I. L. 10246A
Filing No. 15-800

DESCRIPTION • INSTALLATION • MAINTENANCE

INSTRUCTIONS

MAGNETIC CONTACTORS, TYPE MM

Frames 311, 411 Direct Current

One Pole Normally Open and One Pole Normally Closed

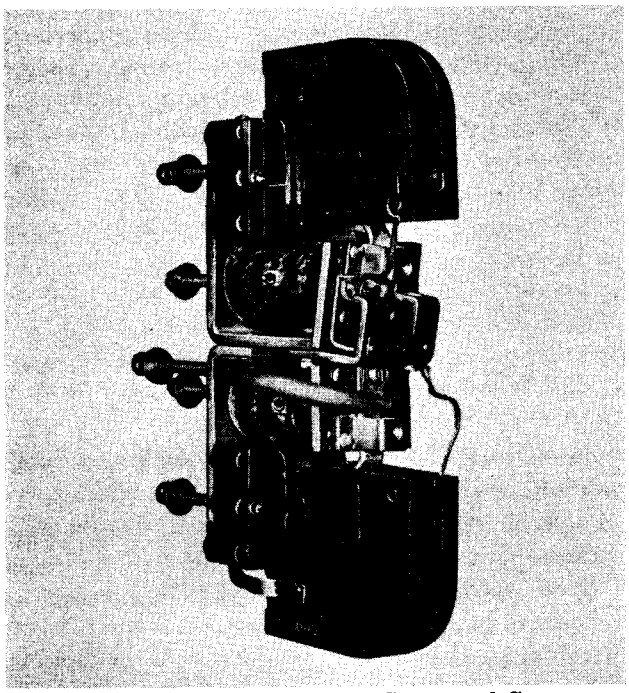

FIG. 1. Types MM-311, 411 Rear-Connected Contactors with Magnetic Blowout on Normally-Open Pole Only

TYPE MM CONTACTORS are general purpose magnetically-operated contactors suitable for use in motor controllers and other switching applications.

Rating

TYPE	8 HR.	1 HR.	INTERRUPTING CAPACITY AT 600 V.
MM-311	100A	133A	1000A
MM-411	150A	200A	1000A

The operating coils are rated for continuous duty and will operate the contactors at 80 to 100 percent of their rated voltage. The contactors are insulated for a maximum potential difference of 600 volts among parts.

DESCRIPTION

The contactors are of unit construction with all parts assembled on a common frame. The armature hinges on a knife-edge bearing which has an extremely long life and requires little maintenance.

The contactor is equipped with two operating coils, the upper coil being used to close the normally-open contact, and the lower coil serving to produce a complete sealing of the normally-closed contact. When neither operating coil is energized the kickout springs hold the lower, or normally-closed, contacts together. Because the kickout springs are not sufficiently strong to produce the full contact pressure, the lower coil should be energized at all times that the lower contacts are to be required to carry current.

An arc shield and blowout structure are always provided on the normally-open pole. They are optional on the normally-closed pole, and should always be provided when this pole is to be required to interrupt a circuit. The arc shield is held in place by the blowout pole pieces and a spring clip, and may be removed by pulling it directly forward. An arc horn in the arc shield relieves the moving contact of excessive burning. The arc, which is drawn between the contacts as they separate, moves outward under the influence of the magnetic blowout field and transfers from the moving contact to the arc horn. A flexible connection which is provided to maintain the arc horn at the same potential as the moving contact serves also to prevent loss or misplacement of the arc shield when the latter is removed for inspection of the contacts.

The moving and stationary contacts are faced with solid silver. The moving contacts are hinged on the armature in such a way that sliding or rubbing of the surfaces when the contacts meet is practically non-existent, a provision essential to the long life of silver contacts.

Plates of nonmagnetic steel are secured to the underside of the armature to prevent the armature from sticking closed against either pole face due to residual magnetism following the interruption of voltage to an operating coil.

Rear-connected contactors are held to the panel by five mounting studs, three of which make provision for the electrical connections (the moving contacts of the two poles are connected at a common

...Front connected contacts are provided with pressure type solderless terminals and are held to the panel by two mounting studs.

The contactors are suitable for mounting only on insulating panels up to 2 inches thick. As the frame is at the same potential as the two moving contacts, special insulating precautions must be taken if a contactor is to be mounted on a conducting surface.

Electrical Interlocks. The Type L-45 normally-open electrical interlock and the Type L-47 normally-closed electrical interlock may be applied to the contactors in numbers limited according to Table No. 1. It should be noted that a contactor having magnetic blowouts on both poles can accommodate a total of four interlocks, whereas a contactor having a magnetic blowout on its normally-open pole only is limited to two interlocks.

Table No. 1

ELECTRICAL INTERLOCK APPLICATIONS

ELECTRICAL INTERLOCK TYPE	MAXIMUM ALLOWABLE NUMBER OF INTERLOCKS TO BE APPLIED TO A CONTACTOR	
	Blowouts on Both Poles	Blowout Only on Normally-Open Pole
L-46 Normally Open	4	2
L-47 Normally Closed	2	2
Total number of interlocks of both types that can be applied to one contactor	4	2

The stationary contact assembly of either type of interlock is mounted on one of the molded bases of the contactor beside the arc shield. A molded insulating detail occupies this location when the contactor is assembled without interlocks at the factory, and this must be discarded at the time an interlock is mounted. The moving arm of the interlock is secured to the contactor armature by means of a single screw. Care should be taken when installing an interlock to make certain that its moving parts function freely and that the contact gaps and overtravels conform with the information given in the interlock Instruction Leaflets 15-829-L46-1B and 15-829-L47-1A.

The sequence in which the various switching operations occurs as the contactor magnet closes is as follows: (1) the main normally-closed contacts open, (2) the main normally-open contacts close, (3) the Type L-46 normally-open interlock closes, and (4) the Type L-47 normally-closed interlock opens.

Mechanical Interlock. A Type M-25 mechanical interlock, Style No. 1597 073, may be employed to safeguard a pair of contactors against the closing of one if the other is already closed. The contactors are mounted side-by-side on 4 3/16 inch centers.

INSTALLATION AND MAINTENANCE

Arc Shield. The arc shield and its arc horn are essential to the performace of the contactor and these parts should always be in place. The flexible connection leading from the arc horn should always be securely fastened to the frame. The arc shield may be removed by pulling it directly forward, allowing the blowout pole pieces (which act as its fixed supports) to guide it in its sliding movement. In replacing the arc shield, care must be taken that the guiding recesses in its sides locate themselves properly on and be gripped firmly by the supporting guides. If the guides are found to be spread apart so that they no longer grip the arc box firmly, remove the arc box and spring the guides together slightly by squeezing them with the fingers. The arc shield should be pushed back as far as it will go, until it is held securely against the molded base by the spring clips.

Armature and Bearing. The knife-edge bearing requires no maintenance other than the removal of accumulated dirt. Oil should not be used, as it hastens the collection of dust.

The upper magnet pole face is secured to the core by means of a bolt having a head that projects forward into a hole in the armature. Care should be taken that the parts maintain their proper alignment, and particularly that the bolt head be accurately centered in the armature hole. Dirt should not be allowed to accumulate.

Operating Coil. When a new operating coil is installed, the identification label should be examined to make certain that the voltage rating and the coil style number are correct for the application. The more commonly used coils are listed in Table No. 2.

This contactor has Class H coils which operate at a temperature rise of 150 degrees C. The surface temperature of the latter coils will be higher than that of Class A coils.

The steps to be followed in removing either of the operating coils are:

1. Remove the arc shield, or shields, as described previously.

2. Loosen the two bolts securing the armature stop to the underside of the contactor frame until the armature stop can be lowered clear of the two dowel pins which locate it in position.

Table No. 2. OPERATING COILS

COIL VOLTS	TYPES MM-311, 411 CONTACTOR COILS	
	Upper Coil Style No.	Lower Coil Style No.
115	1490 640	1622 906
230	1490 641	1622 907
550	1622 924	1622 908
250	1626 810	30B4376G17

3. Allow the self-contained assembly comprising the armature, armature stop, moving contacts and springs to hang by the shunt.

4. Remove the screw holding the pole face to the magnet core on which the coil is mounted.

5. disconnect the coil leads and slide the coil forward until it is clear of the contactor frame.

Contacts. Oil or other lubricant should not be used on the silver contacts. The discoloration which results from arcing and from exposure to the atmosphere usually is not harmful to their performance, and consequently no filing or dressing is necessary.

When the contacts are new they should meet sufficiently in advance of the final sealing of the armature against either the upper or the lower pole face, that a gap of approximately 5/32 inch appears between the underside of the contact and the edge of the fully-sealed armature, as indicated in Fig. 2. As the contacts wear, the amount of this overtravel diminishes, and when at length it decreases to 1/32 inch, the contacts should be replaced.

A moving contact can be removed for replacement by first disconnecting its shunt and then removing its contact spring. Each of the stationary contacts is slotted to facilitate removal, and it is necessary only to loosen the screw until the dowel projecting from the back of the contact is free of the locating hole in the stationary contact support.

When the contacts are new, the open gap of the normally-open contact, with the armature sealed against the lower pole face, should be 9/32 to 11/32 inch. The open gap of the normally-closed contact, when the armature is sealed against the upper pole face, should be 1/4 to 5/16 inch, as shown in Fig. 2.

If after applying new contacts it is found that the overtravels and contact gaps do not conform to the dimensions given, it may be necessary to bend the moving contact straps slightly.

The contact pressures of both the normally-open and normally-closed contacts, when they are new should be as indicated in Table No. 3.

To measure the final pressure of one of the contacts, first close the contactor mechanically in a direction producing full closing of the contact

Table No. 3. CONTACT PRESSURES

CONTACTOR TYPES	CONTACT PRESSURE IN OUNCES	
	Initial	Final
MM-311 MM-411	9-12	22-26

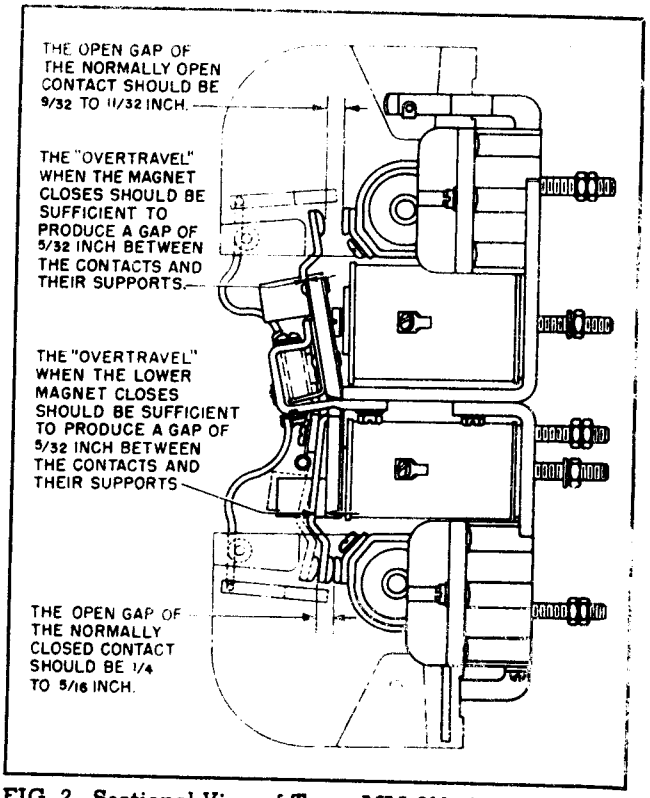

FIG. 2. Sectional View of Types MM-311, 411 Contactors

Then by means of a spring scale hooked to a loop of fine wire, measure the force necessary to separate the moving from the stationary contact.

If, after new contacts are installed, the pressures are not correct, it may be necessary to replace the contact springs or to adjust the contact overtravels in the manner described previously.

Failure of the magnet to operate the contactor may result from an open-circuited operating coil, from a circuit condition in which the voltage is excessively low, or from the presence of friction between the parts Failure of the contactor to open may be caused by friction or by defective kickout springs.

Renewal Parts. Renewal parts may be ordered from the nearest Westinghouse Sales Office. Be sure to describe the part or parts required and give complete nameplate reading on the contactor for positive identification