I.L. 9022-1A
Filing No. 8500

DESCRIPTION • OPERATION • MAINTENANCE

INSTRUCTIONS

DC GENERAL PURPOSE REVERSING TIMESTARTERS

Class 9022

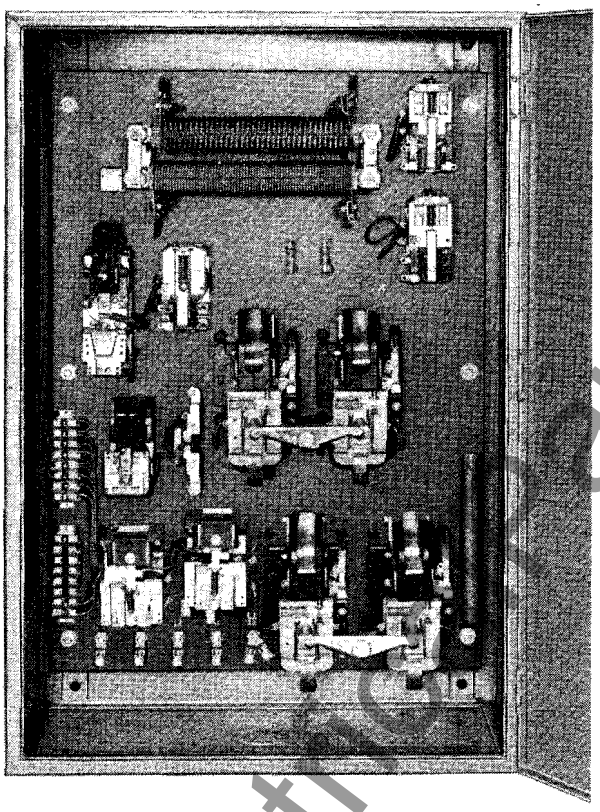


FIG. 1. Class 9022-F Starter for 50 Hp 230 Volts, Adjustable Speed, Reversing Service With Dynamic Braking. This Panel Differs from the Standard in that Control Fuses and Field Loss Relay have been Added.

GENERAL DESCRIPTION

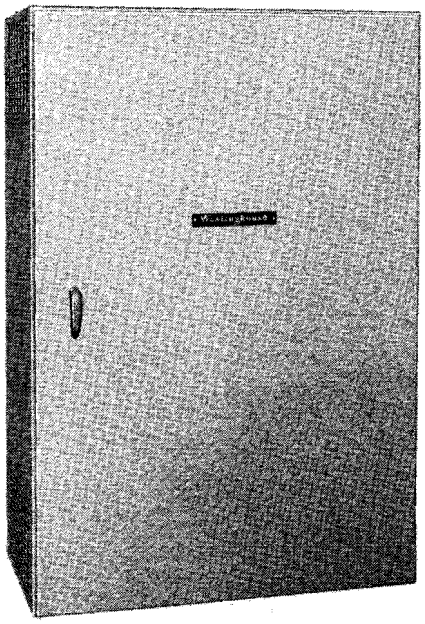
This leaflet has been prepared for guidance in the installation, adjustment, operation, and maintenance of standard general purpose, reversing, DC motor starters, of the following Westinghouse catalog classifications:

Class 9022C—Constant Speed, with Dynamic Braking

Class 9022F—Adjustable Speed, with Dynamic Braking

The typical standard starter consists of a set of mechanically interlocked, reversing line contactors, a dynamic braking contactor, one or more accelerating devices, an overload relay, a set of starting and braking resistors, and necessary auxiliary relays, electrical interlocks and wiring details. Starters for adjustable speed motors include a field fluttering accelerating relay. The contactors sizes and the number of accelerating points are selected to suit the motor rating in line with NEMA standards. On NEMA sizes 1, 2 and 3, the braking contact is part of each reversing line contactor. On larger starters, the braking contactor and line contactors are separate devices.

Although this leaflet is primarily intended for, and is written around standard starters, it applies also to semi-standard, or modified, starters equipped with one or more optional features, a few examples of which, are as follows:



Field Loss Relay—a relay operated by a coil (or coils) in series with the motor shunt field, arranged to open the line contactor in case the shunt field current is interrupted or falls below a safe value.

Field Economizing Relay—a relay that operates to insert a resistance in series with, and thus prevent overheating of, the motor shunt field should it be energized during long periods of motor idleness.

Extra auxiliary interlocks or auxiliary relay, for sequence interlocking with other units or devices.

Field decelerating relay, a device similar to the field accelerating relay used on standard adjustable speed starters, except arranged to protect the motor during deceleration.

Extra Class 9022 starters are enclosed in NEMA Type 1 Cabinets, but special cabinets to meet unusual conditions are often supplied.

Limitations. The control will operate satisfactorily on voltages within the limitations set by NEMA standards, namely 10% above and 20% below the value given on the name plate. Class 9022 controllers are equipped with resistors designed for starting duty in line with NEMA classifications 135 and 136 which permit 10 seconds "on" out of each 80 seconds. Heavier duty than this will overheat the resistor.

Upon receipt of controller, check name plate marking to make sure that the starter is fitted to the type and rating of the motor with which it is to be used. In no event should a motor of greater horsepower be used.

Disconnect Switch. In all cases it is good practice to furnish a fused entrance switch or circuit breaker ahead of each starter or group of starters for short circuit protection. The fuses should have a rating of one and one-half to two times the full load current of the motors which they protect.

OPERATION

By Standard Push Button. All apparatus on the elementary controller diagrams is shown in the de-energized position.

Operation is usually controlled from a three-button push button station marked "Forward-Reverse-Stop", as shown on the wiring diagram.

Fig. 2 is typical of the larger controllers featuring the type "AQ" timetactors. Depression of either the "Forward" or "Reverse" button energizes its first directional contactor whose interlocks, through a relay and dynamic braking contactor, form a holding circuit and disconnect the braking resistor. Interlocks on the braking contactor energize the second directional contactor and initiate the timing cycle by de-energizing the first timetactor which, after a delay, releases, shorting a section of the starting resistor and de-energizing the next timetactor. This process continues until the motor is operating on full line voltage.

On adjustable speed starters, the field accelerating relay picks up and remains closed during the accelerating period to provide full voltage on the motor field. As soon as the last timetactor has dropped out, the same relay becomes a field fluttering relay, automatically accelerating the motor to a speed determined by the setting of the field rheostat.

The time delay between the instant of de-energizing the main winding of each timetactor and its subsequent dropout is adjustable. This is accomplished by changing the position of the sliding tap on a resistor tube. Adjustment of accelerating time is made at the factory and for most applications no further adjustment is necessary. However, in the case of a high inertia load it may be desirable to increase the time bearing in mind that this decreases the number of starts that can be made in a given time as explained under "Limitations".

The motor is stopped by pressing the stop button. This drops out the contactors and connects the braking resistor across the motor armature. In the case of adjustable speed starters, the field relay operates to provide full field for dynamic braking. Immediate reversal or "plugging" of the motor is prevented by an anti-plugging relay which remains energized until the motor speed has been reduced to a safe value, after which it allows the motor to be restarted in either direction.

Fig. 3 is typical of the smaller controllers featuring the type AQZ timetactors. Depression of either the "Forward" or "Reverse" button energizes the timetactors and the proper directional contactor whose interlocks form a holding circuit. Application of power to the motor opens the dynamic braking circuit and de-energizes the first timetactor. Subsequent operation is identical to that in the larger controller.

Adjustment of the time delay in the type AQZ timetactors is obtained by varying the number of copper rings around the core.

Overload Protection. Thermal type overload relays are part of standard equipment. The type

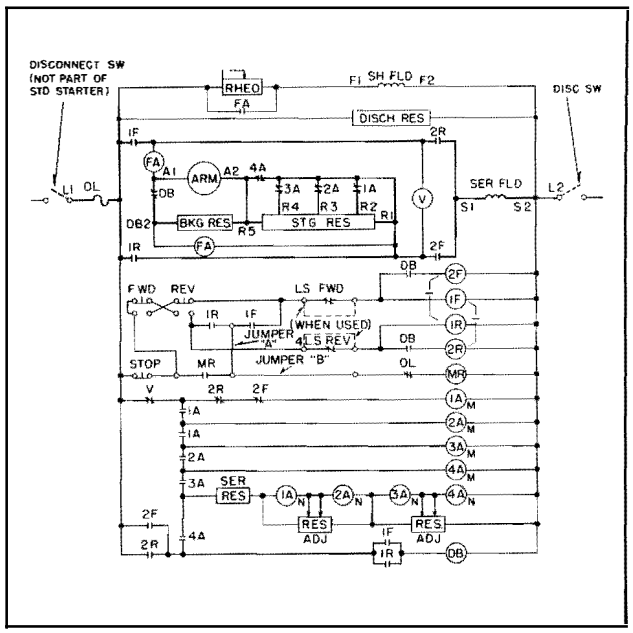


FIG. 2. Typical Schematic Diagram for Class 9022-F Timestarter with Five Accelerating Points.

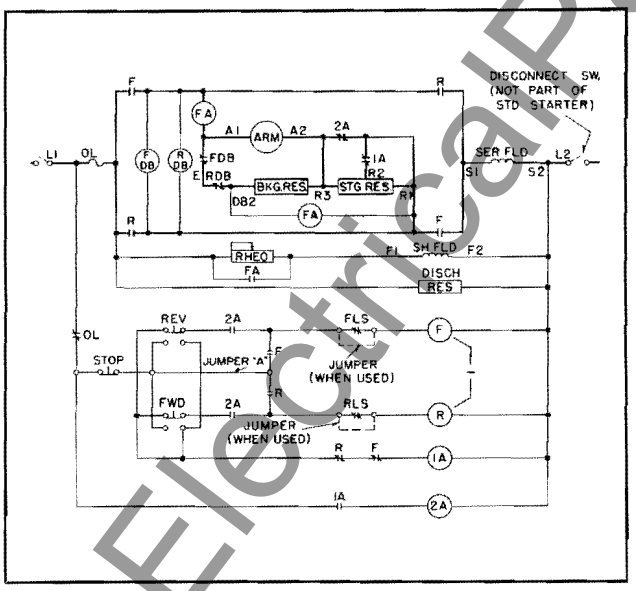


FIG. 3. Typical Schematic Diagram for Class 9022-F Timestarter with Three Accelerating Points.

Note: Above schematics show jumper connections for standard push button operation. Wiring diagram supplied with Class 9022 starters shows different jumper combinations required for Inching and master switch operation.

MW relay is standard on starters from NEMA size 1 through size 4, and Type TI-2 is standard on larger starters, though any conventional relay may be used.

Optional Master Switches. Although Figs. 2 and 3 show the standard "Forward-Reverse-Stop" pushbutton, the diagrams furnished with Class 9022 starters also include connections for other master switch arrangements, such as, inching (jogging) from 2 button station, operation from rotary or drum master switch, automatic and inching operation from 5-button station, marked "Forward-Inch Forward-Reverse-Inch Reverse-Stop", and a Combination of drum master switch and "Inch Forward-Inch Reverse" pushbuttons.

The above optional schemes are provided for on standard starters and standard diagrams by simple rearrangement of jumper connections at the starter control terminals.

Possible Sources of Trouble. If the apparatus fails to function, check the following points for the source of trouble:

1. The source of power may have failed.
2. Entrance switch fuse may have blown.
3. Overload relay contacts may be open.
4. An open circuit may exist in the wiring, or in the push button or interlock contacts.
5. A coil may have failed.

MAINTENANCE

In operating, servicing and adjusting the equipment, consult the diagram and the device instruction leaflets. Particularly remember the following points:

1. **Warning.** ***All circuits should be de-energized and disconnecting devices locked open when working on equipment.***

2. The equipment should be kept clean at all times.

3. Periodic inspection of all equipment should be made to insure that apparatus is kept in working condition.

4. Contacts becoming badly worn should be replaced before they cause failure. Proper spring pressure should be maintained at all times.

5. Do not oil contactor bearings.

6. Do not use emery paper around electrical apparatus. Sandpaper or file only when necessary, and use care to avoid damaging insulation by metal particles.

7. Keep all connections tight; particular attention should be given overload relay heater connections, to keep them clean and tight.

Component Devices. For maintenance and adjustment of component parts, refer to the instruction leaflet applying to the individual device. Following is a list of leaflets for typical devices.

IL-15800-M 010/110/210-1, Sizes 1 & 2—Single pole, Type M Contactors.

IL-15800-M 021/121/221, Sizes 1 & 2, Type M Contactors—2 poles NO & 1 pole NC.

IL-10248, Type MM-321 Contactors, 2 poles NO, 1 pole NC.

IL-10250, Type MM-301 Contactors, 1 pole NC.

IL-15800-1, Type M Sizes 3-4-5-6-7, Spring closed Contactors.

IL-15800-2, Type M Sizes 3-4-5-6-7, Single pole NO Contactors.

IL-15800-3, Type M Sizes 8-9, Single pole NO Contactors.

IL-15827-2-AQ, Type AQ, Timetactors.

IL-15827-3-AQZ, Type AQZ, Timetactors.

IL-10707, Type MW, Overload Relay.

IL-3487, Type IT2, Overload Relay.

IL-15827-11, Type AV, Relay.

IL-15827-4-AYC, Type AYC, Auxiliary Relay.

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