Instructions for Type DPM 1000V DC Contactor and Type L-67 Auxiliary Contacts

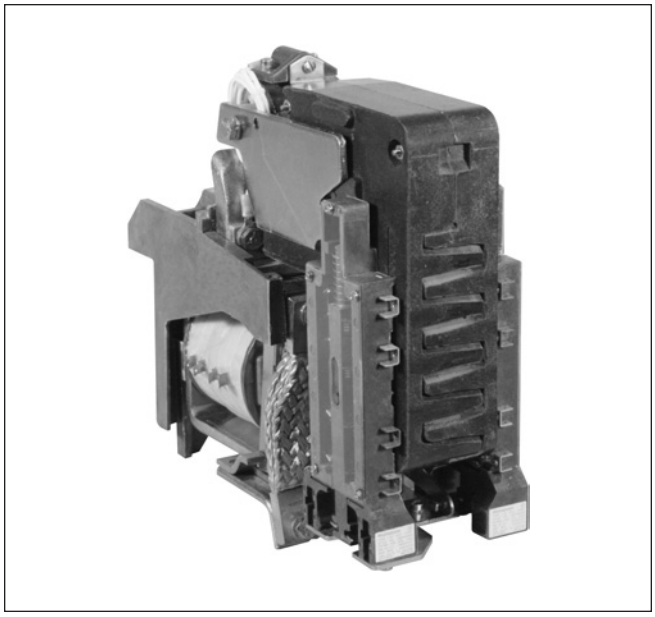


Figure 1. Type DPM Contactor with Auxiliaries

The Contactor

The Type DPM contactor is a 1000V DC, definite purpose, single-pole, magnet-closed contactor especially designed for use in applications in which a compact heavy-duty device is essential but where interruption of heavy overload current is not required. This contactor may also be applied where dust and vibration are present.

This industrial type control is designed to be installed, operated and maintained by adequately trained workmen. These instructions do not cover all details, variations or combinations of the equipment, its storage, delivery, installation, check-out, safe operation or maintenance. Care must be exercised to comply with local, state and national regulations, as well as safety practices, for this class of equipment. See back page for outline and mounting dimensions.

The continuous current and current interrupting ratings are as indicated in **Table 1**.

The Type DPM contactor is intended for mounting directly on a 3" channel or angle frame, but may be adapted for mounting on a flat metal or insulating panel.

The arc chute exhausts at the front of the contactor to eliminate the necessity for arcing clearance above the contactor. This permits close vertical stacking where vertical height is restricted.

All vital parts are removable from the front of the contactor without disturbing line or load connections.

The DC operating coil is rated for continuous duty and will operate the contactor over a voltage range of 80% to 110% of rated coil voltage. The .250" x .032" thick dual terminal tabs are for No. 250 Faston connectors.

Power circuit insulating parts are molded from glass-polyester materials selected for their arc and track-resisting qualities. Clearance and creepage distances meet or exceed the values established by NEMA standards for 1000 volt equipment, including those to auxiliary contact circuits.

⚠ CAUTION

If the mounting rail dimension (3") shown in **Figure 5** is exceeded, normal transient voltages that occur in 1000 volt systems will cause a flashover to the latch release calibrating screw.

When the arc chute is removed, the contact spring for the load arc horn connection moves into the path of the kick-out spring arm to block the magnet armature open. This mechanical interlocking feature prevents unintentional operation of the contactor when the arc chute is removed but can be released by hand during maintenance.

Optional Latch Mechanism

Some Type DPM contactors have a factory installed optional overcurrent latch mechanism which engages needle bearing rollers mounted on the vertical edges of the magnet armature.

Under heavy overload conditions, the latch will engage to prevent the contactor from opening load currents which may exceed the interrupting capacity of the arc chute. When the load current again returns to normal, the latch will disengage to allow the contactor to open when the operating magnet is de-energized.

The magnetic latch pickup and release currents are set at the factory but may be changed by a leaf spring adjustment on the bottom rear of the contactor. See *Overcurrent Latch* on **Page 6**.

Table 1. Contactor Ratings

Maximum Line Voltage (DC)	Continuous Carry Current Rating (Amperes)	Interrupting Rating (Amperes)
1000	1250	1250

Contact Structure

The Type DPM contact structure employs a single-break moving contact. An electromagnetic blowout is energized by a singe-turn continuous duty blowout coil which is a permanent part of the main current carrying path, plus a multiple-turn intermittent duty auxiliary blowout coil which is in the circuit only during arc interruption.

The stationary contacts are a part of a sub-assembly which may be removed from the front of the contactor without disturbing line connections to the contactor.

Two solid stationary contact segments are bolted in place and provide optimum thermal and electrical conductivity. A third spring-loaded contact segment makes contact before and opens after the solid contact segments to act as an arcing contact. The spring-loaded contact segment, in addition, acts to minimize contact arcing due to mechanical shock and vibration.

A single moving-contact segment spans all three stationary contact segments and is bolted to a copper bar backed up by a steel support. The pivoted moving-contact support, together with the braided copper shunt permit torsional movement. With this torsional freedom, the moving contact is able to make contact with both solid stationary contacts even though these two contact faces may not be perfectly aligned.

Both moving and stationary contacts are faced with a silver alloy, whose surfaces are kept clean by a slight rolling and wiping action as the contacts seal. A compression spring in the moving contact assembly provides for contact wear.

Arc Chute

The arc chute is held in place by a captive screw mounted at the rear, above the blowout coil. The line arc horn connector completes the electrical circuit between the auxiliary blowout coil and the line arc horn so that current in the line arc horn must pass though the auxiliary blowout coil. (See **Figure 4**.)

The load arc horn must be at the same potential as the load terminal of the contactor. This circuit is completed by a spring-loaded connection between the load arc horn connector, projecting from the bottom of the arc chute, and the metallic parts bolted to the contactor load terminal.

Magnetic blowout pole pieces are mounted on both sides of the arc chute adjacent to the contacts to provide a magnetic field which acts to move the arc off the contact and into the arc chute when the contacts open under load.

To remove the arc chute, disengage the line arc horn connection screw from the auxiliary blowout terminal. Then rotate the arc chute forward approximately 45 degrees and lift off of the contactor.

When the arc chute is removed, the blowout pole pieces can be rotated slightly upward to provide sufficient clearance for removal of the stationary contact sub-assembly.

Auxiliary Contacts

Each type DPM contactor can accommodate one or two Type L-67 auxiliary contact units, each consisting of four circuits as shown in **Table 2**.

Table 2. L-67 Auxiliary Contact Units

Contact Combination Provided by One Unit	Part Number
4NC	**2087A40G01**
1NO/3NC	**2087A40G02**
2NO/2NC	**2087A40G03**
3NO/1NC	**2087A40G04**
4NO	**2087A40G05**
Mounting Plate — One required for each L-67 unit.	**2087A35H01**

Table 3. L-67 Contact Ratings

Voltage	Make Current	Break Current	Carry Current
25 – 600V DC	250 VA	250 VA	10A
50 – 500V AC	5000 VA	10A	10A
501 – 600V AC	4800 VA	8A	10A

Type L-67 contact units are field mountable. Each unit requires one mounting plate (Part Number 2087A35H01). The L-67 contact ratings for inductive loads are shown in **Table 3**. Each L-67 circuit has .250" wide x .032" thick dual terminal tabs for No. 250 Faston connectors.

All contacts, both moving and stationary, have dual silver buttons whose surfaces are kept clean by a wiping action as the contacts close. The individual moving-contact buttons are mounted on separate spring finger sections and engage the stationary contact buttons at an angle. This arrangement provides parallel current paths plus a contact wedging action which results in maximum resistance to mechanical shock and vibration.

Each Type L-67 auxiliary contact unit is supplied with a return spring. However, the pushrod is arranged to engage its operating linkage in a manner that permits it to be driven and held in both its normal and actuated positions. This provides a positive operating action which aids in preventing unintentional operation of the contacts due to mechanical shock or vibration. Also, it prevents the L-67 auxiliary contact unit from sticking in the actuated position because of friction or light contact welds.

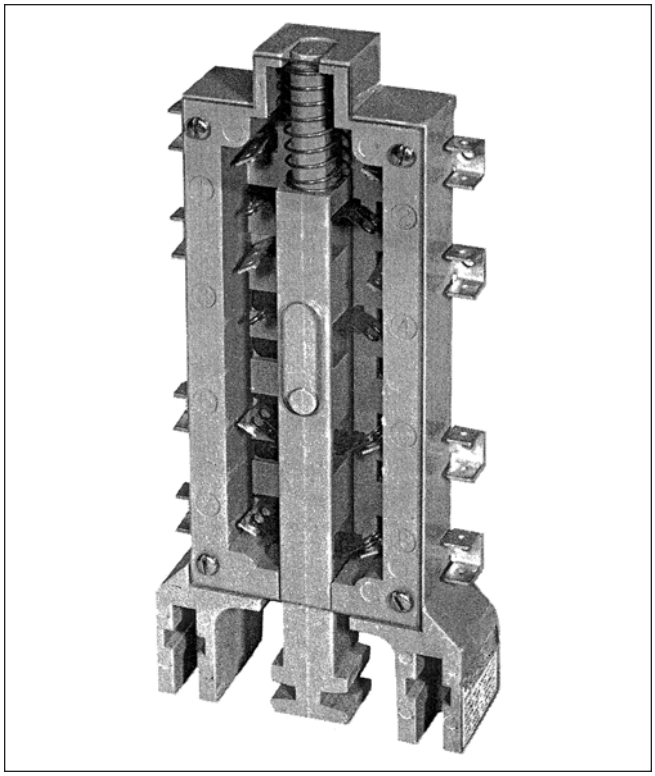


Figure 2. Type L-67 Auxiliary Contact Unit

Auxiliary Contact Installation

A Type L-67 auxiliary contact unit mounted with #10-32 screws using the two mounting feet at the pushrod end of the molded housing as shown in **Figure 1**. The two mounting screws engage #10-32 square nuts held captive by slots in the molded housing.

After a Type L-67 auxiliary contact unit is installed, check to make sure the pushrod is not driven solid against its stop when the contactor is closed. The unit is properly installed when the pushrod can be depressed slightly beyond the position it takes when the magnet armature is fully sealed.

Replace the entire L-67 unit if parts become severely worn.

Maintenance

This industrial type control is designed to be installed, operated and maintained by adequately trained workmen. These instructions do not cover all details, variations or combinations of the equipment, its storage, delivery, installation, check-out, safe operation or maintenance. Care must be exercised to comply with local, state and national regulations, as well as safety practices, for this class of equipment.

As with all electrical apparatus, a routine inspection and maintenance program should be established when this contactor is put into operation. The frequency of inspection should, of course, depend upon the severity of the contactor duty.

Do all work on this contactor with the main circuit disconnect device open.

Before the contactor is placed in service for the first time, or following maintenance work, operate the contactor slowly by hand two or three times without power to check the alignment and operation of moving parts.

When the arc chute is removed, it is necessary to depress the load arc horn contact spring before the main contacts can be closed. Forcing the contacts closed, without depressing the arc horn contact spring, may distort the contact spring so that it is unable to provide contact force for the load arc horn when the arc chute in installed.

If the contactor operates satisfactorily by hand, then close and open it two or three more times using the operating magnet, but with the main power circuit de-energized.

In the event the contactor has been operated under heavy fault conditions, it should be inspected at the first opportunity after it is de-energized.

A routine maintenance program should include the following salient points.

1. See that bolts, nuts, washers and terminal connectors are tight and in good condition. Replace items showing excessive wear or corrosion.
2. Inspect insulator for breaks, cracks or burns. Clean the insulators where abnormal conditions such as salt deposits, cement dust or acid fumes prevail. This is necessary to avoid flashover as a result of the accumulation of foreign substances on their surfaces. The insulators should never be cleaned with an oily rag or waste. Oil holds dirt particles which may cause arcing across the surface of the insulators.
3. Check the general condition of connectors, shunts and other current carrying parts. Especially note any discoloration which would indicate excessive heating due to loose hardware, high current or low contact force. To obtain maximum access to these details, the arc chute must be removed.

Moving Contact

Moving contact force with new contacts should be as follows:

Initial Force — 4.4 to 7 lbs.

Final Force — 9 to 13 lbs.

Contact forces are measured just above the top edge of the contact inlay and in a line perpendicular to the moving contact face as shown in **Figure 4**.

Initial contact force is measured with the contacts open. When making this measurement, the magnet armature must be blocked part way closed to hold the moving contact assembly clear of the open gap stop. Initial force reading should be taken when the armature is blocked open .125" as indicated in **Figure 3**. The arcing contact must not bear against the moving contact when this measurement is made.

Final contact force is measured with the magnet fully sealed and with the arcing contact depressed slightly so that it does not apply force to the moving contact.

Moving contact overtravel with new contacts should be .001" to .050" when the top of the armature is blocked .125" from the magnet frame and measured as indicated in **Figure 3**.

After the contactor is placed in service, the contact faces will be eroded by mechanical wear and arcing so that contact overtravel and final contact force will gradually decrease with time.

When the armature gap of **Figure 3** decreases to .03" or less with the moving and solid stationary contact segments at the touch point, replace the contacts.

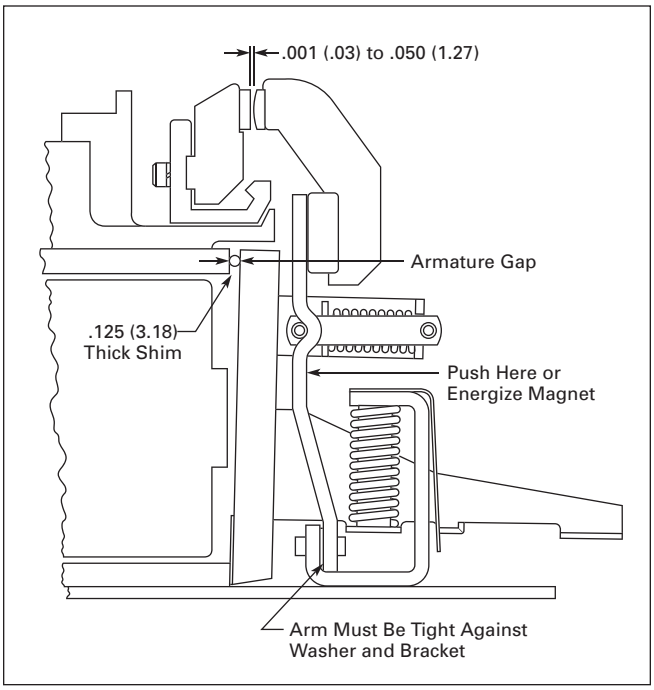


Figure 3. Contact Overtravel Measurement — Approximate Dimensions in Inches (mm)

Arcing Contact

Final contact force with new contacts should be 3 to 4.5 lbs. measured at the top edge of the contact inlay. Final force is that required to depress the arcing contact to a point where the arcing contact face is even with the contact faces of the two solid contact segments.

Arcing contact overtravel is the distance the arcing contact projects beyond the two solid stationary contact segments when the moving contact is open. With new contacts, overtravel is approximately .09". Replace the arcing contact when it no longer projects beyond the solid stationary contact segments when the moving contact is in the open position.

Contact Replacement

Replace badly pitted, burned or worn contacts. If the contact inlays look satisfactory except for sharp edges or rough spots, which might hinder proper closing, clean them by using a fine file. No attempt should be made to file out the pit marks. Do not use abrasive materials on the contacts.

Replace the old moving contact by removing the two 5/16" bolts securing the moving contact to the moving contact support.

After the moving contact is removed, take off the stationary contact support sub-assembly from the front of the contactor in one assembly by removing the two 5/16" bolts securing it to the molded contactor base and main blowout coil. The two solid contact sections can be freed by removing the socket head cap screws from the rear of the stationary contact sub-assembly.

The arcing contact is held in place by its contact spring.

To install new contacts, reverse the above procedure making sure all bolts are tight and insulating spacers are mounted between the arcing and stationary contact segments.

After the new contacts are installed, close the switch slowly by hand and check to see that lateral alignment of the moving contact with the stationary contact is within .032". Poor alignment may be corrected by loosening the two bolts attaching the moving contact spring saddle to the armature and then sliding the moving contact support assembly to he left or right as required to provide proper contact alignment.

On closing, the moving contact must first make contact with the spring-loaded stationary contact segment and then the two solid contact segments. On opening, the spring-loaded contact segment must break contact last.

After the arc chute is installed, operate the switch slowly by hand and check for any friction or interference with the arc chute or other parts.

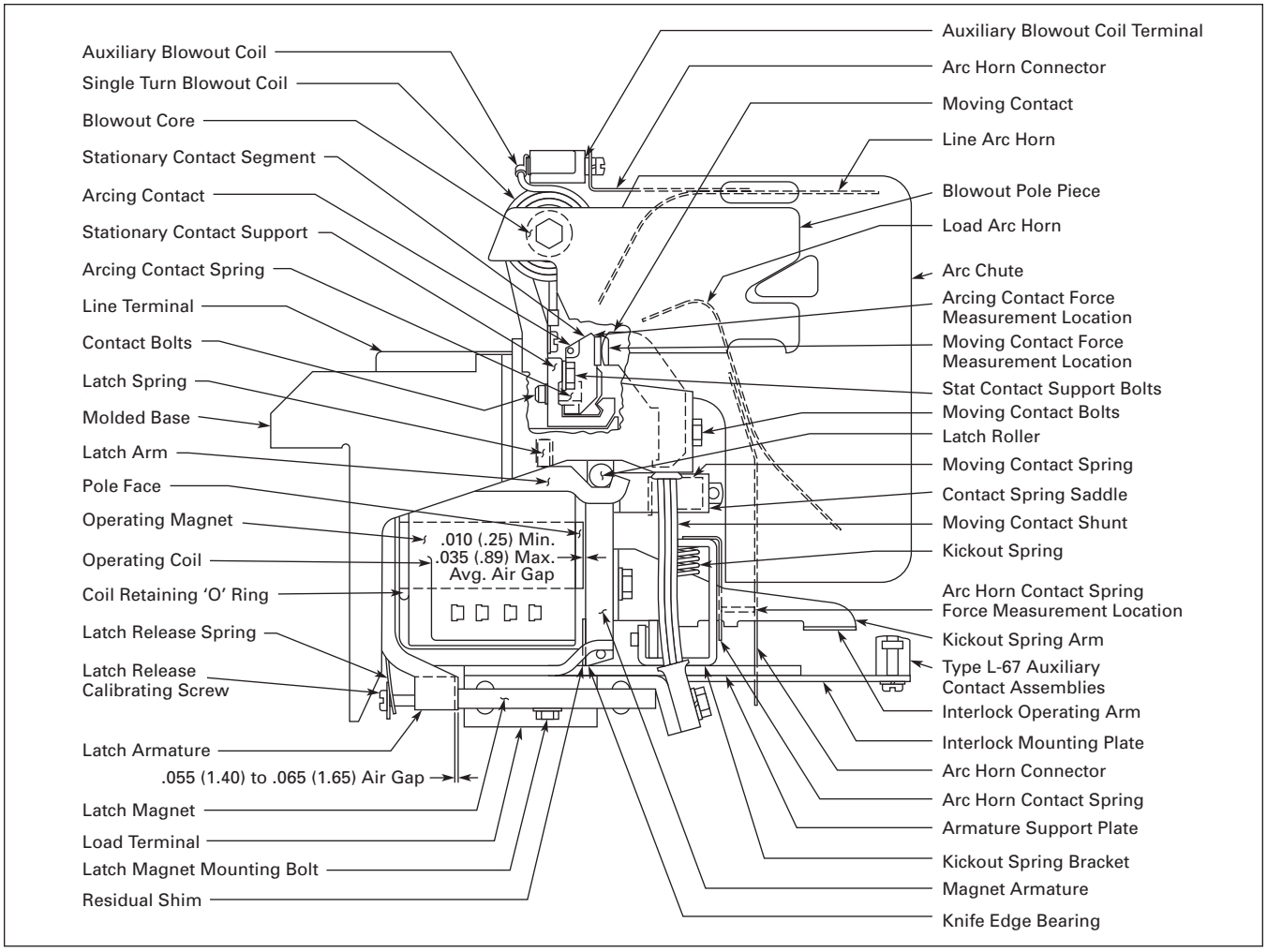


Figure 4. DPM Contactor with Magnet Armature and Contacts in the Closed Position

Arc Chute

The arc chute chamber, blowout pole pieces and arc horns are essential to the proper performance of the contactor and these parts must always be in place and properly connected when the contactor is required to interrupt current.

The line arc horn connections, projecting from the upper rear corner of the arc chute, must be securely bolted to the auxiliary blowout coil terminal to provide a good electrical connection between the line arc horn and auxiliary blowout coil and also to fasten the arc chute securely in place.

The load arc horn connection projects from the bottom of the arc chute, where it makes electrical connection with the load side of the contactor. This connection is spring loaded by a leaf spring mounted on the front of the armature kickout spring bracket.

This leaf spring must apply a force of 7 pounds or more against the load arc horn connector. An additional function of this leaf spring is to lock the contactor open when the arc chute is not in place.

Usually, the arc chute requires little or no maintenance, but it may conveniently be checked whenever the main contacts are examined or changed.

Examine the arc horns and arc chute walls for excessive arc erosion. Also examine the arc chute walls and grid plates for excessive metal deposits and for cracks. Clean dust and other foreign matter from the arc chute chamber.

Operating Magnet

The knife-edge armature bearing requires no maintenance other than the removal of accumulated dirt. Do not oil the bearing, as it hastens the collection of dust. A shelf is provided on the armature plate to minimize falling dust and dirt from collecting between the armature and frame at the knife-edge bearing.

The magnet pole face is secured to the core by means of a 5/16" bolt having a head that projects forward into a hole in the armature. Care must be taken that the parts maintain their proper alignment, and particularly that the bolt-head has clearance to the sides of the hole in the armature.

The air gap between the pole face and magnet armature shown in **Figure 4** must not be less than .010" at any point and the average gap measured on the horizontal and vertical center lines of the pole must not exceed .035".

A beryllium-copper shim is mounted on the armature at the knife-edge bearing to provide permanent non-magnetic gap. This shim should be checked during regular maintenance inspections to be sure it is in place.

Failure to Close

A magnet may fail to close for any of the following reasons:

1. The lead wire to the operating coil is disconnected.
2. The operating coil is open circuited or has shorted turns.
3. The DC operating voltage is below 80% of the rated coil voltage.
4. There is interference or friction between moving parts.
5. There is excessive contact, kickout or auxiliary contact spring force.
6. Armature gap is too large.

Failure to Open

A magnet may fail to open for any of the following reasons:

1. There is a mechanical interference or friction.
2. Contacts are welded together.
3. Residual magnetism is holding the magnet closed because of low kickout spring force, defective or missing anti-residual shim or insufficient pole-face gap.

Operating Coil

The operating coil is designed to operate at high temperatures, and is insulated to meet such service. Do not be alarmed to find the coils hot to the touch.

When a new operating coil is installed, examine the identification label to make certain that the voltage rating is correct for the application. Commonly used operating coils are shown in **Table 4**.

Table 4. Replacement Coils

Coil Voltage	Part Number
28V DC	**2114A92 G04**
36V DC	**2114A92 G05**
55V DC	**2114A92 G06**
74V DC	**2114A92 G09**
110V DC	**2114A92 G14**
125V DC	**2114A92 G15**
275V DC	**2114A92 G16**
600V DC	**2114A92 G20**

To remove and replace the operating coil, proceed as follows:

1. Remove arc chute.
2. Disconnect coil leads.
3. Remove the auxiliary contact assemblies and their steel mounting plates, by removing the two #10-32 screws located on the underside of the steel armature support plate. If the contactor has only one or no auxiliary contact assemblies, remove the remaining one or two #10-32 screws securing the magnet kickout spring bracket to the armature support plate.
4. Remove moving-contact.
5. Unbolt the lower ends of the two moving contact shunts.
6. Pull the bottom end of the magnet armature out and rotate it upward approximately 90 degrees. Now lift the armature sub-assembly off the contactor.
7. Remove pole-face bolt and pole-face.
8. Slide operating coil off the core in a horizontal direction.

To install a new operating coil, reverse the above procedure.

Overcurrent Latch

The overcurrent latch is an optional feature not found on all units.

Little maintenance is required by the overcurrent latch other than occasional inspection to see that the assembly moves freely between the engaged and disengaged positions.

Under heavy overload conditions, the latch will engage and hold the main contacts closed even though the contactor operating coil is de-energized. When the load current drops down to normal, the latch will disengage and slow the main contacts to open, provided the operating coil is de-energized.

Latch pickup current is 1500 amperes or less and is dependent on the downward force exerted by a compression spring operating on the horizontal portion of one of the latch arms.

The value of load current at which the latch releases is dependent on the kickout force exerted on the latch armature by a leaf spring mounted on the rear of the operating magnet frame.

The overcurrent latch is calibrated and sealed at the factory to release between 1350 and 1450 amperes and should not require further adjustment. If recalibration should become necessary, the kickout force and latch release current setting may be varied by adjusting the latch release calibrating screw in the latch armature. (See **Figure 4**.)

The latch release calibrating screw is self-locking and may be rotated clockwise to increase kickout force and increase the value of current at which the latch will release. Turning the calibrating screw counterclockwise will decrease kickout force and lower the current at which the latch will release.

Latch calibration is independent of operating coil polarity.

When the latch engages, the lower ends of the latch arms must strike the magnet pole faces slightly before one or both horizontal latch arms make contact with the undersides of the latch rollers.

The latch magnet is provided with elongated mounting holes, so it may be shifted to provide proper engagement of the latch arms.

The latch assembly must move into position freely without friction or interference between the latch hooks and front surfaces of the rollers.

The latch armature is mounted .060" from the leading edges of non-magnetic latch arms so it provides a .060" non-magnetic gap. This gap influences latch release calibration and must be kept free of iron filings and other foreign matter.

Auxiliary Contact Units

When a Type L-67 auxiliary contact unit is new, contact overtravel should be greater that the combined thickness of two contact buttons so that contact force will be maintained as long as the contact faces are usable. This overtravel can be easily determined by observing the distance between the moving contact bridging member and the slot in the pushrod.

A periodic inspection should be made to see that the parts move freely without excessive friction or binding. Do not oil the pushrod.

The silver contacts in the L-67 will not need dressing throughout their normal life.

⚠ CAUTION

Following any inspection procedure, or after any maintenance work — **BE SURE TO REPLACE** the arc chute, reconnect the line arc horn, and lower the magnetic blowout pole pieces to the operating position.

⚠ CAUTION

Never attempt to interrupt current without having arc chute and blowout pole pieces in their proper operating position, or without securely tightening the line arc horn connection.

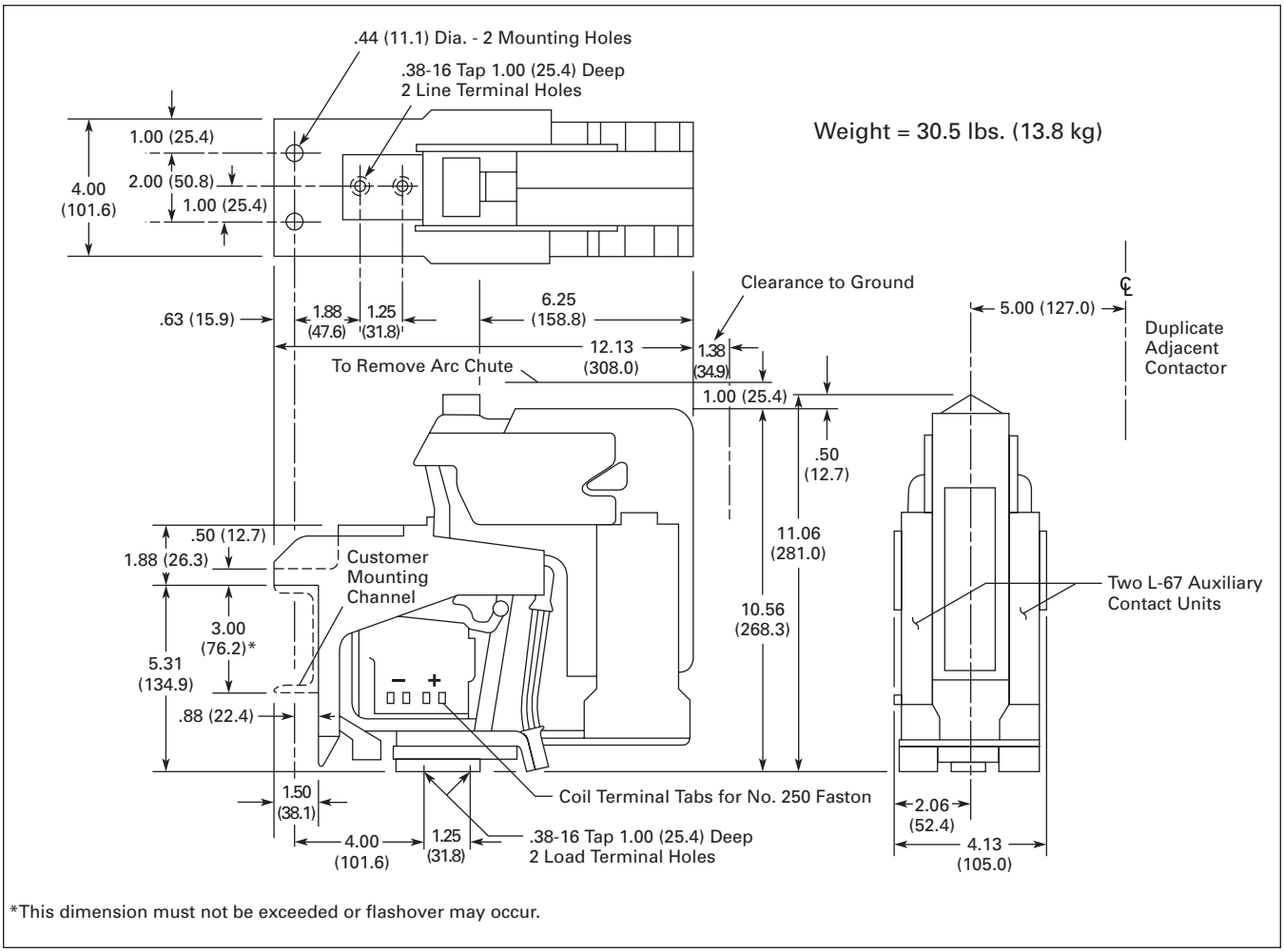
Renewal Parts

Renewal parts for Type DPM contactors are shown in **Table 5**.

Table 5. Renewal Parts

Item	Part Number	Required for One Contactor
Moving Contact	**2117A94G02**	1
Stationary Contact	**2117A93G01**	2
Arcing Contact	**2117A91G03**	1
Shunt	**3534C86G01**	2
Auxiliary Blowout Coil	**3534C88G01**	1
Arc Chute	**2131A94G03**	1
Moving Contact Spring	**2087A05H06**	1
Arcing Contact Spring	**2087A05H09**	1
Kickout Spring	**2087A05H05**	1
Load Arc Horn Spring	**2087A16H01**	1
Latch Calibration Spring	**2087A21H01**	1
Latch Bias Spring	**2087A05H03**	1
Operating Coil	See **Table 4**	1
Coil Retaining “O” Ring	**484B512G04**	1
Auxiliary Contact Units	See **Table 2**	2 max.

Dimensions



*This dimension must not be exceeded or flashover may occur.

Figure 5. Dimension Drawing — Approximate Dimensions in Inches (mm)

Table 6. Approximate Dimensions and Shipping Weights

Dimensions in Inches (mm)			Shipping Weight lbs. (kg)
Width	**Height**	**Depth**	
4.13 (105)	11.06 (281)	12.13 (308)	30.5 (13.8)

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