



a-c magnetic • non-reversing and reversing

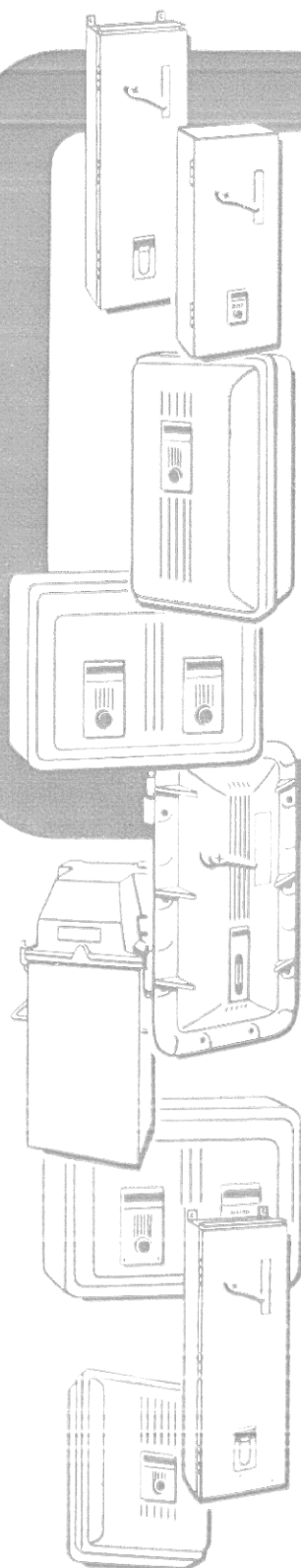
full voltage ***Life-Linestarter****

*polyphase and single phase
up to 600 volts • 60, 50, 25 cycles*

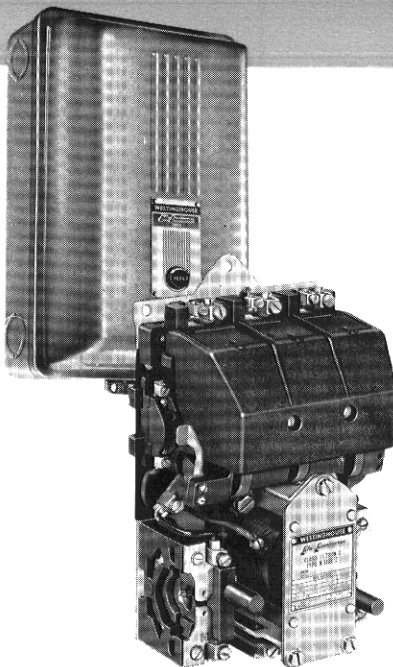
descriptive
bulletin

11-000

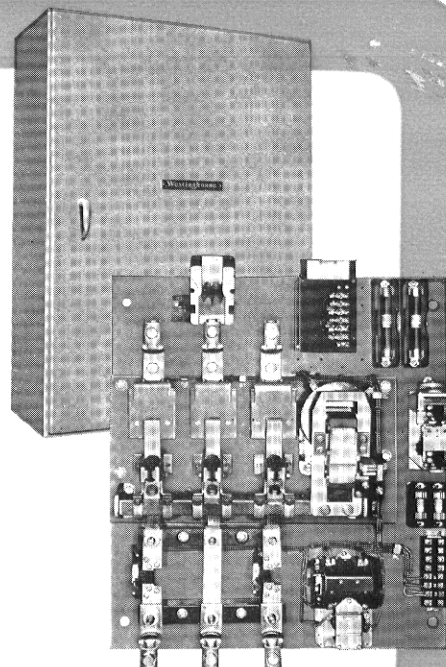
page 1



typical sizes 0 through 4



typical sizes 5 through 8



Westinghouse Life-Linestarters may be used either for across-the-line starting of squirrel cage induction motors, or for the primary control for wound rotor motors. They provide a versatile and convenient magnetic control for either local or remote operation plus many exclusive features to simplify wiring and installation . . . to better protect motor, machine and operator.

The complete line of Life-Linestarters is designed to simplify installation and maintenance. They can be combined with either a Westinghouse AB circuit breaker or a circuit disconnect switch to form combination starters with superior performance characteristics.

advantages

uniform and complete line
fast and positive operation
dependable overload protection
service-proven design
attractive appearance
full range of NEMA enclosures
parts front-removable
straight-through wiring
Bonderized sheet steel enclosures

*trade mark

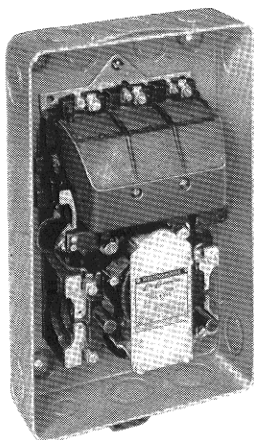
in this bulletin:

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December, 1955

new information

mailed to: E/182/DB; D61-5C,D,S; C21-5D, E, F, P, V, X, d, p, y, o; C22-5d to j, p, q to u, y, z; CHH

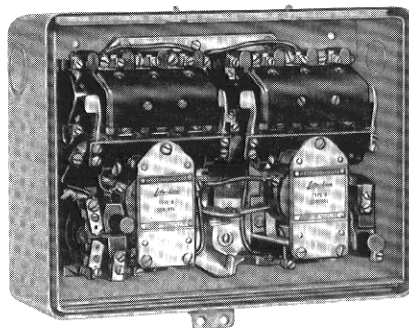
**basic types of Life-Linestarters available****non-reversing**

This magnetic starter is designed for across-the-line starting and stopping of squirrel-cage induction motors or as a primary starter for wound rotor motors. Magnetically operated, it provides motor running protection through bi-metallic type thermal overload relays.

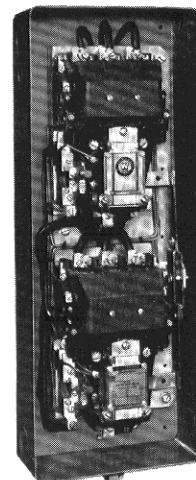
The basic starter, as shown above and explained in detail on pages 4 through 6, is the "building block" used in all size 0 through 4 Westinghouse Life-Linestarters . . . reversing, multi-speed, multi-motor, combination, and specific purpose controls.

reversing

horizontal interlocking

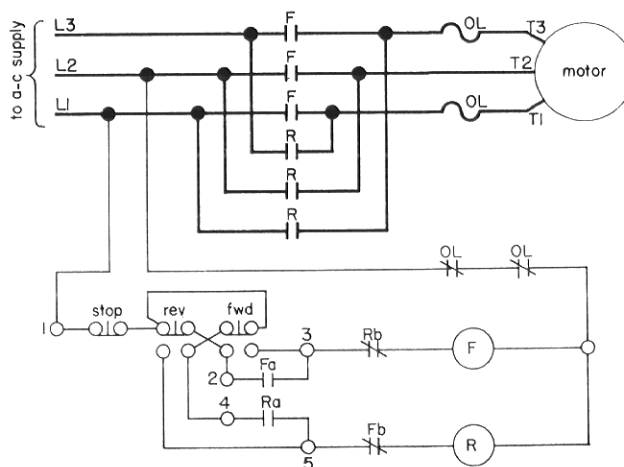
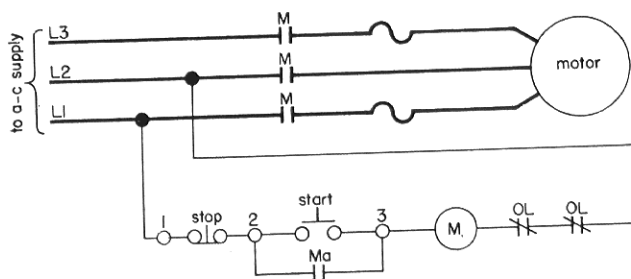


vertical interlocking

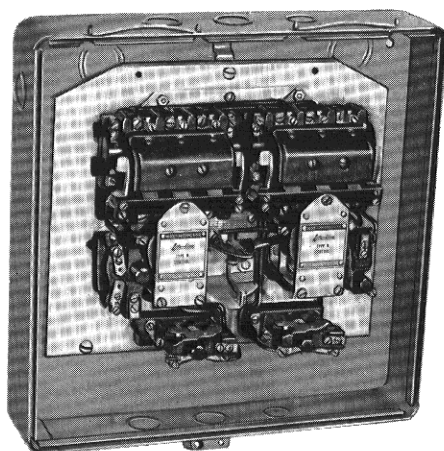


Reversing Life-Linestarters are designed for starting, stopping, and reversing the direction of a-c squirrel cage motors, and for the primary control of reversing wound rotor motors. Essentially they consist of a forward and a reverse contactor of standard Life-Linestarter design, which are mechanically and electrically interlocked to prevent both contactors from being closed at the same time. Available in both horizontal and vertical mounting types, either open or enclosed:

type	NEMA sizes								
	0	1	2	3	4	5	6	7	8
horizontal interlocking	x	x	x	x	x				
vertical interlocking			x	x	x	x	x	x	x

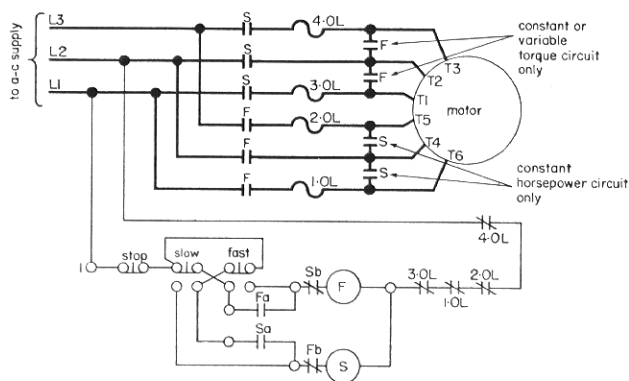
typical diagrams

multi-speed



Multi-speed Life-Linestarters are designed to provide remote magnetic control of 2, 3 and 4-speed squirrel cage motors. They are suitable for constant horsepower, variable torque or constant torque; single or multi-winding motors.

The multi-speed starter provides a contactor for each motor speed, wired for manual speed selection by means of a push-button control station. These contactors are of basic Life-Linestarter design and are mechanically and electrically interlocked. As a modification, the starter may be provided with auxiliary relays to accomplish automatic acceleration or deceleration.

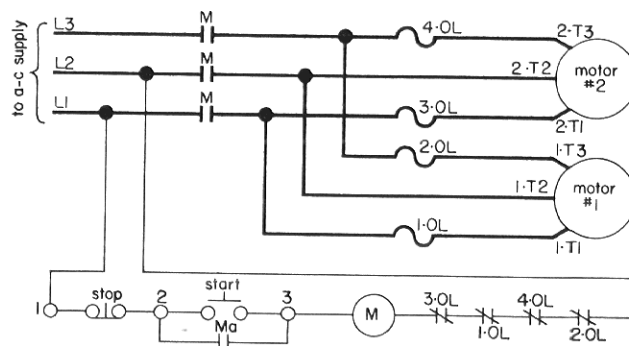


multi-motor



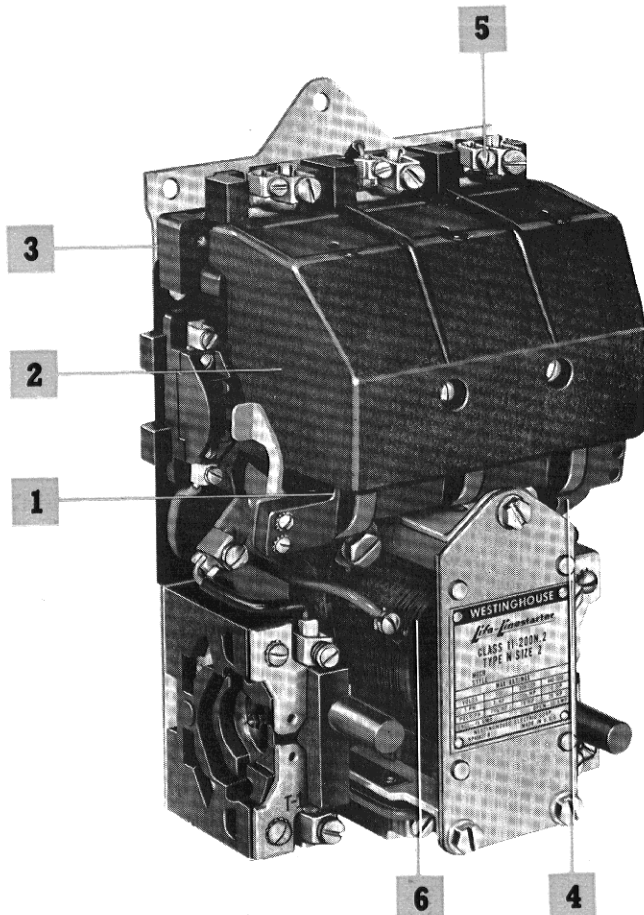
Multi-motor Life-Linestarters are designed for use on machine tools and similar applications which require operation of two or more motors from a single starter. The starter size is determined by the combined horsepower of the motors being controlled.

Starters controlling up to a maximum of 4 motors have overload relays which reset simultaneously when the reset button in the cover is pressed.

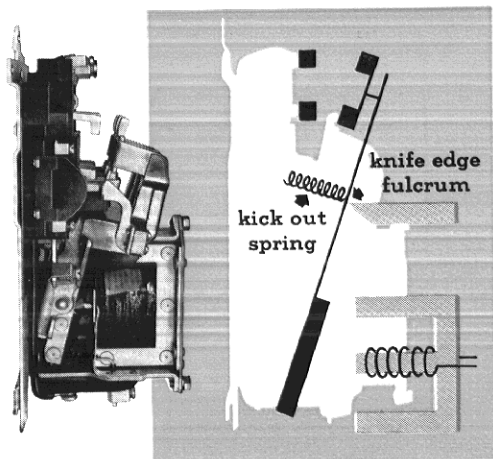




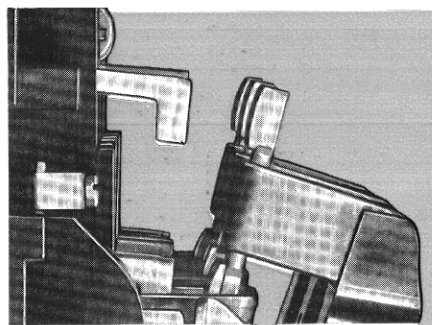
sizes 0 through 4 design features



The Life-Linestarter uses an inverted armature in which a single moving element is pulled against a stationary magnet . . . a "see-saw" on a knife edge. There are no sliding members . . . nothing to stick or jam. The knife edge bearing of special hardened steel is friction-free.

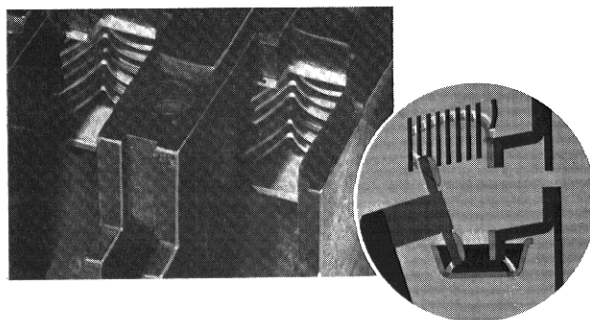


1 silver-to-silver contacts



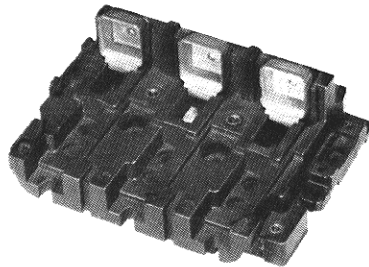
The Life-Linestarter has double break silver-to-silver contacts for longer life and greater dependability. Double break contacts arc in series . . . provide longer break distances. Silver is an ideal contact material as it retains its high conductivity even when oxidized, and so never requires filing, dressing or cleaning. Both upper and lower stationary contacts are identical and interchangeable. This simplifies ordering, reduces inventory and makes servicing easy.

2 De-ion[®] arc quencher



The De-ion arc quencher was developed by Westinghouse research to increase contact life by reducing burning and pitting, and has been an exclusive design feature for many years. It consists of an arcing chamber formed by non-carbonizing insulating barriers and a series of metal plates, or grids, arranged in parallel. When the contacts move apart the resulting arc is drawn into the arcing chamber by magnetic force, where it is confined, divided and harmlessly extinguished in the layers of de-ionized gas between plates. Size 1 contains arc cups only as the low current arc does not require grids, while size 0 is without cups for the same reason.

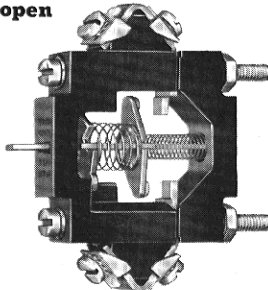
3 non-carbonizing insulating materials



Insulating parts which require high dielectric properties are of Rosite, an inorganic, non-carbonizing material of superior strength. This tough material not only has excellent insulating qualities but is non-tracking and resistant to rough handling and breakage.

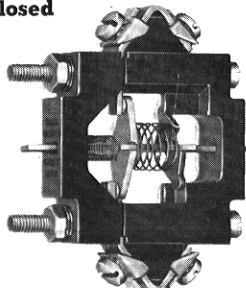
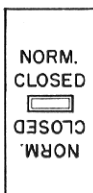
4 electrical interlocks

normally open



Adjustable cam at left, contacts open; pressure on plunger closes contacts against spring action. Convertible studs face rear.

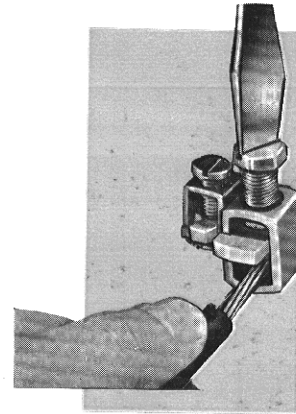
normally closed



Adjustable cam at right, contacts closed; pressure on plunger opens contacts against spring action. Interlock reversed from top photo; studs can also be reversed.

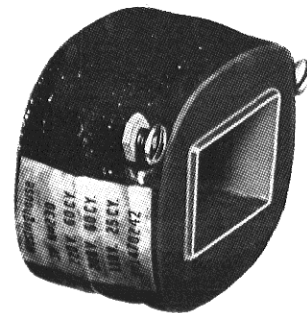
For complex interlocking circuits three additional normally open or normally closed auxiliary contacts, or interlocks, can be provided. These are in addition to the one interlock furnished as standard equipment which serves as the normally open holding interlock. These can be quickly altered to form any combination of normally open or normally closed contacts without adding any new parts. Size 3 and 4 interlocks are a unit assembly, requiring only a cam adjustment to convert from normally open (top photo) to normally closed (bottom photo). For sizes 0, 1 and 2, see page 15

5 pressure type connectors



The pressure-type connector holds the wire without binding around a post . . . speeds installation and provides a positive, low-resistance connection for either solid or stranded conductor, in a range of sizes to cover the full rating of the starter.

6 vacuum impregnated coil



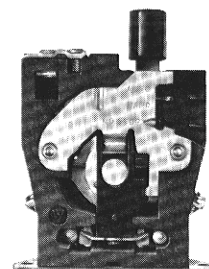
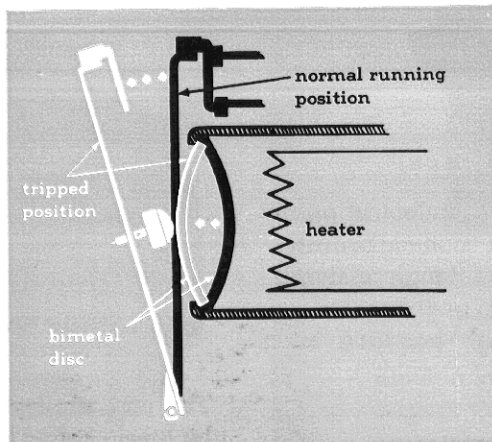
The coil is vacuum-impregnated with a high-grade varnish to resist moisture and withstand physical abuse. All air is withdrawn during impregnation to eliminate hot spots and insure uniform heat dissipation. Convenient terminals on the coil itself eliminate flexible leads. Each coil is plainly labeled with its voltage, frequency and identifying style number.

continued ►

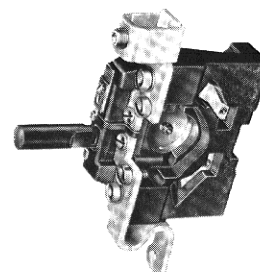


sizes 0 through 4 design features, continued

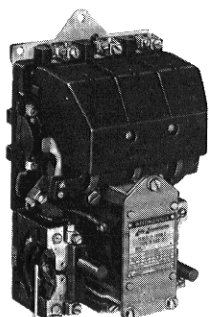
7 bi-metallic thermal overload relay



design through size 2



design from size 3 through size 8



7

8

Overload protection is accomplished by a bi-metallic, snap-action disc type of overload relay. This is a reliable precision device. The bi-metallic disc overload relay is not damaged by attempted reset at any time during its cooling period.

The bi-metallic disc consists of two dissimilar metals laminated together and pressed into a concave disc. When heated to a predetermined temperature by the heater element adjacent to the disc, the more rapid expansion of one metal increases disc tension until it suddenly snaps to its convex position, opening the contacts and stopping the motor. When the disc cools, it snaps back to its original position. These discs retain their precise action and accurate calibration.

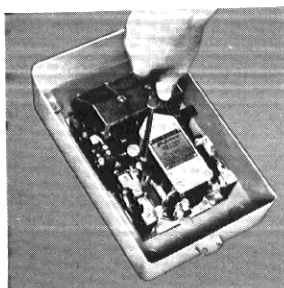
automatic: Overload contact opens and closes automatically . . . a feature not available on many relays . . . reset button can be used as a stop button.

hand: Overload contact opens automatically . . . requires resetting by operator . . . can also be used as a stop button.

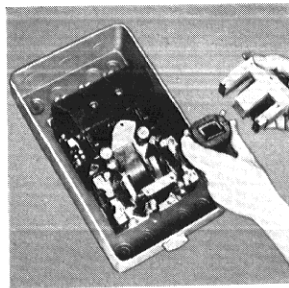
no stop: Overload contact opens automatically . . . requires resetting by operator . . . cannot be used as a stop button.

to remove parts:

coil

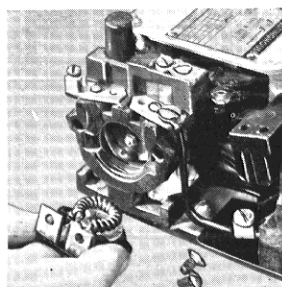


remove coil leads and magnet screws



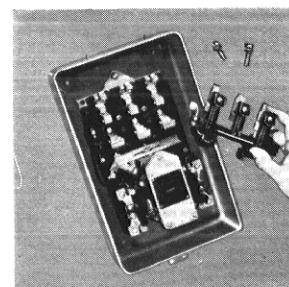
remove magnet assembly, remove coil

heater



remove heater screws, remove heater

contacts



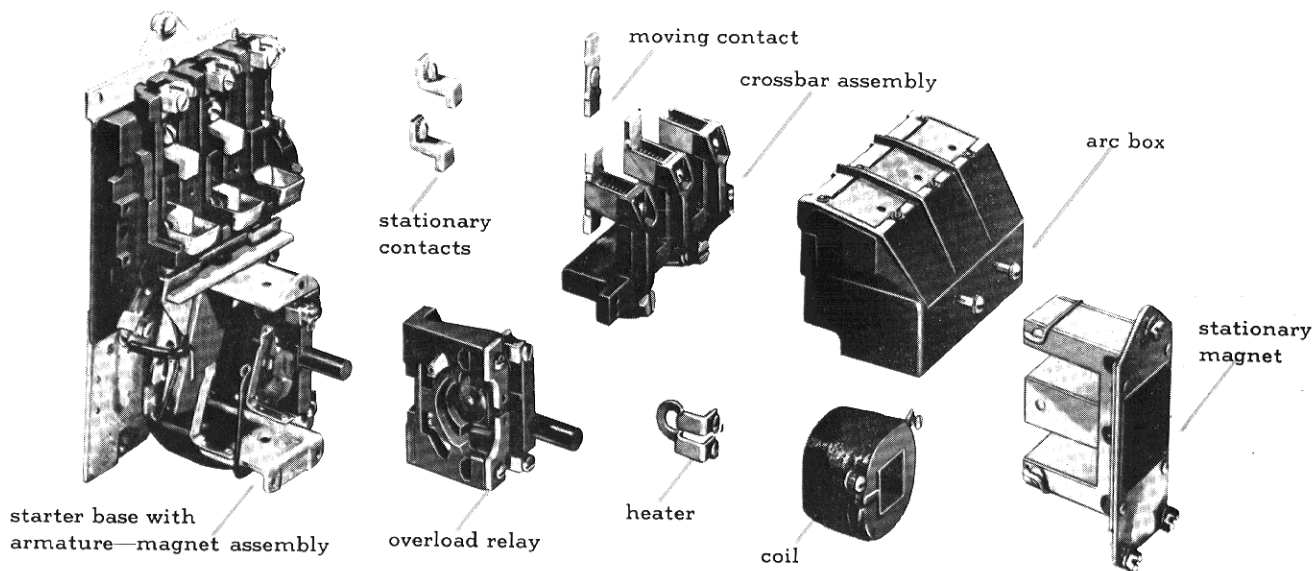
remove arc box and cross bar

8 front removable parts

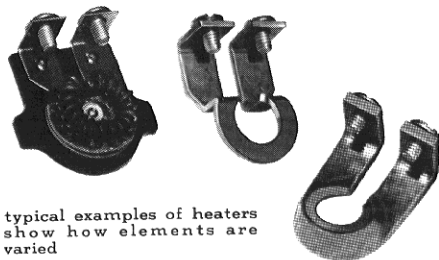
In designing the Life-Linestarter, Westinghouse made sure that the removal of all parts was accomplished quickly and easily. All screws can be reached from the front, and all parts can be removed from the front without disturbing the wiring. The exploded view shows the relationship of the parts as removed for servicing operations.

Open starters require only normal electrical clearances between units for panel mounting applications.

Front-removable parts eliminate the need for additional space for installation or servicing operations.



interchangeable heaters

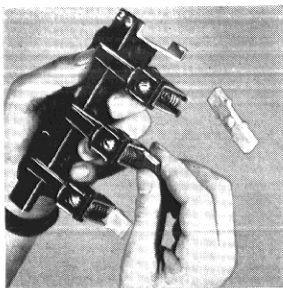


typical examples of heaters show how elements are varied

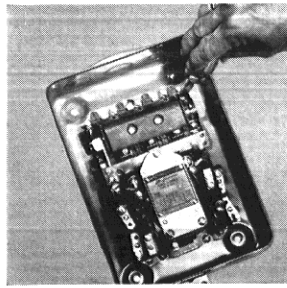
The same type of overload relay heater is used in all sizes of Life-Linestarters (NEMA sizes 0 through 8). Provides flexibility of application . . . sturdy construction . . . simple installation . . . reduced inventory.

to install parts:

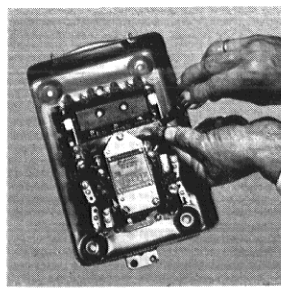
electrical interlocks



twist out moving contacts



install interlock on base



fasten operating cam on cross bar



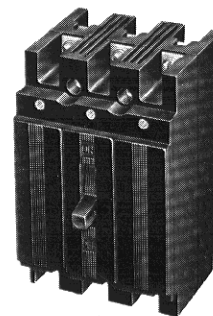
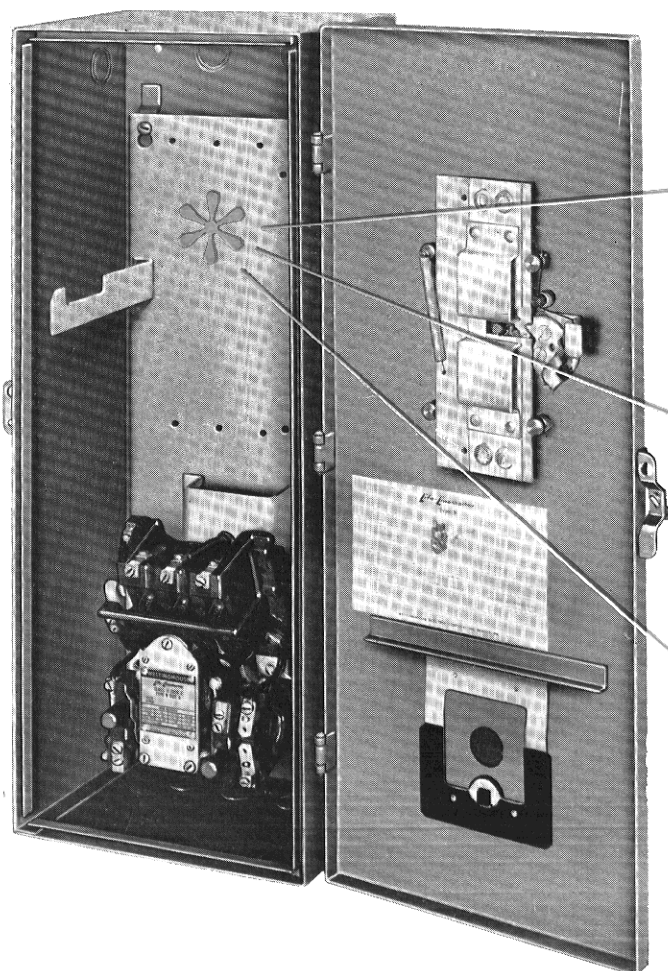
sizes 0 through 4 combination Life-Linestarters and special sizes 3 and 4

combination Life-Linestarters

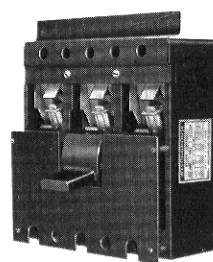
Combination Life-Linestarters combine a disconnect switch (with or without circuit protection) and a starter in a single enclosure. As such they utilize mounting space more efficiently; provide a neater, more compact installation. In the combination Life-

Linestarter design this disconnect may be either:

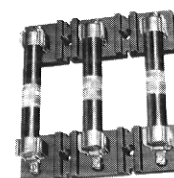
- automatic AB De-ion circuit breaker
- circuit disconnect switch, unfused
- circuit disconnect switch, with fuses



De-ion circuit breaker

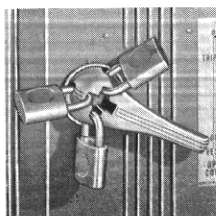


non-fusible disconnect

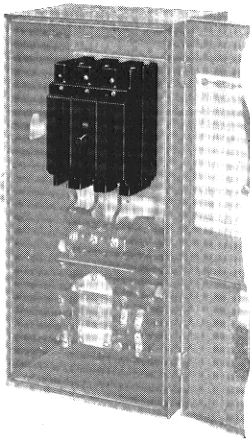


fusible disconnect

safety handle



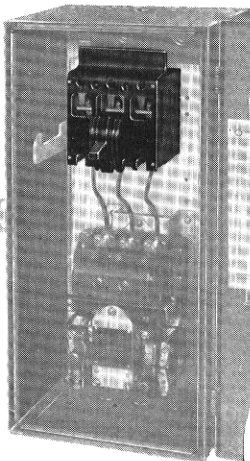
The operating handle of the combination Life-Linestarter is interlocked with the door latch to prevent opening the cover while the handle is either in the *on* or *off* position. It must be moved beyond *off* to the *open cover* position before the door will open. The handle is designed for one to three padlocks to lock the starter *off* and the cover *closed*.



De-ion circuit breaker

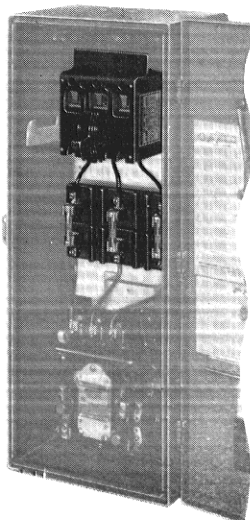
The AB De-ion circuit breaker used in combination Life-Linestarters provides the ultimate in modern up-to-date circuit protection.

It operates on the thermal-magnetic principle (delayed action tripping on sustained overloads when wire temperatures are within the safe limit — instantaneous action on short circuits).



non-fusible disconnect

The Westinghouse De-ion switch was specially designed for inclusion in combination Life-Linestarters. It can be used either fused or unfused and is the smallest load break device in its field and is more compact than any comparable switch. AB breaker type construction assures long life and rugged dependability. It has higher interrupting capacity than any comparable devices. Not an automatic tripping device.

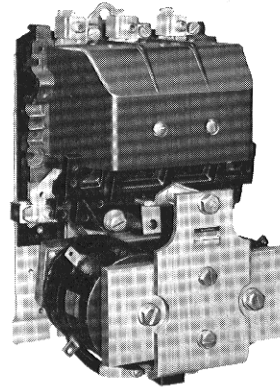


fusible disconnect

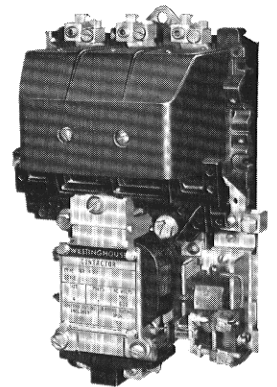
The fused versions of the Life-Linestarters employ heavy duty fuse blocks of Rosite with standard NEC reinforced fuse clips and are available in a full range of sizes from 30 to 400 amperes, either 250 or 600 volts.

special sizes 3 and 4

NRD • d-c operated



NRL • latched-in



These contactors are similar in appearance and construction to the type N except that the type NRD has d-c operating magnets and the type NRL has an added mechanical latch-in and shunt trip device.

The type NRL contactor and latch assembly may be a-c or d-c operated. The main operating coil is continuously rated on a-c voltage and momentarily rated on d-c voltage. It is normally de-energized by a pair of contacts actuated by and forming a part of the latch mechanism. The contactor is closed and latched by energizing the shunt trip coil.

Contacts are of the double-break type and are faced with a special silver alloy for long life and optimum conducting and rupturing performance. The arc box employs the De-ion grid principle of arc interruption.

Operating coils are rated for continuous duty at 80% to 110% of rated voltage for type NRD, and 85% to 110% on a-c and 80% to 110% on d-c for type NRL.

A total of four electrical interlocks may be mounted on either contactor. On the type NRL, one interlock is required for operation of the latch mechanism. Mechanical interlocks are also available for horizontal or vertical interlocking of a pair of contactors to prevent accidental closing of either if the other is already closed.

Three type MW overload relays may be added to these contactors.



size 5 general features

Size 5 Life-Linestarters can be supplied open or in enclosures with all devices mounted on the Add-A-Part panel. Starters are rated 100 and 200 hp, 3-phase, 60 cycle, 208 to 600 volts.

These Linestarters are available in combination with an AB circuit breaker or non-fusible disconnect switches.

2 bi-metallic thermal overload relay

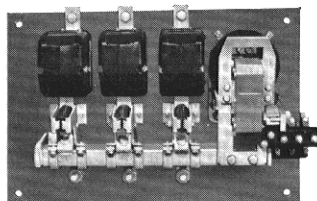
Snap action operation is assured by a new type MW-52 disc type bi-metallic thermal overload relay. Its snap action provides quick-make, quick-break operation assuring long relay contact life. It is adjustable for *hand*, *automatic reset* or *non-stop* operation.

3 Add-A-Part panels

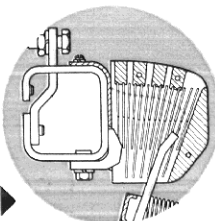
The pre-drilled Add-A-Part panel provides space and drilling for adding or substituting a variety of control accessories, a unique feature which permits modification of the control scheme with a minimum of time and expense in the field.

Front removal of all parts, straight-through wiring and solderless connectors makes this starter ideal for a wide range of applications.

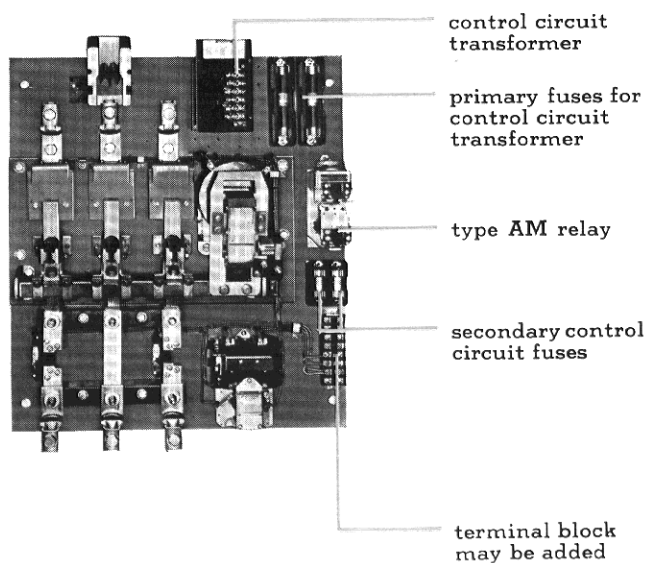
1 contactor (type NF)



De-ion grids combined with magnetic blow-out



The type NF contactor combines a magnetic blowout and De-ion grids to provide a means for quickly extinguishing the arc to minimize contact burning. The magnetic field of the blowout forces the arc from the contact faces into the De-ion grids where it is divided and quickly extinguished.

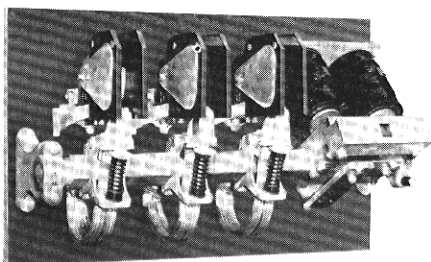


polyphase and single phase
up to 600 volts • 60, 50, 25 cycles

sizes 6, 7, 8 general features

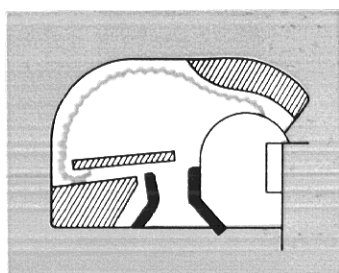
These starters differ from size 5 in that they are not Add-A-Part construction and the contactor is operated with direct current supplied from a built-in selenium rectifier. They are rated 200 to 900 hp, 208 to 600 volts.

contactor (type NFD)



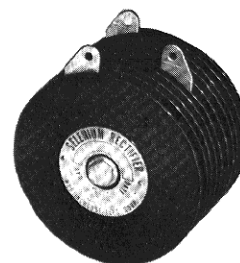
The type NFD contactor uses a clapper type d-c magnet which is a "C" shaped magnet with operating coil in one leg of the C. It operates quietly and is quick opening and closing. Nitrided bearing pins insure long accurate operation with minimum wear.

magnetic blowout



The type NFD contactors used in sizes 6, 7 and 8 starters use a magnetic blowout for arc quenching. Mutual repulsion forces the arc upward and outward. The arc jumps off of the contacts and within a fraction of a second is stretched and literally blown out.

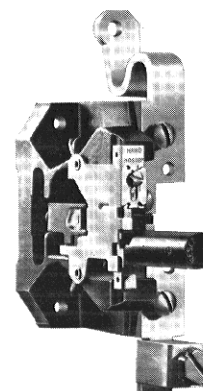
d-c magnetic operation



typical
selenium
stack

Selenium stacks provide d-c magnetic operation from a-c supply. The solid core of the magnet maintains a constant value of magnetic flux with constant polarity.

bi-metallic thermal overload relay



sliding plate
adjusts for
automatic
hand or
no stop
operation

Dependable overload protection is accomplished by a bi-metallic, snap-action disc type relay which can be easily adjusted for *automatic*, *hand* or *no stop* operation. The same type of heater is used in all sizes 0 through 8. See page 6 for further details.

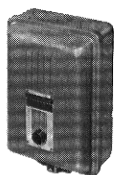


enclosures

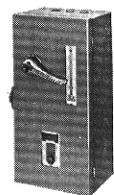
Enclosures should be selected to protect mechanisms against dust, corrosive atmospheres, water, and service conditions which are hazardous or which in any way would interfere with the function of the apparatus. For unusual conditions not covered here, call your Westinghouse representative.

for non-hazardous locations

general purpose • NEMA 1



These Bonderized enclosures are suitable for general indoor applications where atmospheric conditions are normal. They provide protection against dust and indirect splashing; but are not dust-tight.



Enclosures are drawn or flat style with lift-off or hinged covers. Knockouts provided in top, bottom, sides and rear according to enclosure design. See selector guide, page 16, for full range of sizes.

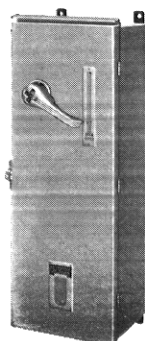
water-tight • NEMA 4



Cast iron enclosures through size 2 or sheet steel enclosures from size 3 with gasket between case and cover to exclude water. Also include hold-down bolts around entire cover to compress the gasket.



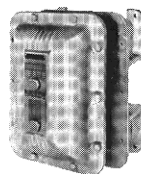
industrial • NEMA 12



This Bonderized sheet steel enclosure is gasketed. The cover is hinged and is opened by releasing captive screws. There are no conduit knockouts or openings; mounting feet are provided. There are no external overload resets on combination starters; however, non-combination starters do have external resets.

for hazardous locations

for explosive vapors • NEMA 7



Cast iron enclosures through size 2 and boiler plate from size 3 are reinforced with wide, machined flanges. Heavy bolts hold the cover securely in place. All conduit openings are threaded. Suitable for NEC class I, group D hazardous atmospheres containing gasoline, lacquer solvent vapors or natural gas.

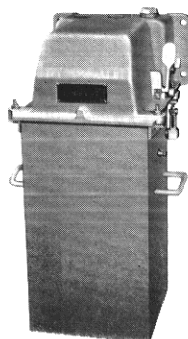


for explosive dusts • NEMA 9



Cast iron enclosures through size 2 and boiler plate from size 3 with wide, machined flanges. Heavy bolts hold the cover securely in place. All conduit openings threaded. Suitable for NEC class II, groups E, F and G hazardous atmospheres containing metal dust, carbon black, coal or coke dust and grain dust.

for hazardous or corrosive conditions

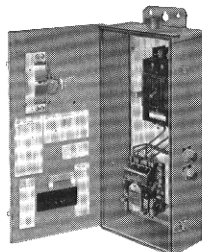


NEMA 8: Designed to conform with Westinghouse interpretation of U/L requirements for class I, group D hazardous locations in an oil-immersed device. Tank is sheet steel and head is cast iron. For operation where gasoline, naphtha, alcohol, acetone and lacquer solvent vapors as well as natural gas are present.

NEMA 11: Tank of sheet steel and head of cast iron. Designed to conform with Westinghouse interpretation of U/L requirements for corrosive conditions. For use in foundries, chemical plants and petroleum plants where explosive atmospheres are not encountered.

specific purpose controls

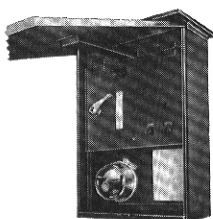
rain-tight pumping panel • class 11-204, 11-206



The rain-tight control panel is an outdoor unit specially designed to provide efficient reliable control for deep well pumping operation and many other applications under a wide range of climatic conditions.

This unit is available in a range of sizes from NEMA size 1 through 5, and may be applied through a range of horsepower ratings up to 200 hp. A third overload relay is available for applications where WYE-DELTA power transformer connections make this necessary. Low voltage protection is also incorporated in the starter.

oil well pumping panel • class 11-274, 11-276



These controls are specially designed for the control of oil well pumping motors. Enclosures are of the NEMA 3 weather-proof type to permit outdoor surface or pole mounting close to the pumping motor. The control provides for across-the-line motor starting with complete overload and low voltage protection. It is available in two general types: the Automatic Unit, which automatically controls pumping by means of a built-in time switch, and the Local Control Unit, which provides manual control only.

cotton card • class 11-240, 11-244, 11-246

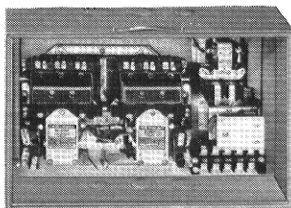


This controller is designed to meet the special requirements of individual motor-driven cotton cards.

The reversing switch cannot be operated until the cabinet door is opened by the operating handle which disconnects the motor. Provision is also made for padlocking the cabinet door to prevent opening by unauthorized persons.

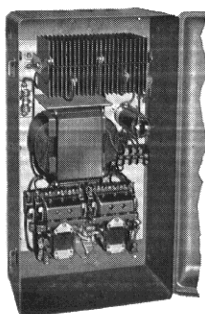
Available as a plain starter, class 11-240, or with built-in fusible disconnect switch, class 11-244, or type AB circuit breaker, class 11-246, providing circuit protection.

laundry • class 11-280



Used to control the action of washing machines and drying tumblers. The laundry controller includes a reversing Life-Linestarter, synchronous motor driven cycle timer, a brake relay which also acts as a low voltage protective relay, and a 5-point terminal block in a single NEMA 1 enclosure, with gasketed cover. Available in NEMA sizes 0 through 2.

electrical braking • DYNAC® • class 15-600



DYNAC is a form of dynamic braking where direct current is applied to one phase of a squirrel cage or wound rotor motor after the removal of the a-c voltage.

Braking torques in excess of eight times the full load running torque are available but three times the braking torque is usually all that is needed to bring the machine to a safe, smooth and definite stop. This braking action is completed faster than plug stopping or can be extended over a selected period by use of a timing circuit.

Up to 600 volts and choice of 60, 50 or 25 cycles in braking unit only, complete non-reversing or complete reversing units with short-time or long-time braking.

Open type for panel mounting, or in NEMA 1, 4, 7, 12 enclosures or JIC specifications.

See descriptive bulletin 15-600 for complete information.

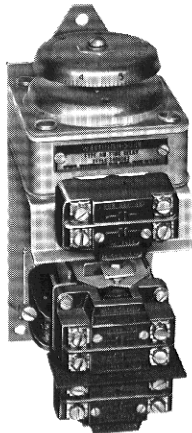


modifications

Westinghouse a-c control is further distinguished as a "complete line" by virtue of the many accessories and kits available to modify standard starters for special application. The components shown here will take care of most of the problems of custom control.

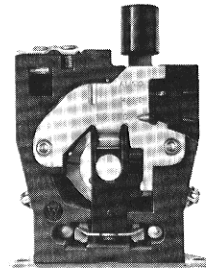
relays

time limit • type AM



Type AM time limit relay is a pneumatic device, for time delay or sequencing applications. It is of the two-circuit type with double make and double break contacts. It is adjustable from .02 to 200 seconds and convertible from on-delay to off-delay.

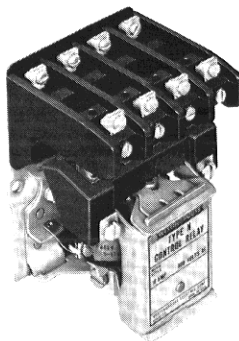
3rd overload relay • sizes 0 to 8



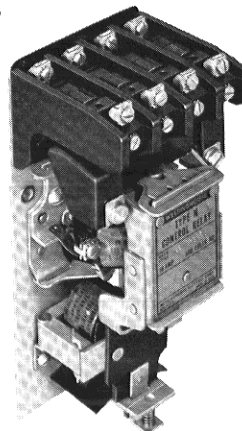
Starters with three overload relays are available for operation on 3-phase service. Relays are of the bi-metallic, snap-acting type with inverse time delay trip. They are adjustable for: *automatic*, *hand*, or *no stop* reset. Reset button can be used as stop button unless adjusted for *no stop*.

control • types N, NL and AMA

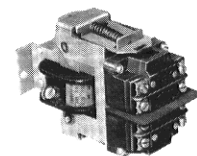
type N



type NL



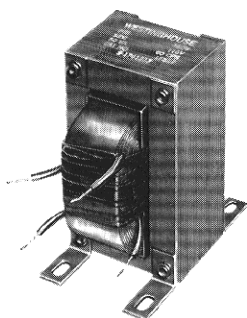
type AMA



Type N control relay is available in a maximum of 6-poles; voltages up to 600 volts. The open rating is 10 amperes continuous. Contacts are easily convertible from normally open to normally closed. A latched-in version of the type N relay is the type NL, above center. Available in a maximum of 6-poles; voltages up to 600 volts. Contacts also convertible from normally open to normally closed. Type AMA is the magnet assembly of the type AM and is applied as a general purpose control relay.

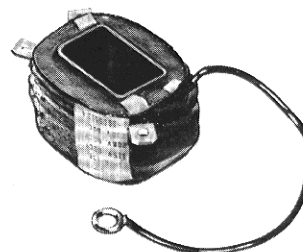
*polyphase and single phase
up to 600 volts • 60, 50, 25 cycles*

control circuit transformers



These transformers can be installed in suitable starter enclosures to provide low voltage for the control circuit and to provide added safety for operating personnel. Additional capacity can be provided for work lamps. Available with single or dual voltage primary. Secondary voltage is usually 110 volts.

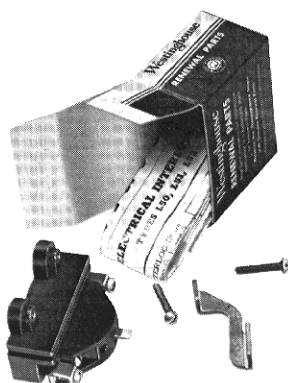
dual voltage coils



Dual voltage 115/230 volt coil is furnished as standard for single phase class 11-200, sizes 0, 1 and 1½ Life-Linestarters. It is usually wired for 230 volt service when factory-installed.

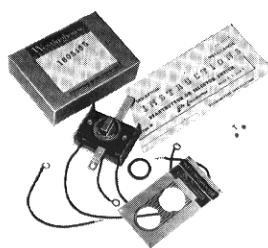
kits

extra interlocks



The complex interlocking circuits, up to three more interlocks can be provided. These are in addition to the one normally-open holding interlock furnished as standard. Kits can be supplied with contacts normally open or normally closed but can be converted either way in the field.

pushbutton or selector switch in cover



Starters are available with built-in pushbuttons or selector switches to provide local control. Reset button is used also for stop button. Handy modification kits are available to make this a field modification in most NEMA 1 enclosures.

renewal parts



Carton contains a complete set of normal wearing parts, consisting of moving contacts, moving contact springs and stationary contacts. Separate kits are available for 2 or 3-pole starters.



a-c magnetic • non-reversing and reversing
full voltage Life-Linestarters

guide to class number

single speed

		circuit disconnect in same enclosure	ratings: range			NEMA sizes available	class no.
			phase	max. hp	volts		
non-reversing	air break	none	1	7½	115-230	0-2	11-200
			2	25	110-600	0-2	
			3	600	110-600	0-7	
		non-fusible	3	200	110-600	0-5	11-203
	fusible	3	100	110-600	0-4	11-204	
	circuit breaker	3	400	110-600	0-6	11-206	
	oil immersed	none	3	600	110-600	0-7	11-200
non-fusible		3	50	110-600	1-4	11-203	
circuit breaker		3	400	110-600	1-5	11-206	
reversing	air break	none	1	3	115-230	00-1	11-210
			2	25	110-600	0-2	
			3	300	110-600	00-6	
		non-fusible	3	100	110-600	0-4	11-213
	fusible	3	50	110-600	0-3	11-214	
	circuit breaker	3	100	110-600	0-4	11-216	
	oil immersed	none	3	25	110-600	1-2	11-210
non-fusible		3	25	110-600	1-2	11-213	
circuit breaker		3	25	110-600	1-2	11-216	

multi-speed

non-reversing	air break	none	3	100	110-600	0-6	11-950
	oil immersed	none	3	25	110-600	1-2	11-950
reversing	air break	none	3	200	110-600	0-5	11-951

multi-motor

non-reversing	air break	none	3	200	110-600	1-5	11-230
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specials

raintight pumping panel	fusible	3	100	220-440	1-4	11-204
	circuit breaker	3	200	220-440	1-5	11-206
cotton card	none	3	25	440-600	0-2	11-240
	fusible	3	25	600	0-2	11-244
	circuit breaker	3	25	600	0-2	11-246
oil well pumping	fusible	3	100	220-440	1-4	11-274
	circuit breaker	3	100	220-440	1-4	11-276
laundry	none	1 2 3	1½ 25 25	115-230 110-600 110-600	0 0-2 00-2	11-280
	none	3	25	110-600	1-2
	fusible	3	25	110-600	1-2
DYNAC (electrical braking)	none	3	25	110-600	1-2
	circuit breaker	3	25	110-600	1-2

Westinghouse Electric Corporation

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motor and control division: Buffalo plant, Buffalo 5, N. Y.

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