can be adjusted enough to allow for load current currents and still protect against light overload. A magnetic only breaker provides short-circuit protection only.

Combining the features of both actions, Westinghouse thermal magnetic breakers provide instant action on short currents, yet allow instantaneous overloads such as motor starting currents and initial lighting surges, and are thus best suited to most applications.

Ambient compensation is obtained by using an additional bimetallic element which counteracts the effect of ambient temperature changes on the thermal element. (The magnetic element has no temperature effect.) This bimetallic element provides a practically constant current rating over a wide range of ambient and is particularly suitable where there are unusually high, low or fluctuating temperatures.

TRIPAC breakers have thermal magnetic and current limiting action. For safety, the current limiting action is limited to the same as the thermal action. The thermal action is limited to the same as the thermal action for standard breakers. When a breaker is encountered, the silver links in the current limiter melt, thus opening the circuit. The action occurs with such rapidity that the current is limited to a relatively low value. Simultaneously, the magnetic action of the breaker also functions to open the breaker contacts and aids in clearing the short circuit. A wire holding a plunger against the contacts will move when the silver links melt. The action causes the plunger to be extended holding the trip bar in the unlatched position. Therefore, it is impossible to reclose the circuit breaker until the blown limiter is replaced. Interlocks (not shown) will prevent relatching of the breaker if a limiter is omitted and will also open the circuit breaker contacts before the limiter plug-in contacts are broken if an attempt is made to remove the limiter housing assembly with the breaker in the "on" position.

thermal magnetic breakers

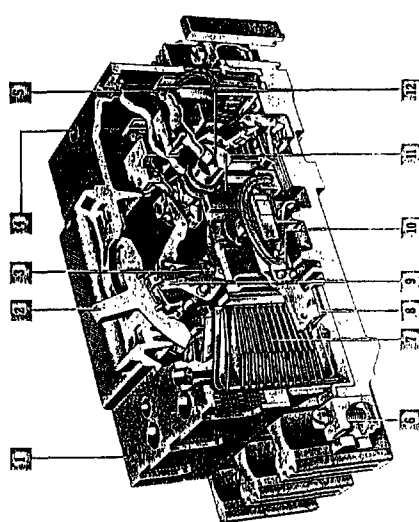


availability: Quicklags through PA breakers

application

A general purpose breaker suitable for wide application that has become a standard for the protection of low voltage distribution systems. Supplied for branch and feeder overcurrent and short-circuit protection they are widely used in panelboards, switchboards and similar apparatus. Special breaker types, which are variations of the thermal magnetic breaker, are shown on pages 6, 7 and 8. Thermal magnetic breakers have all the design features shown including thermal overload protection plus a magnetic trip element for instantaneous protection against high fault currents. Type EA and larger breakers accommodate a wide variety of modifications as shown on pages 10 through 15.

general design features



amperes: 15 to 2000

maximum volts: 600 volts a-c • 250 volts d-c

1 molded cases

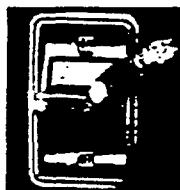
Moldarra S and/or glass polyester cases combine built-in ruggedness and high dielectric strength in a compact design that is both space-saving and attractive. Mechanism is entirely enclosed providing maximum safety.

2 positive indication

Position of handle gives positive indication of whether circuit breaker is on, off or tripped.



on: Handle in this position indicates that the circuit is closed or on.



tripped: When the breaker trips automatically due to overload or short circuit, the handle moves to a position midway between the manual on and off.



off: Handle is in this position when circuit is open or off. To restore service after automatic tripping, handle is first moved from center to off and then to on.

3 free bearing surfaces

Bearing surfaces are of dissimilar metals. This prevents bearing wear, allowing long service life.

4 factory sealed

Smaller breakers are sealed to prevent tampering and changing of calibration. In the KA, LA, MA, PA, HK, HLA and HMA frames the trip units are individually sealed and are interchangeable by removing the breaker cover.

5 accurate protection

All tripping members have ground and polished latch surfaces and are heat-treated to prevent distortion. Heat-treated bi-metals retain calibration permanently.

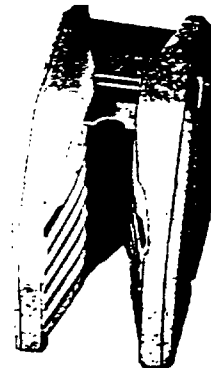
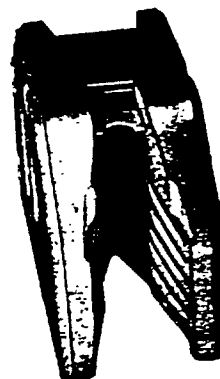
6 firm connectors

Pressure type connectors are standard with all ratings above 30 amperes and make efficient dependable connections. Quicklag and E frame breakers rated 30 amperes or less have screw type

terminals. Terminals suitable for copper or aluminum cable are supplied as standard on 100 ampere breaker frames. Breaker frames rated 225 ampere and above are supplied with terminals suitable for copper cable only as standard. In these frames, terminals suitable for either aluminum or copper cables can be specified.

7 De-ion arc quenchers

This Westinghouse development 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 1/2 cycle.

**8 silver alloy contacts on all breakers**

For increased contact life and enduring low resistance; special alloys prevent sticking and welding.

9 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.

10 electrically welded connections

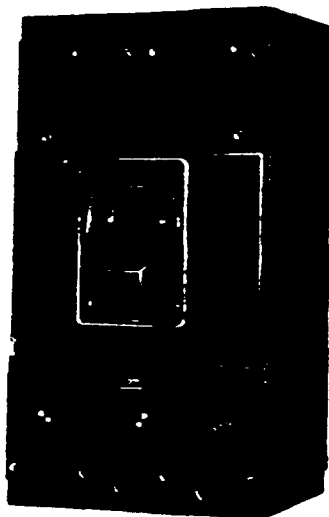
Firm, strong welded connections assure long life. Provide low resistance and low watts loss, with increased economy in operation.

11 complete interpole barriers

Completely isolate one pole from another, eliminate possibility of phase-to-phase flashover.

12 common-trip

Multi-pole units have insulated common-trip bar that opens all poles when an overload occurs in any one phase. Minimizes possibility of single phasing.



availability: EA through MA breakers

application

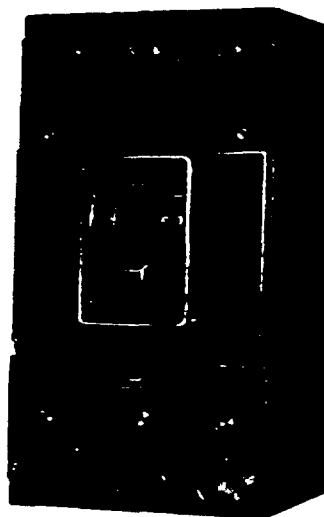
Ambient compensating breakers provide a practically constant current rating over a wide range of temperatures and are thus suitable where unusually high, low or fluctuating temperatures are encountered. These breakers minimize the need for derating in higher ambient temperatures.

construction

Has all the standard design features shown on pages 4 and 5.

Ambient compensating breakers are calibrated at 25°C. However, due to a built in compensator these breakers will carry approximately the same current at other ambients with a very small ampere rating change. The trip units are thermally compensated to carry rated load at 50°C while still meeting U/L tripping requirements for 25°C breakers at 25°C. Ambient compensated breakers do require slight derating at ambients above 50°C.

These breakers differ from specifically calibrated breakers, in that the latter do not utilize compensators, but are specifically calibrated for the ambient in which they are to be applied.



availability: FA through PA breakers

application

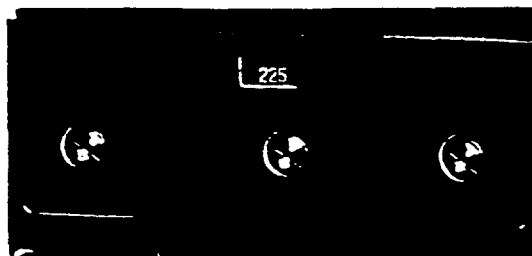
Magnetic only breakers are designed specifically for short-circuit protection for use on systems where overload protection is provided by other means. This type breaker is not listed with Underwriters' Laboratories, Inc.

construction

Has all the standard design features shown on pages 4 and 5 except that it does not have a thermal trip element.

front-adjustable magnetic trip

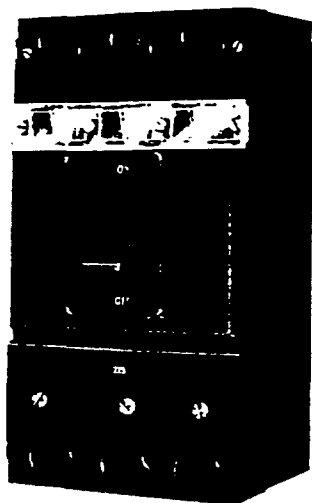
Each breaker is calibrated at the factory for a specific trip range and set on the high side. Adjustment knobs located in the front cover can be adjusted downward to a specific requirement within the specified range. The adjustment knobs, made of red nylon, have 5 definite main setting positions and 4 mid-setting positions. The magnetic trip is so designed that each point follows a linear scale and each of the 9 settings has a significant value, within calibration tolerances.



amperes: 15 to 2000

maximum volts: 600 volts a-c • 250 volts d-c

Saf-T-Vue Breakers



availability: EA through MA breakers

application

This breaker allows 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.

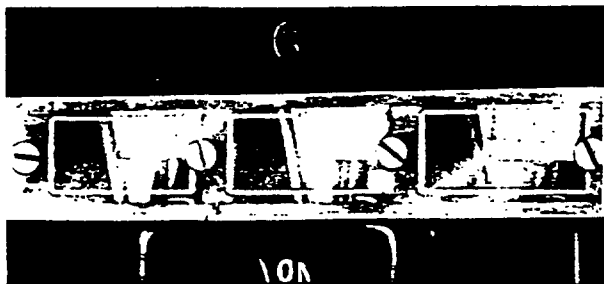
construction

Has all the standard design features shown on pages 4 and 5.

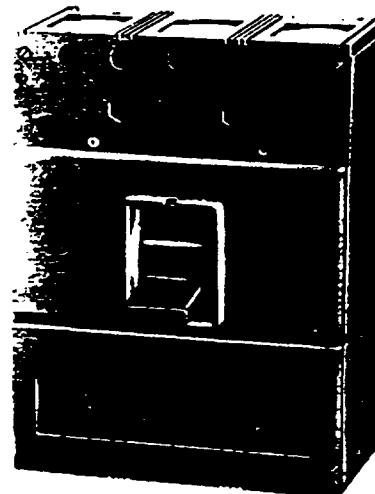
Immediately over the arc extinguisher, a plastic type window is inserted into the cover to permit easy viewing of the contacts. Thus, by visual inspection it can be readily determined whether the breaker is "open" or "closed".

Saf-T-Vue's transparent window is made of clear, heat-resistant thermoplastic—won't scorch or cloud on normal overloads.

Available on thermal-magnetic, magnetic only and ambient compensating breakers. Not available in the MARK 75 and TRI-PAC lines.



MARK 75 Breakers



availability: HF, HK, HLA and HMA breakers

application

The increased interrupting rating of this breaker makes it ideally suited for use in network systems, where high fault currents are available.

Special calibration, ambient compensation and various attachments are available in addition to the high interrupting capacity.

construction

Has all the standard design features shown on pages 4 and 5.

The MARK 75 differs from the standard thermal magnetic breaker in that the construction provides improved performance that permits application on circuits that will deliver 75,000 amperes at 240 volts a-c.

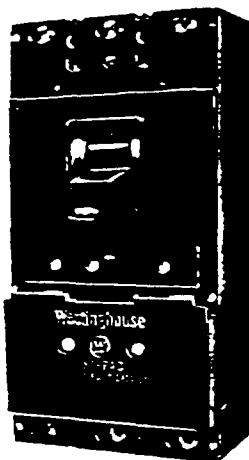
magnetic-only MARK 75

Types HF and HK MARK 75 magnetic-only breakers are not front-adjustable. Type HF is supplied with fixed magnetic trip setting only with trip set between 9 to 11 times nominal rating of breaker. Type HK is adjusted by removing the cover and adjusting the levers on the load side of the trip unit.

Types HLA and HMA are front adjustable. Red adjustment knobs are located in the front cover and can be adjusted to specific requirements.



TRI-PAC Breakers



availability: TRI-PAC types F through L

application

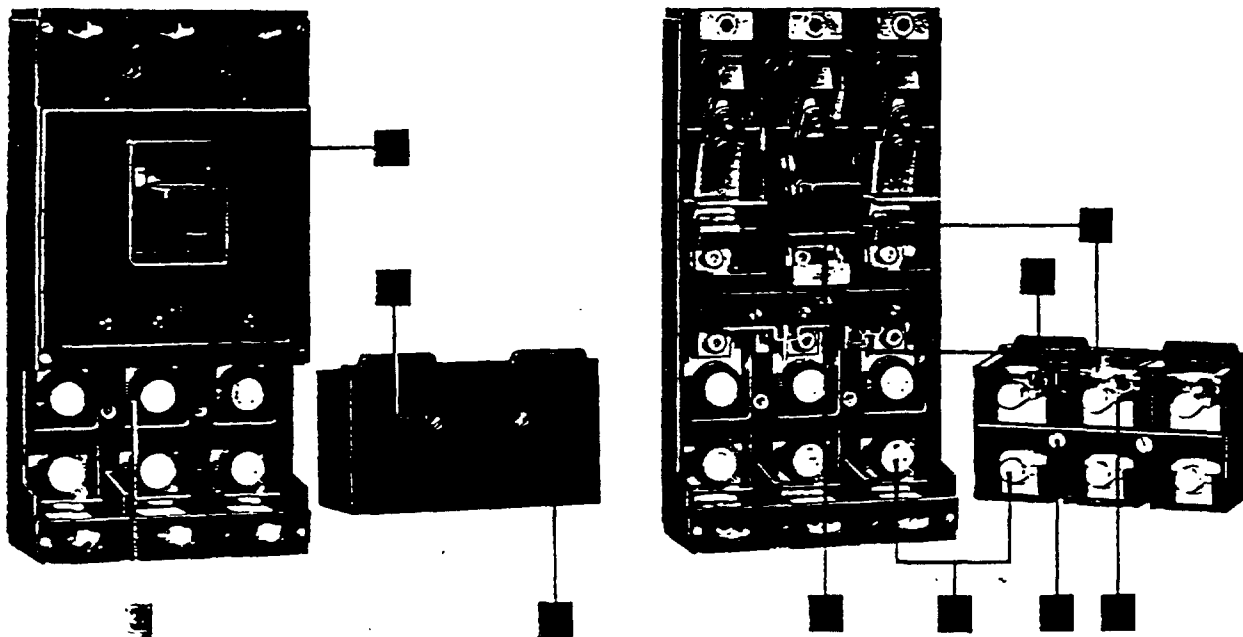
The TRI-PAC breaker is essentially an AB De-ion circuit breaker incorporating a current-limiting device which enables it to be used on distribution systems where fault currents up to 100,000 symmetrical rms amperes are available.

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.

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.

TRI-PAC Breakers in Switchboards



amperes: 15 to 2000

maximum volts: 600 volts a-c • 250 volts d-c

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® and/or glass polyester cases.

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.

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.

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.

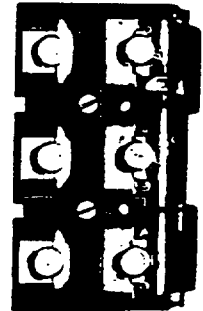
specially designed current limiters: When a high fault current causes one or more limiters to function, a spring-loaded plunger is instantly ejected from the end of the limiter. The plunger strikes a trip bar which causes the breaker contacts to open the instant the fault occurs.

An extended plunger on any limiter indicates, at a glance, on which phase the fault has occurred 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.



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



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.

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.

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

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.

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

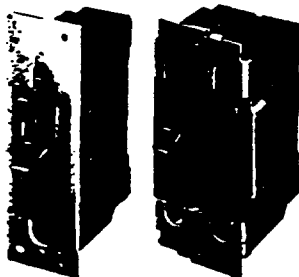
accessories: TRI-PAC breakers accommodate many standard AB breaker accessories including: shunt trip, undervoltage trip and auxiliary contacts. Application of other accessories should be reviewed with Westinghouse.



accessories

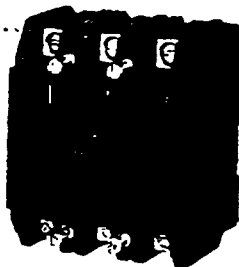
AB breakers are, for the most part, used in conjunction with . . . or built into . . . other equipment such as panelboards, switchboards and numerous types of enclosures. Realizing that matched parts mean flexibility and time-saving assembly for the builder, Westinghouse offers the following:

Quicklag faceplate • availability: Quicklag C



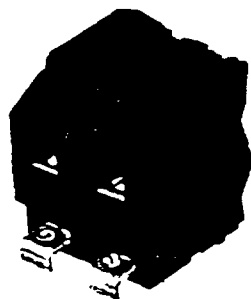
For front panel mounting. Faceplate snaps over the front of the single-pole breaker, is a two-piece wraparound on the two-pole breaker.

Quicklag front mounting inserts: availability: Quicklag C



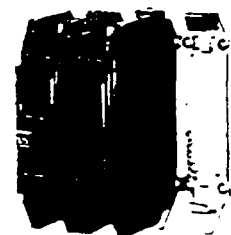
For front panel mounting. Self tapping inserts screw into cover rivet holes of 2 and 3-pole Quicklag C breakers.

Quicklag clamp • availability: Quicklag C



For base mounting of Quicklag breakers on panels. Two needed per breaker.

Quicklag base mounting plate • availability: Quicklag C



Plates accommodate six single-pole, three two-pole or two three-pole breakers. Can be cut for specific need.

handle locks:

Various handle locks are available to prevent either accidental or deliberate operation of circuit breakers. The "trip free" handle of the AB De-ion circuit breaker enables it to trip on overload or short circuit conditions, even though handle locks are in place.

for Quicklag breakers

Lockdog • availability
all Quicklags—non-padlocking, removable



padlock attachment

availability • all Quicklags—
padlockable, removable



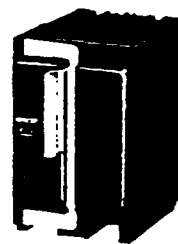
padlock device

availability • all 1 pole
Quicklags padlockable, non-removable; meets requirements of California Code

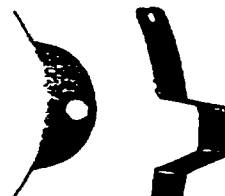


padlock device

availability • 2 and 3 pole
Quicklag types P and B and QCC padlockable, non-removable; meets requirements of California Code



for industrial breakers



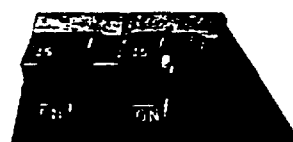
padlockable non-padlockable

handle locks

availability • EA through MA
Padlockable Unit meets requirements of California Code

handle ties •

standard • availability: Quicklag P, B and C breakers



For use with adjacent pairs of breakers which are not interconnected. Affords true trip indication, bars single-pole operation when double-pole manual switching is required.

amperes: 15 to 2000

maximum volts: 600 volts a-c • 250 volts d-c

page 11

California type handle tie

availability: Quicklags, EA and EH breakers



To meet California code requirements, which call for a solid tie.

terminal shields

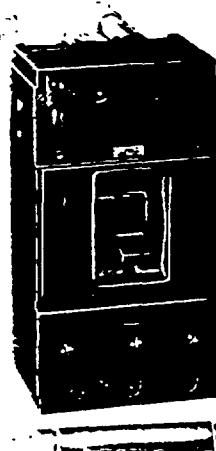
availability: EA through MA, MARK 75 and TRI-PAC breakers



Westinghouse offers a complete line of formed terminal shields which fasten over the line ends of AB breakers to protect personnel against accidental contact with the incoming wiring. Meet most exacting safety requirements; e.g. for machine tool control panels where overload relays are internally reset.

rear terminal studs

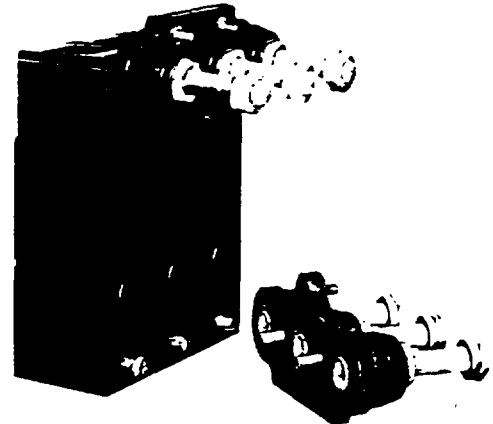
availability: EA through MA, MARK 75 and TRI-PAC breakers



For adapting breakers for switchboard and other rear-connected applications. Studs can be used with standard breakers without any modification. EA and FA breaker studs are available for mounting breakers on insulated or steel panels. Studs for larger breakers are designed for use on insulated panels.

plug-in kits

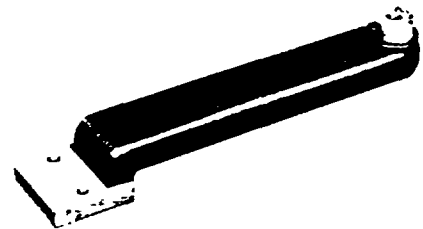
availability: EA through MA, MARK 75 and TRI-PAC breakers



Designed to provide quick and easy plug-in installation in switchboards. Tulip type connectors are built into the molded support block. Male studs are connected into breaker terminals.

panelboard connecting straps

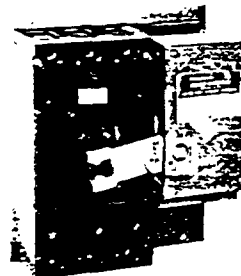
availability: EA through MA, and MARK 75 breakers



For connection of breakers to bus bars in narrow or convertible distribution panelboards. Straps and available panelboards parts are shown in price list 29-120 with individual breaker types.

motor operators

availability: EA through PA, MARK 75 and TRI-PAC breakers



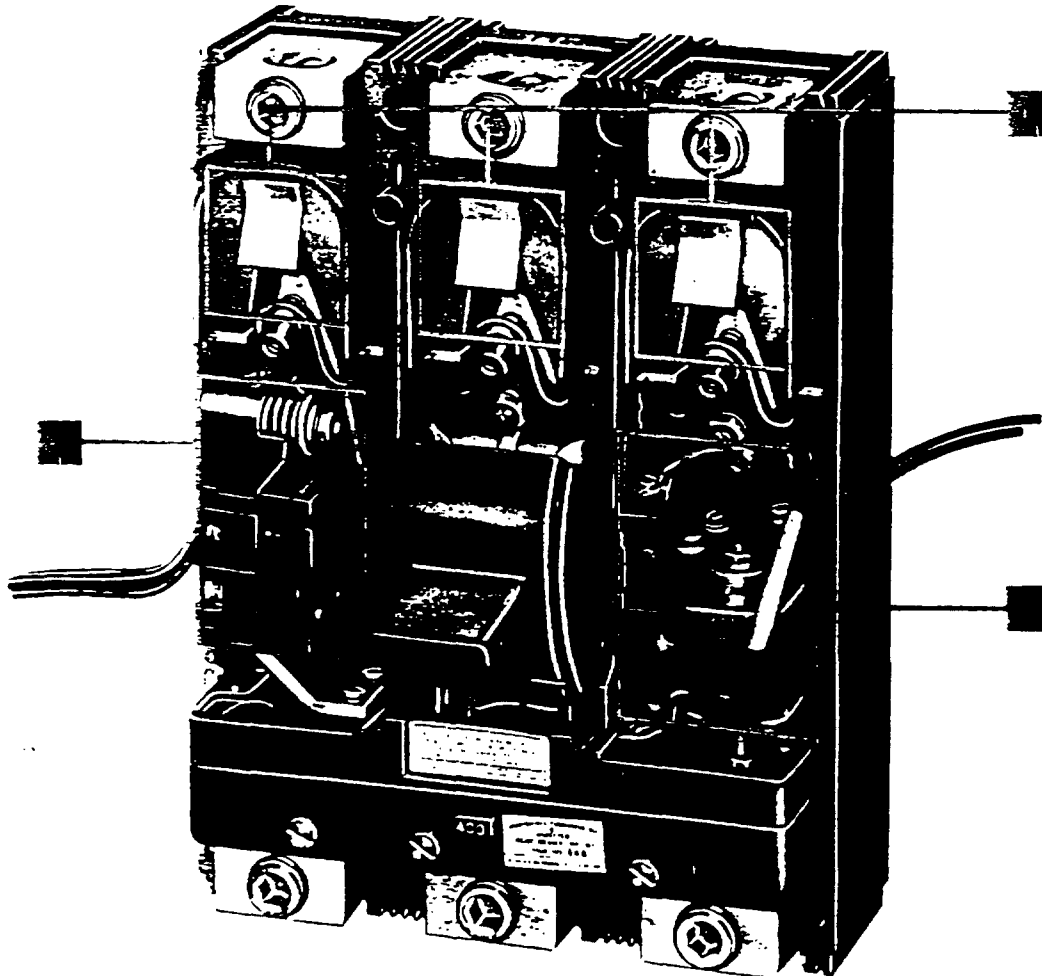
For complete remote operation of circuit breakers. Means for manual operation is provided in the event of power failure or emergency. Available in 120, 208, 240, 480 volt a-c ratings.

Motor operators are intended for infrequent operation in line with U/L endurance standards for molded case circuit breakers.



Mounting accessories and modifications

For severe or unusual operating conditions, for special functions or control sequences, Westinghouse breakers can be custom built or modified with special attachments. Beyond the basic function of overcurrent and short-circuit protection, such special breakers meet modern, complex circuit requirements, and add flexibility of operation and efficiency.



- 1 This space is used only for very special modifications such as on 575 volt d-c breakers where standard arc chutes are replaced with special ones. Other specialized breakers such as field discharge breakers and breakers with reverse current trips, which have only 2 switching poles, use one pole space in this area.
- 2 This mounting space is used for mounting various attachments shown on opposite page. Standard attachment leads are 18" long and are brought out side of breaker as shown.
- 3 This mounting space is used for mounting various attachments shown on opposite page. Attachment leads can be brought out rear of breaker as shown for panelboard or other applications where space beside breaker is limited. Attachment leads brought out rear of breaker must be specified.

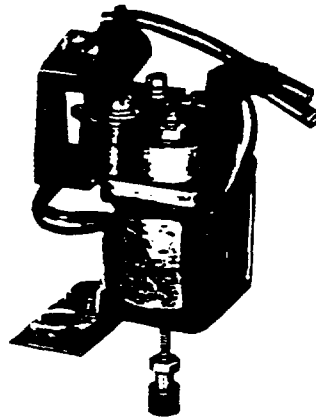
amperes: 15 to 2000

maximum volts: 600 volts a-c • 250 volts d-c

page 13

shunt trip

availability:
EA through PA,
MARK 75 and
TRI-PAC breakers



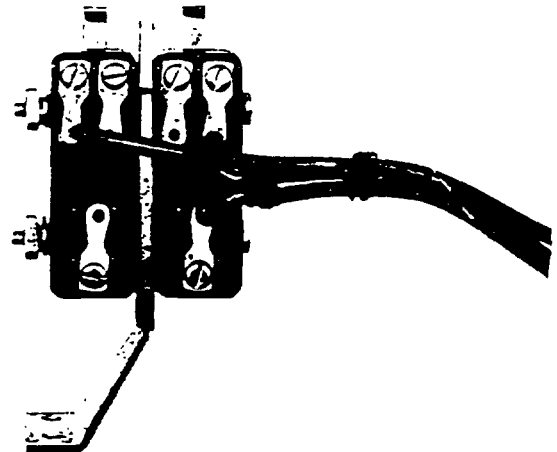
Shunt trips are used to trip the breaker electrically from a remote point.

Shunt trip coils do not have a continuous rating. A cut-off switch is included to break the coil circuit when the breaker opens. A cut-off switch is not provided in the EA breaker; therefore, the coil circuit must be broken by making connections to the load side of the breaker or using an auxiliary switch in a 3-pole breaker. Available for voltages up to 250 volts d-c and 600 volts a-c.

Mounting location varies among breakers. Refer to pl 29-120 for specific locations. May be field installed in 1A and larger breakers.

auxiliary switch

availability: EA through PA, MARK 75 and TRI-PAC breakers

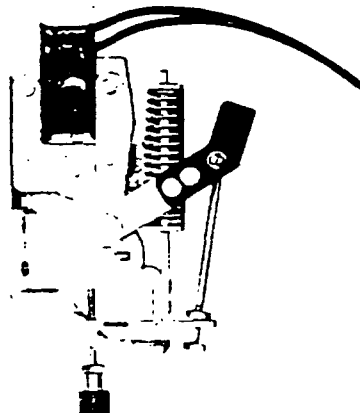


Auxiliary switches are used to open or close control circuits as the breaker operates. These internally mounted switches are normally supplied in the form of miniature switches having 1A contact, 1B contact and common. Type A contacts are closed when the breaker is closed and type B contacts are open when the breaker is closed.

Mounting locations varies among breakers. Refer to pl 29-120 for specific locations. May be field installed in 1A and larger breakers.

undervoltage trip

availability:
EA through PA,
MARK 75 and
TRI-PAC breakers



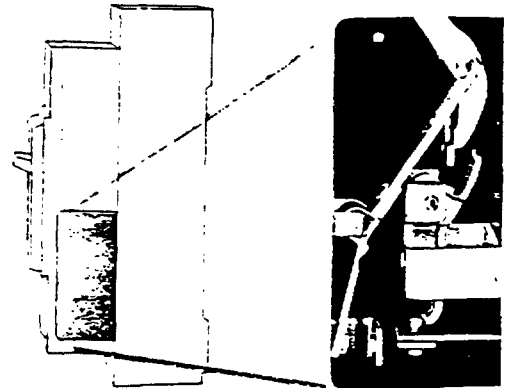
Undervoltage trips are used to automatically trip the breaker when the line voltage drops below 40 to 60% of normal. The breaker cannot be reset until voltage returns to 80% of normal.

Undervoltage trips are available for voltages up to and including 250 volts d-c and 600 volts a-c. For some voltages, a 10" or a 4" external resistor is supplied for connecting in series with the trip coil. Only instantaneous action is offered.

Mounting location varies among breakers. Refer to pl 29-120 for specific locations. May be field installed in 1A and larger breakers.

alarm switch

availability: EH through PA, MARK 75 and TRI-PAC breakers



These switches do not function with manual operation. When the breaker is tripped, the alarm switch closes to energize an indicating light or sound an alarm. Switches which open on tripping can also be supplied when specified. Illustration at left shows position occupied. In right illustration color indicates alarm switch in operating position. The alarm switch is placed atop the trip trigger section and must be built-in at the factory. Alarm switches cannot be field installed.



internally mounted accessories and modifications continued

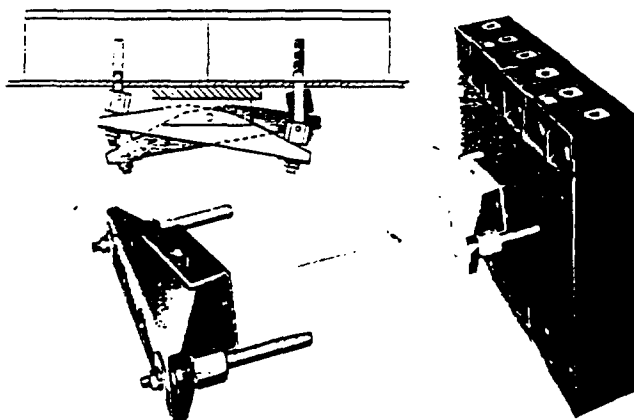
mechanically interlocked breakers

Mechanical interlocks provide a means to interlock two breakers that only one may be closed, yet both may be open at any given time.

walking beam type

availability: EH through MA, MARK 75 and TRI-PAC breakers

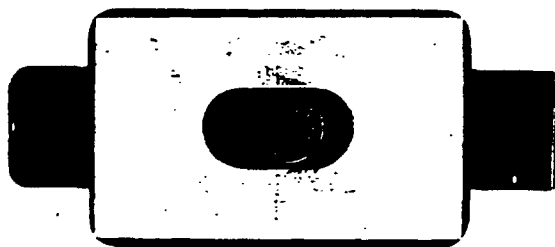
Walking beam interlocks mount on panel at the rear of breakers. When one breaker is closed, a non-conductive plunger extends into the opposite breaker to prevent it from closing. The closed breaker must open before the open breaker may be closed. Circuit breakers require special machining to fit walking beam interlock and should be ordered from the factory with the necessary interlock. Refer to price list for standard breaker spacings.



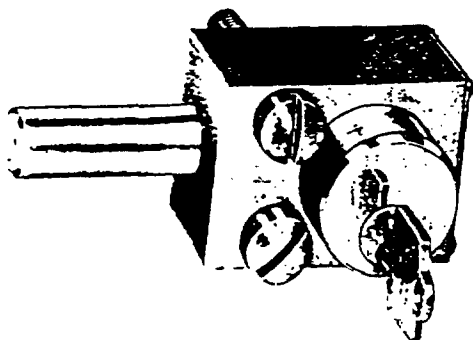
sliding bar type

availability: EA through MA, MARK 75 and TRI-PAC breakers

Sliding bar interlocks mount on panel in front of breakers. When bar is extended toward one breaker blocking handle in open position, opposite breaker can be closed. Closed breaker must be opened and handle blocked with sliding bar before opposite breaker can be closed. Breakers do not require alteration for use with this attachment. Refer to price list for standard breaker spacings.



Kirk key interlock • availability: EH through PA, MARK 75 and TRI-PAC breakers



Kirk key interlocks mount directly to breaker cover. Plunger is extended by turning key in cylinder, thereby locking breaker in open position. Various keying arrangements can be supplied. (e.g.—key removable only when plunger extended; key removable when plunger either extended or retracted; multi-cylinder operation of plunger).

A pair of breakers, remote from each other, can be interlocked so that only one can be closed at one time, by using kirk key interlocks operable by the same key and key removable only when plunger is extended.

These interlocks cannot be field mounted.

amperes: 15 to 2000

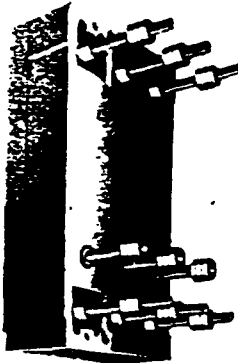
maximum volts: 600 volts a-c • 250 volts d-c

page 15

dual voltage breakers

availability: E through MA, and MARK 75 breakers

For dual voltage equipment protection with only one trip rating, breakers may be supplied with center studs. At the maximum voltage the trip unit carries all the current. At the lower voltage, the current is doubled, with half the current by-passing the trip unit through the center stud connections. Thus, one rating breaker can be used for both connections. Rear connecting studs are normally used with center tap studs for line and load connections.



field discharge breakers

availability: F, HK and HKL breakers

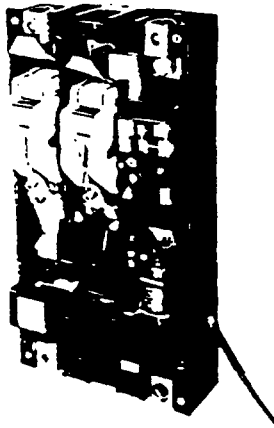
Field discharge breakers are composed of 3-pole frames having two outside non-automatic poles and a center pole field discharge contact arranged to close as the outside contacts are opened and vice versa. Thus, the center pole is used as a field discharge contact. Automatic tripping can be supplied in outside poles if desired.



reverse current breakers

availability: 2-pole HK or HLM in 3-pole frame

This internally mounted device is used on d-c circuits to open on a 10-15 percent reversal of current. Mounted in the right pole (positions 2 and 3 of illustration on page 12) are a reverse current relay and a shunt trip actuated by this switch. These breakers must be factory assembled.



575 volt d-c breakers •

availability: HK and HLM
(3-pole frame only)

For use on d-c circuits rated up to 575 volts. These breakers are similar to standard breakers except are equipped with special 575 volt d-c arc chutes. Breakers are supplied in 3 pole frame and should be wired with 2 poles in series on positive side of circuit and other pole on negative side.



electrically-interlocked breakers

availability: HK, HKL, HLM breakers

Energizing a rear-mounted relay will trip the breaker and prevent its re-closure until relay is de-energized. Available as a factory modification.

breakers with paralleled poles

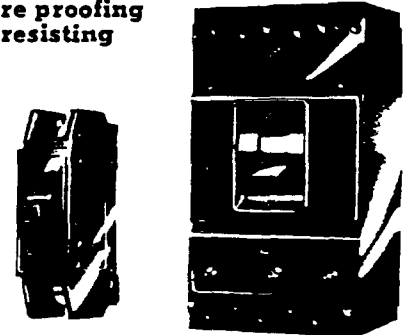
Breaker poles are paralleled for high current single-pole operation by the addition of straps at line and load ends of breaker, as well as internal strap ahead of the trip, to assure an equal division of the load. For example, a 2-pole F breaker rated 100 amperes would have a single-pole rating of 200 amperes with paralleling straps. Parallel connections are made at factory and are available for types E through MA and MARK 75 breakers. Application of parallel poles should be reviewed with Westinghouse.

breakers with series connections

Series connection of breaker poles for single-pole high voltage operation can be made without any special parts. Application of series or poles should be reviewed with Westinghouse.

fungus-moisture proofing and corrosion resisting

availability:
all AB breakers



Breakers may be made to resist extreme moisture and fungus conditions found in tropical and other humid localities. Breakers are coated with a varnish; in addition, fibre parts are impregnated and varnished to prevent moisture absorption.

For chemical or heavy salt-laden atmospheres, where corrosion is accelerated, special platings and materials are available. When ordering, these conditions should be specifically outlined to assure best protection.



typical specifications

thermal magnetic breakers

Electrical circuits shall be protected by molded case AB De-ion circuit breakers, as manufactured by Westinghouse Electric Corporation or approval equal. Each pole of these breakers shall provide inverse time delay overload protection and instantaneous short-circuit protection by means of a thermal-magnetic element. The minimum interrupting ratings of the circuit breakers shall be at least equal to the available short circuit at the line terminals.

ratings shall be as follows:

type	maximum continuous amps	maximum volts a-c	interrupting ratings (RMS asymmetrical amps)			
			240v a-c	480v a-c	600v a-c	250v d-c
EA	100	240	7,500			
EH	100	480	15,000	10,000		10,000
FA	100	600	20,000	15,000	15,000	10,000
JA	225	600	25,000	20,000	15,000	10,000
KA	225 I.T.	600	30,000	25,000	25,000	10,000
LA3	400	600	50,000	35,000	25,000	20,000
LA	400 I.T.	600	50,000	35,000	25,000	20,000
MA	800 I.T.	600	50,000	35,000	25,000	20,000
PA	2000 I.T.	600	150,000	100,000	75,000	

I.T. = interchangeable trip

The breakers shall be operated by a toggle type handle and shall have a Quick-make, Quick-break overcenter switching mechanism that is mechanically trip free from the handle so that the contacts cannot be held closed against short circuits and abnormal currents. Tripping due to overload or short circuit shall be clearly indicated by the handle automatically assuming a position mid-way between the manual "ON" and "OFF" positions. All latch surfaces shall be ground and polished.

Breakers must be completely enclosed in a molded case. Non-interchangeable trip breakers shall have their covers sealed; interchangeable trip breakers shall have the trip unit sealed to prevent tampering. Ampere ratings shall be clearly visible. Contacts shall be of non-welding silver alloy. Arc extinction must be accomplished by means of De-ion arc chutes, consisting of metal grids mounted in an insulating support. Terminals shall be listed with Underwriter Laboratories suitable for use with copper cable.

Circuit breakers shall be listed with Underwriters' Laboratories, Incorporated, conform to requirements of NEMA Standards Publication No. AB 1-1959, and meet the appropriate classifications of Federal Specification W-C-375a.

further information

prices: price list 29-120

application: application data 29-160

dimensions: dimension sheet 29-170

TRI-PAC breakers

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 knob 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.