

CLASS 4102 AND 4204 SIZE 5 AC CONTACTOR AND STARTER MODEL S

2 OR 3 POLES

FRONT CONNECTED

DESCRIPTION

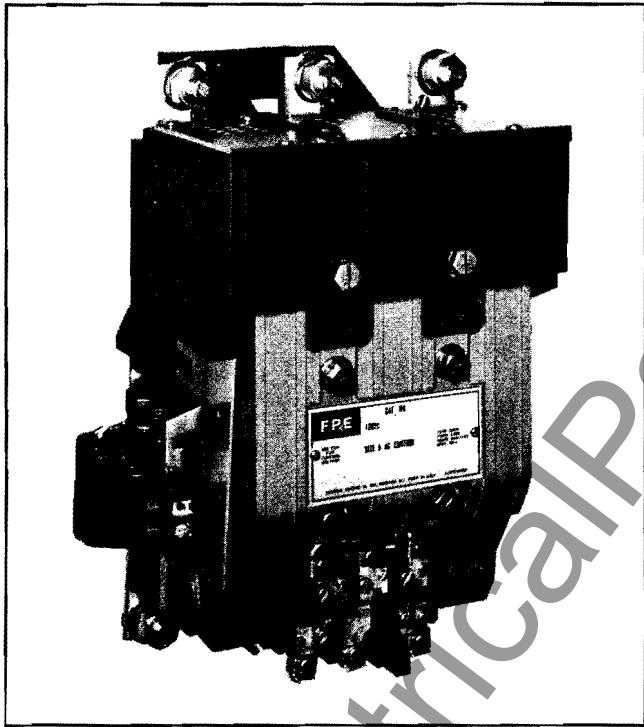


Fig. 1

Complete Full Voltage Across-Line Starter Assembly with Class 4102 Contactor, Class 5470CM51 Electrical Interlock, Current Transformers and Class 5480CR141 Thermal Overload Relay Providing 3 Pole O/L Protection.

The Size 5 AC Contactor is completely assembled on an insulated base of molded glass-polyester. It is suitable for mounting on either steel or insulating panels. Contactors are available in 2 or 3 pole front connected assemblies. A starter assembly, see Fig. ①, incorporates integrally mounted current transformers and overload relay.

This unit is supplied with an AC operating magnet. The operating coils are designed for continuous duty from 85% to 110% of rated voltage. The contact ratings are listed in Fig.②.

Characteristics	Open	Enclosed
Voltage Rating	600	600
8-hour rating, Amperes	300	270

Fig. 2 — Ratings

The main contacts are of the bridging or double break type. Both moving and stationary contacts are faced with a silver alloy, whose surfaces are kept clean by a rolling and wiping action as the contacts seal. Stainless steel compression springs in each moving contact assembly insure adequate contact force while providing resilience to allow for contact wear.

The arc box provides a mechanical stop for the moving contact assembly and maintains the proper open contact gap. In addition, the arc box contains arc quenchers which draw the arc away from the contacts at opening and produce a rapid and confined arc interruption. Twin kick-out springs insure positive drop-out of the armature assembly when the coil is de-energized.

INSTALLATION

Before mounting and wiring, the desired accessories such as electrical interlocks, mechanical interlocks, current transformers and overload relays should be mounted on the Class 4102 Size 5 AC Contactor or Starter assembly.

The assembly should then be mounted with four 5/16" dia. bolts. Mounting dimensions are shown in Fig. ③.

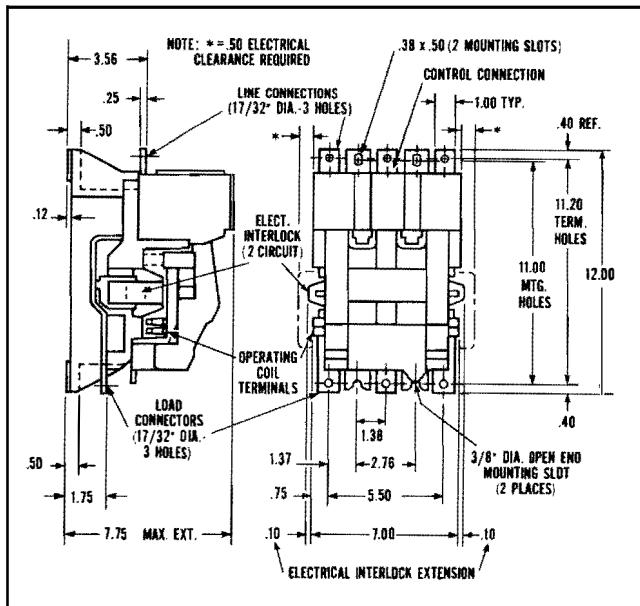


Fig. 3

Class 4102 Model C Size 5 AC Contactor and Starter Outline

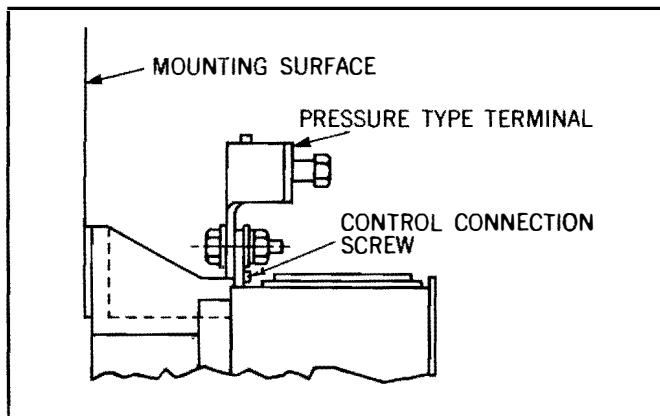


Fig. 4

Proper Assembly of Pressure Type Line Terminals to the Contactor.

Both line and load terminals have 17/32" diameter holes for 1/2" diameter hardware. Pressure type terminals, when used, should be assembled on the rear of the copper line terminal straps, as shown in Fig. ④ to provide access to the control connection screws. Pressure type terminals may be assembled on either front or rear of the load terminals.

Once installed, the assembly should be checked to insure proper operation of the basic contactor mechanism and accessory devices before power is applied.

The following list of the maintenance instructions should be used as a guide:

- a) The crossbar and springs must operate freely.
- b) Electrical and mechanical interlocks must be properly installed and adjusted.
- c) Current transformers if required must be installed and wired to the overload relay. Proper heaters must be installed before operating the motor.
- d) The proper operating coil must be installed and properly connected.
- e) The arc box must be in place. The contactor must never be operated in a power circuit unless the arc box is securely bolted in place.
- f) The main contacts must have overtravel and spring force.

ELECTRICAL INTERLOCKS

Description

The Class 4102 contactor will accommodate a total of two 5470CM51 electrical interlock units, providing a total of 4 circuits. One 5470CM51 interlock unit with 2 circuits is normally supplied on the left side.

The interlock unit is retained in a metal bracket by spring clips and operated by a metal operator mounted on the crossbar.

Additional interlock units are available with various contact arrangements as listed in Fig. ⑤. The kits include the interlock unit, mounting bracket, operator and the necessary hardware.

Installation and Checking

The metal mounting bracket is mounted on the contactor base with the hardware provided. The 5470CM51 interlock unit can then be installed.

The metal interlock operator is then mounted on the crossbar with the hardware provided.

For proper interlock operation, when the contactor is fully closed, the interlock push rod can be manually depressed .06 (1/16 inch) further. If adjustment is necessary, the slot in the end of the operator should be opened or closed to obtain this .06 (1/16 inch).

Interlock Pole Combination	Class No. Interlock Unit Only	Class No. for Interlock Kit (Includes Interlock Unit, Mounting Bracket, Operator, and Hardware)
1 NO - 1 NC *	5470 CM 51	5470 CM 501
2 NO	5470 CM 52	5470 CM 502
2 NC	5470 CM 53	5470 CM 503
1 NO	5470 CM 50	5470 CM 500
1 NO (E.M.)	5470 CM 54	5470 CM 504
1 NC (D.B.)	5470 CM 55	5470 CM 505

NO = Normally open circuit
E.M. = Early Make

NC = Normally closed circuit
D.B. = Delayed Break

* = Must use same polarity

Fig. 5 Class 5470CM51 Electrical Interlocks

MECHANICAL INTERLOCKS

The Class 4102 Size 5 Contactor, when used in combination with other contactors, may be mechanically interlocked to protect against the closing of one, when the other is already closed. Mechanical interlock combinations, for both vertical and horizontal assemblies, are listed in Figs. ⑥ and ⑦. Complete instructions and adjustment procedures for Class 5470CM511 through 5470CM514 Mechanical Interlocks are contained in instruction Leaflet I.L.-M1-567.

Upper Contactor	Lower Contactor	Use Mech. Intlk. Type
Class 4102 Size 5	Class 4102 Size 5 or 6	5470 CM 511
Class 4102 Size 3 or 4	Class 4102 Size 5	5470 CM 512

Fig. 6 Vertically Mounted Contactors Mechanical Interlock Combinations

Left Contactor	Right Contactor	Use Mech. Intlk. Type
Class 4102 Size 5	Class 4102 Size 5 or 6	5470 CM 513
Class 4102 Size 3 or 4	Class 4102 Size 5	5470 CM 514

Fig. 7 Horizontally Mounted Contactors Mechanical Interlock Combinations

OVERLOAD PROTECTION

Current Transformers and Overload Relays

The Thermal Overload Relay is available in ambient compensated or non-compensated versions which can be mounted directly on the contactor base and do not require additional panel space. See Fig. ①. The relay is wired to 300/5 ratio current transformers which are an integral part of the Size 5 Starter.

MAINTENANCE

Contact Forces

With new contacts, the total contact forces per pole should be:

Initial force 6 to 7 pounds (Fig. 8-A)
Final Force 7.5 to 8.5 pounds (Fig. 8-B)

After turning off the power, they may be measured by exerting a measured pull until the paper is allowed to move using the method shown in Fig. 8-A and 8-B.

Contact Overtravel

The initial contact overtravel, with new contacts, is $.23 \pm .03$ inches ($13/64$ to $17/64$ inches) and is measured with the power off as shown in Fig. 8-B. Contact replacement is necessary when the overtravel on any pole has been reduced to $.06$ ($1/16$) inch. The contacts must be replaced on all poles at the same time. Contact replacement is then achieved by the following procedure with the power off:

1. Remove the arc box.
2. Remove the three moving contact assemblies.
3. Remove the compression springs from the assemblies and twist the moving contacts to remove them from the saddles.
4. Remove the stationary contacts. (A $1/4"$ allen wrench is required for the $5/16$ socket head cap screws).

To install new contacts, reverse the procedure making sure all bolts and screws are tight, (the stationary contact mounting bolts must be tightened to 100–150 inch-pounds) and the arc box is securely in place. Check to be sure both kick-out springs are properly seated.

The main contacts, when new, are designed to touch the bottom faces before the top faces touch. Also, the moving contacts should touch the stationary contacts at the same instant within $.03$ inches maximum error on all poles as the contactor is closed.

Arc Box

The arc box provides the mechanical stop for the moving contact assembly while maintaining the proper open gap for the main contacts. The molded box also supports the arc quenchers which are contained within the arc box. Two, front accessible, bolts hold the arc box in place. This arc box requires no maintenance except for a periodic inspection to check if any grids have been damaged by fault conditions. The contactor must never be operated in a power circuit unless the arc box is securely bolted in place.

Kickout Springs

Normally no maintenance is required for these springs other than to make sure that they are properly seated on the molded crossbar assembly. In case they are

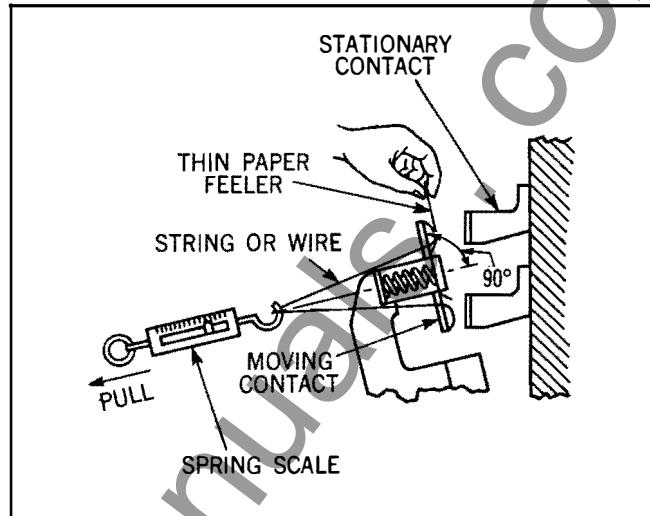


Fig. 8-A
Initial Contact Force Measurement

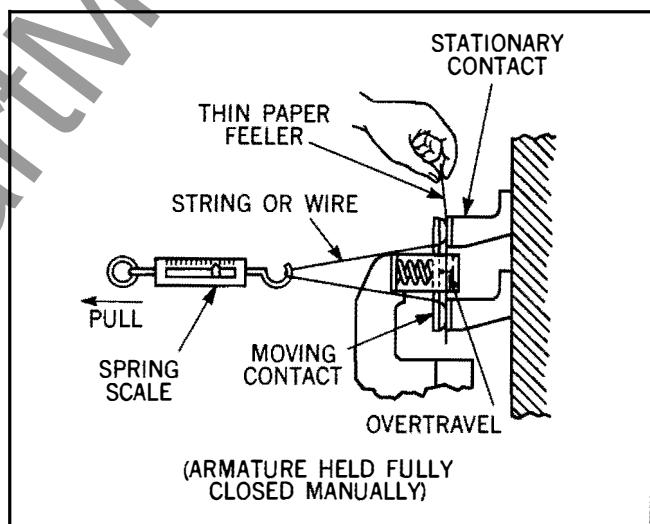


Fig. 8-B
Final Contact Force Measurement

inadvertently removed from the molded base where they are captivated in a hole slightly smaller than the free spring outside diameter, they can be reinstalled readily with a needle-nose plier as shown in Fig. ⑨. Hold the front end of the spring. Insert the pliers inside the spring, and rotate the offset pin end of the spring in a direction to decrease its outside diameter. Keep the spring restrained until the pin end has been inserted into the molded base.

Magnet Suspension

Both the stationary and moving magnet assemblies are flexibly mounted to assure proper sealing of the magnet for quiet operation. Both helical compression springs and flat leaf springs are in back of each magnet part. The moving armature has less spring force and restraint than the stiffer stationary magnet assembly. In case these magnets are ever disassembled,

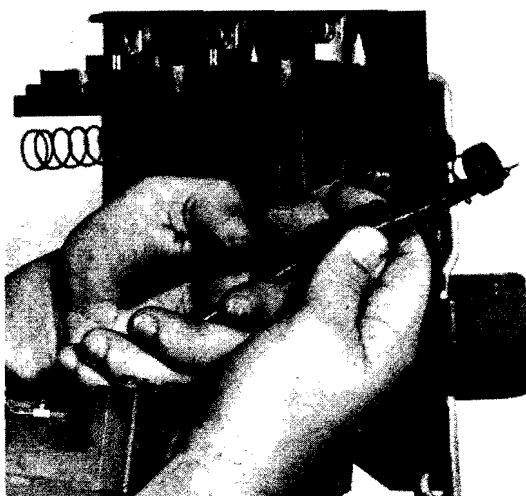
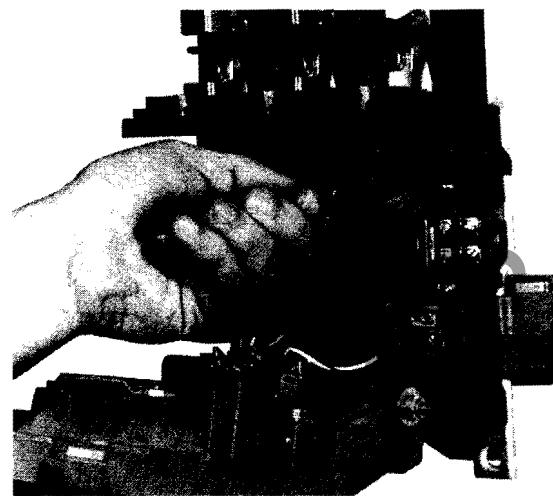


Fig. 9 Installation Method for Kickout Springs



particular care must be used to make sure that the flat leaf springs are centered on the laminated magnet assemblies and are not jammed between the magnets and the molded guide projections. After reassembly, be sure to check that both the stationary and moving magnets can be manually depressed or rocked in their mountings. Again, the moving armature assembly can be rocked with much less force and more freedom than the stationary assembly.

Operating Coils

When installing a new coil, check the identification label for the correct style number, voltage, and frequency.

Figure 10 lists the more commonly used coils and shows the connection diagram for each voltage. To replace an operating coil, proceed as follows:

1. Remove all power to the contactor and operating coil.
2. Remove coil leads.
3. Remove the arc box. (2 bolts)
4. Remove the moving contact assemblies from the crossbar. (3 screws) Gently lower the crossbar.
5. Remove the old coil from the magnet by removing the two mounting screws.
6. Place the new coil on the contactor and replace the two mounting screws.
7. Replace the moving contact assemblies. (Tapped hole in saddle must be in line with the clearance hole in the crossbar).
8. Replace the arc box on the contactor and securely tighten both mounting bolts. Make sure both kickout springs are properly seated.
9. Reconnect the leads to the new coil. Move crossbar by hand and make sure it moves freely with no mechanical friction.

LABEL MARKING	CONTROL VOLTS	CONNECT TO	OPERATING COIL STYLE NUMBER AND COLOR
A - ● 110/60 ● B C - ● 120/60 ● D	110	A - B	2050 A 14G05 RED
C - ● 208/220 ● B C - ● 240/60 ● D	120	C - D	
A - ● 208/220 ● B C - ● 240/60 ● D	208/220	A - B	2050 A 14G10 GREEN
A - ● 440/60 ● B C - ● 480/60 ● D	240	C - D	
A - ● 440/60 ● B C - ● 480/60 ● D	440	A - B	2050 A 14G15 YELLOW
A - ● 550/60 ● B C - ● 600/60 ● D	480	C - D	
A - ● 550/60 ● B C - ● 600/60 ● D	550	A - B	2050 A 14G17 GRAY
A - ● 550/60 ● B C - ● 600/60 ● D	600	C - D	
A - ● 120/60 ● B C - ● 240/60 ● D	120	A - B	2050 A 14G20* GRAY
A - ● 120/60 ● B C - ● 240/60 ● D	240	C - D	

* NOTE: Supplied connected for 240 volts with both jumpers wired A to B. For 120 volts reconnect the jumpers A to D and B to C as shown on coil label.

Fig. 10
Operating Coils for Class 4102 and 4804
Size 5 Contactor and Starter

RENEWAL PARTS

Complete renewal parts data is listed in RPD 5480 CR500.

Federal Pacific Electric Company
Newark, New Jersey 07101

Printed in U.S.A.

CLASS 4102 SIZE 6 AC CONTACTOR MODEL C

2 OR 3 POLES

FRONT CONNECTED

DESCRIPTION

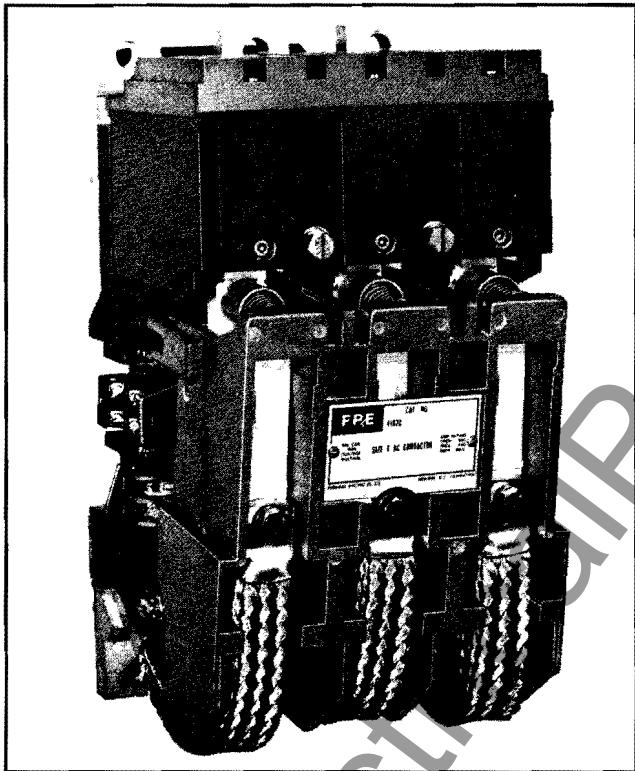


Fig. 1

Class 4102 Contactor with Class 5470CM51
Electrical Interlock.

The Class 4102 Size 6 AC Contactor is completely assembled on an insulated base of molded glass-polyester. It is suitable for mounting on either steel or insulating panels. Contactors are available in 2 or 3 pole front connected assemblies. See Fig.①

This unit is supplied with an AC operating magnet. The operating coils are designed for continuous duty from 85% to 110% of rated voltage. The contact ratings are listed in Fig.②

Characteristics	Open	Enclosed
Voltage Rating	600	600
8-hour rating, Amperes	600	540

Fig. 2 – Ratings

The main contacts are of the single break type. Both moving and stationary contacts are faced with a silver alloy, whose surfaces are kept clean by a rolling and wiping action as the contacts seal. Stainless steel compression springs in each moving contact assembly insure adequate contact force while providing resilience to allow for contact wear.

The arc box provides a mechanical stop for the moving contact assembly and maintains the proper open contact gap. In addition, the arc box contains arc quenchers which draw the arc away from the contacts at opening and produce a rapid and confined arc interruption. Twin kick-out springs insure positive drop-out of the armature assembly when the coil is de-energized.

INSTALLATION

Before mounting and wiring, the desired accessories such as electrical and mechanical interlocks should be mounted on the Class 4102 Size 6 AC Contactor assembly.

The assembly should then be mounted with four 5/16" dia. bolts. Mounting dimensions are shown in Fig. ③.

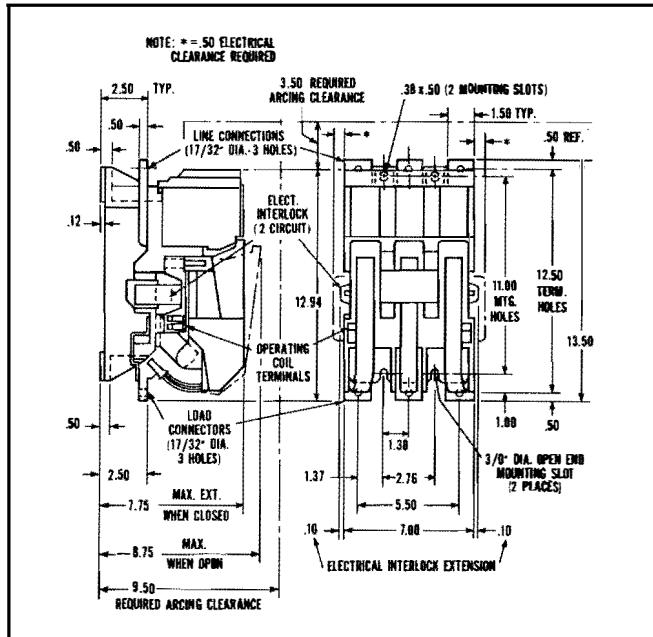


Fig- 3

Class 4102 Model C Size 6 AC Contactor Outline

Both line and load terminals have 17/32" dia. holes for 1/2" dia. hardware. Dual-lug pressure type terminals, when supplied, should be assembled on the front of the copper connection straps using the mounting pattern shown in Fig. ④.

Once installed, the assembly should be checked to insure proper operation of the basic contactor mechanism and accessory devices before power is applied.

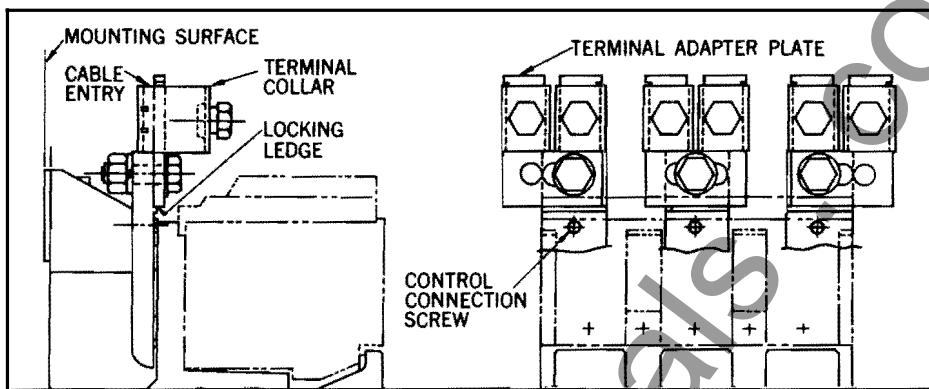


Fig. 4
Proper Assembly of Pressure Type Terminals to the Contactor

The following list or the maintenance instructions should be used as a guide:

- a) The crossbar and springs must operate freely.
- b) Electrical and mechanical interlocks must be properly installed and adjusted.
- c) The proper operating coil must be installed and properly connected.
- d) The crossbar must be in position. The contactor will not operate if the crossbar is rotated forward, out of position.
- e) The arc box must be in place. The contactor must never be operated in a power circuit unless the arc box is securely bolted in place.
- f) The main contacts must have overtravel and spring force and move freely.

ELECTRICAL INTERLOCKS

Description

The Class 4102 Contactor will accommodate a total of two 5470 CM51 electrical interlock units, providing a total of 4 circuits. One 5470 CM51 interlock unit with 2 circuits is normally supplied on the left side.

The interlock unit is retained in a metal bracket by spring clips and operated by a metal operator mounted on the crossbar.

Additional interlock units are available with various contact arrangements as listed in Fig. ⑤. The kits include the interlock unit, mounting bracket, operator and the necessary hardware.

Installation and Checking

The metal mounting bracket is mounted on the contactor base with the hardware provided. The 5470 CM51 interlock unit can then be installed.

The metal interlock operator is then mounted on the crossbar with the hardware provided.

For proper interlock operation, when the contactor is fully closed, the interlock push rod can be manually depressed .06 (1/16 inch) further. If adjustment is necessary, the slot in the end of the operator should be opened or closed to obtain this .06 (1/16 inch).

Interlock Pole Combination	Class No. Interlock Unit Only	Class No. for Interlock Kit (Includes Interlock Unit, Mounting Bracket, Operator, and Hardware)
1 NO-1 NC *	5470 CM51	5470 CM501
2 NO	5470 CM52	5470 CM502
2 NC	5470 CM53	5470 CM503
1 NO	5470 CM50	5470 CM500
1 NO (E.M.)	5470 CM54	5470 CM504
1 NC (D.B.)	5470 CM55	5470 CM505

NO = Normally open circuit NC = Normally closed circuit
E.M. = Early Make D.B. = Delayed Break
* = Must use same polarity

Fig. 5 Class 5470 CM51 Electrical Interlocks

MECHANICAL INTERLOCKS

The Class 4102 Size 6 Contactor, when used in combination with other contactors, may be mechanically interlocked to protect against the closing of one, when the other is already closed. Mechanical interlock combinations, for both vertical and horizontal assemblies, are listed in Figs. ⑥ and ⑦. Complete instructions and adjustment procedures for Class 5470 CM511, 5470 CM513 and 5470 CM611 Mechanical Interlocks are contained in Instruction Leaflet I.L.-MI-567.

Upper Contactor	Lower Contactor	Use Mech. Intlk. Type
Class 4102 Size 5 or 6	Class 4102 Size 6	5470 CM511
Class 4102 Size 6	Size 7	5470 CM611

Fig. 6 Vertically Mounted Contactors Mechanical Interlock Combinations

Left Contactor	Right Contactor	Use Mech. Intlk. Type
Class 4102 Size 5 or 6	Class 4102 Size 6	5470 CM513

Fig. 7 Horizontally Mounted Contactors Mechanical Interlock Combinations

MAINTENANCE

Contact Forces

With new contacts, the total contact forces per pole should be:

- Initial force 7.5 to 8.5 pounds (Fig. 8-A)
- Final force 9 to 10 pounds (Fig. 8-B)

After turning off the power, they may be measured by exerting a measured pull until the paper is allowed to move using the method shown in Fig. 8-A and 8-B.

Contact Overtravel and Replacement

The initial contact overtravel, with new contacts, is $.18 \pm .02$ inches (5/32 to 13/64 inches) and is measured with the power off as shown in Figs. 8-A and 8-B. Contact replacement is necessary when the overtravel on any pole has been reduced to .05 (3/64) inch. The contacts must be replaced on all poles at the same time. Contact replacement is then achieved by the following procedure with the power off:

1. Remove the arc box and gently lower the crossbar.
2. Disconnect shunts from moving contact.
3. Remove the three contact springs and their protectors. Remove the nameplate.
4. Remove the moving contacts by removing their bearing pins. (A 5/32" allen wrench is required for the #10 socket head cap screws).
5. Remove the stationary contacts. (A 1/4" allen wrench is required for the 5/16 socket head cap screws).

To install new contacts, reverse the procedure making sure all bolts and screws are tight, (the stationary contact mounting bolts must be tightened to 100–150 inch-pounds) the crossbar is raised into its proper position with the moving contacts inside the arc box, and the arc box is securely in place. Check to be sure both kickout and contact springs are properly seated and the nameplate is in place.

The moving contacts should touch the stationary contacts at the same instant within .03 inches maximum error on all poles as the contactor is closed.

Arc Box

The arc box provides the mechanical stop for the moving contact assembly while maintaining the proper open gap for the main contacts. The molded box also supports the arc quenchers which are contained within the arc box. Two, front accessible, bolts hold the arc box in place. This arc box requires no maintenance except for a periodic inspection for grid damage or zircon liner burn-through by fault conditions. The contactor must never be operated in a power circuit unless the arc box is securely bolted in place.

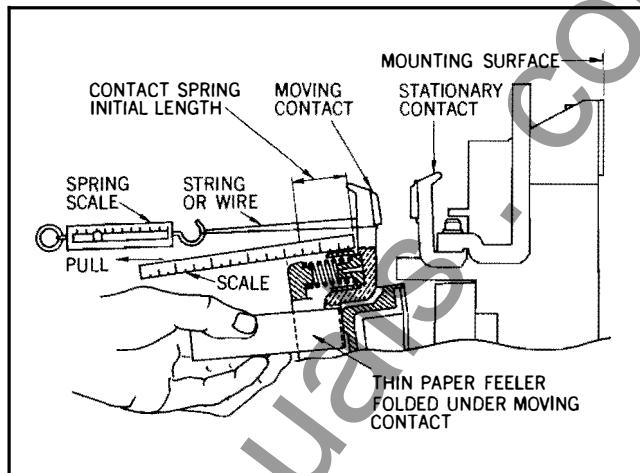


Fig. 8-A
Initial Contact Force & Spring Length Measurement

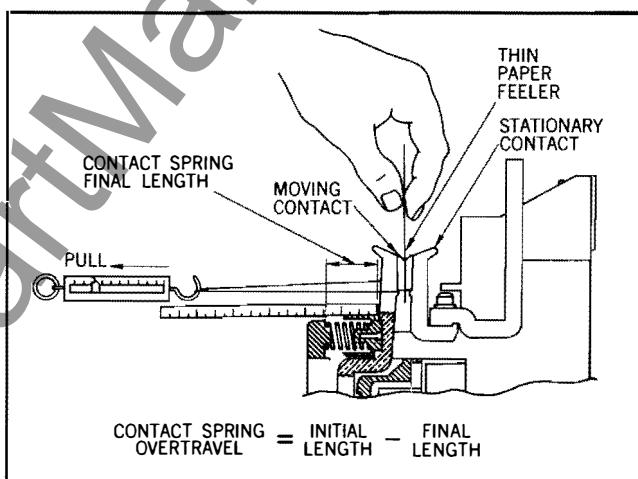


Fig. 8-B
Final Contact Force & Spring Length Measurement

Kickout Springs

Normally no maintenance is required for these springs other than to make sure that they are properly seated on the molded crossbar assembly. In case they are inadvertently removed from the molded base where they are captivated in a hole slightly smaller than the free spring outside diameter, they can be reinstalled readily with a needle-nose plier as shown in Fig. ⑨. Hold the front end of the spring, insert the pliers inside the spring, and rotate the offset pin end of the spring in a direction to decrease its outside diameter. Keep the spring restrained until the pin end has been inserted into the molded base.

Magnet Suspension

Both the stationary and moving magnet assemblies are flexibly mounted to assure proper sealing of the magnet for quiet operation. Both helical compression springs and flat leaf springs are in back of each magnet part. The moving armature has less spring force and restraint than the stiffer stationary magnet as-



Fig. 9
Installation Method for Kickout Springs

sembly. In case these magnets are ever disassembled, particular care must be used to make sure that the flat leaf springs are centered on the laminated magnet assemblies and are not jammed between the magnets and the molded guide projections. After reassembly, be sure to check that both the stationary and moving magnets can be manually depressed or rocked in their mountings. Again, the moving armature assembly can be rocked with much less force and more freedom than the stationary assembly.

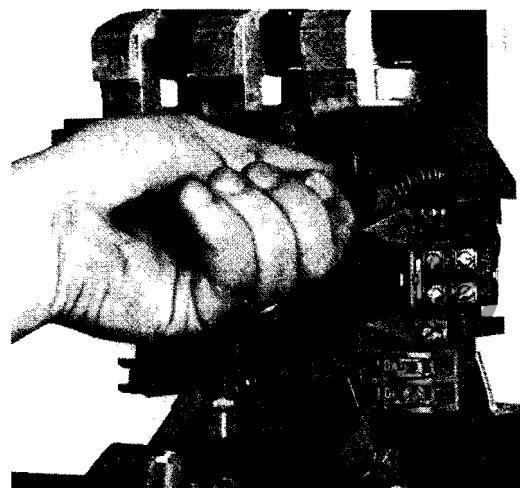
Operating Coils

When installing a new coil, check the identification label for the correct style number, voltage, and frequency.

Figure 10 lists the more commonly used coils and shows the connection diagram for each voltage.

To replace an operating coil, proceed as follows:

1. Remove all power to the contactor and operating coil.
2. Remove coil leads.
3. Remove the arc box, (2 bolts) and gently lower the crossbar assembly.
4. Remove the old coil from the magnet by removing the two mounting screws.
5. Place the new coil on the contactor and replace the two mounting screws.
6. Raise the crossbar into its proper position with the moving contacts inside the arc box.
7. Replace the arc box on the contactor and securely tighten both mounting bolts. Make sure both kickout springs are properly seated.
8. Reconnect the leads to the new coil. Move crossbar by hand and make sure it moves freely with no mechanical friction.



LABEL MARKING	CONTROL VOLTS	CONNECT TO	OPERATING COIL STYLE NUMBER AND COLOR
A - ● 110/60 ● B C - ● 120/60 ● D	110	A - B	2050 A 12G05 RED
C - ● 208/220 ● D	120	C - D	
A - ● 208/220 ● B C - ● 240/60 ● D	208/220	A - B	2050 A 12G10 GREEN
C - ● 240/60 ● D	240	C - D	
A - ● 440/60 ● B C - ● 480/60 ● D	440	A - B	2050 A 12G15 YELLOW
C - ● 480/60 ● D	480	C - D	
A - ● 550/60 ● B C - ● 600/60 ● D	550	A - B	2050 A 12G17 GRAY
C - ● 600/60 ● D	600	C - D	
A - ● 120/60 ● B C - ● 240/60 ● D	120	A - B	2050 A 12G20* GRAY
A - ● 240/60 ● B C - ● 240/60 ● D	240	C - D	

* NOTE: Supplied connected for 240 volts with both jumpers wired A to B. For 120 volts reconnect the jumpers A to D and B to C as shown on coil label.

Fig. 10
Operating Coils for Class 4102 Size 6 Contactor

RENEWAL PARTS

Complete renewal parts data is listed in RPD5480 CR 600.