

SQUARE D Instruction Bulletin

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Size 5A, 400 Amp, Single Pole DC Contactor, Normally Closed Type MGAO3, Series A Class 7004

INTRODUCTION

This instruction bulletin illustrates and describes Class 7004 MGAO3 single pole DC contactors. The Class 7004 Type M contactor is a DC magnetic, milltype clapper device designed to meet NEMA Standards. Table 1 lists the contactor ratings.

Contactors Ratings

Table 1 Maximum Contactor Ratings @ 600 VDC +40° C Ambient

Ratings	DC Motor Horsepower @ 230 VDC	DC Amperes
Open 8 hour	110	400
Enclosed	100	360
Crane	150	533

Operating Coils

The operating coils are designed in accordance with NEMA standards to continuously withstand 110% of rated voltage and to successfully operate the contactor at 80% of rated voltage. Standard coil voltages are 115/120 V and 230/240 V. Table 2 lists the ratings for standard operating coils. For other available coil voltages, refer to Class 9998 Coil Data Catalog Sheet.

Table 2 Operating Coil Ratings

Coil Part Number	DC Voltage Rating	Nominal Resistance @ +20° C (¾)
D51017 - 243 - 53	230/240	1220
D51017 - 243 - 56	115/120	310

Electrical Interlocks

Electrical interlocks consist of stationary contacts mounted on the contact arm support (item 23) and moving contacts attached to the bottom of the contact arm (item 22). A set of electrical interlocks contains one normally-open and one normally-closed double break contact. Make and break ratings apply for double-throw contacts only when both the normally-open and normally-closed contacts are connected to the same polarity. Electrical interlock ratings, listed in Table 3 and Table 4, are in accordance with NEMA standard ICS-2-125 (A600 and N600 table ratings).

Table 3 Electrical Interlock AC Ratings (A600)

Volts	Maximum Current (A)		Maximum Continuous Current (A)
	Make	Break	
120	60	6	10
240	30	3	10
480	15	1.5	10
600	12	1.2	10

Table 4 Electrical Interlock DC Ratings (N600)

Volts	Maximum Current (A)		Maximum Continuous Current (A)
	Make	Break	
125	2.2	2.2	10
250	1.1	1.1	10
480	0.4	0.4	10

Contact Tips

The movable and stationary power contact tips are identical. Copper power contact tips are standard. Silver-faced power contact tips are available and are recommended for applications where the contactors remain closed for long periods of time. Silver-faced contact tips are standard on crane manual disconnect switches and are optional on DC starters.

INSTALLATION

▲ DANGER

HAZARDOUS VOLTAGE.

To prevent electric shock or burn, disconnect power to contactor before installation, adjustments, maintenance or troubleshooting. Metal parts of the contactor may be at line voltage. Failure to observe this precaution will result in severe personal injury or death!

1. Unpack contactor carefully. Remove shipping tape if used.
2. Check nameplate data for correct equipment. Visually verify that the contactor operating coil (item 36) is the correct voltage. The operating coil circuit voltage may be different than the power circuit voltage.

▲ CAUTION

EQUIPMENT DAMAGE HAZARD.

Failure to connect operating coil to proper voltage may cause improper contactor operation or damage to coil. Failure to observe this precaution could result in personal injury or product damage.

3. Visually verify that all parts are undamaged and secure.
4. Mount the contactor vertically on a rigid support and fasten down tightly using a plain washer against the contactor base. Provide the clearances shown in Figure 1 above the top of the contactor and in front of the arc chute.
5. With all power removed, mount auxiliary devices such as electrical interlocks on contactor. Install and adjust these auxiliary devices according to procedures in the instruction sheets provided with the devices.
6. Pivot the arc chute upwards. The contact tips (item 10) should meet squarely. If they do not meet, align them by the procedure in "Contact Tip Alignment" on page 4.
7. Pivot the arc chute down to its proper position.

▲ CAUTION

PRODUCT DAMAGE.

Operating contactor with arc chute up may decrease contact tip life or cause product damage. Failure to observe this precaution could result in product damage and shortened product life.

8. Check the wiring diagram on the contactor instruction sheet before connecting the contactor coil leads, power contact leads and interlock leads. Wire the contactor according to the instruction sheet, making sure all connections are secure.

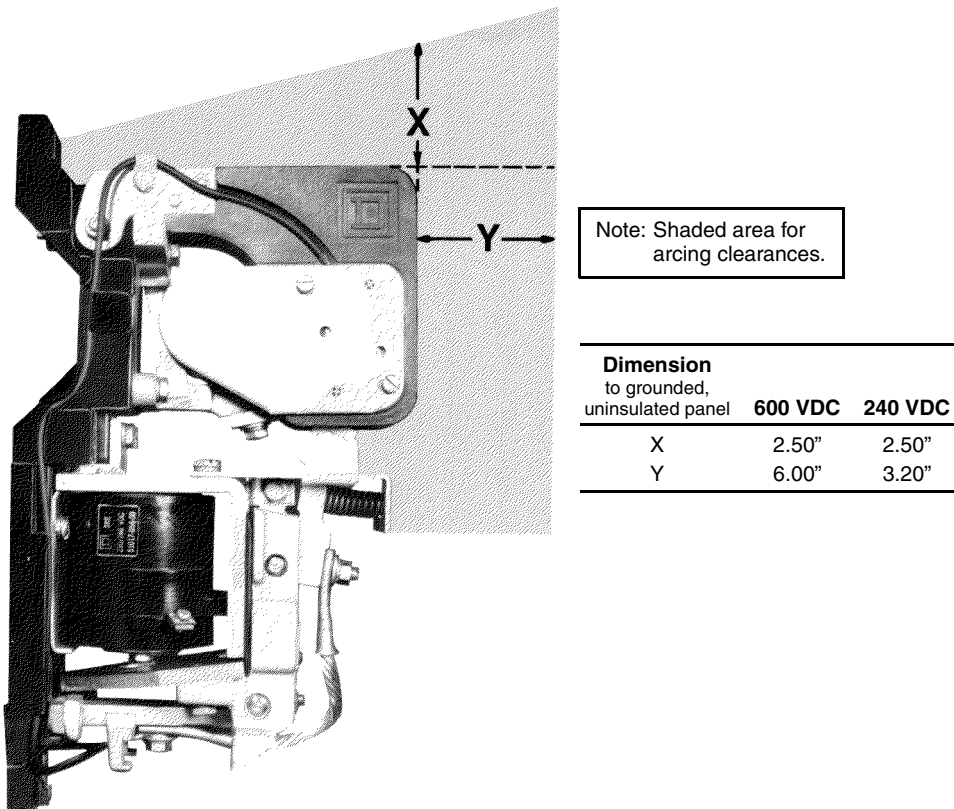


Figure 1 Electrical Clearances

ADJUSTMENTS

Contactors may require contact alignment or adjustment of the electrical interlocks. This section describes the adjustment procedures.

⚠ DANGER

ELECTRICAL ARC.

Contactors operated under load expel an arc. Stay away from contactor operated under load.

HAZARDOUS VOLTAGE.

To prevent electric shock or burn, disconnect power to contactor before aligning contact tips or adjusting electrical interlock. Metal parts of contactor may be at line voltage.

Failure to observe these precautions will result in severe personal injury or death!

Contact Tip Alignment

Refer to Figure 2 when aligning the contact tip.

1. Remove all power. Pivot arc chute upward.
2. Visually verify that movable contact tip is properly seated against the ridge on the auxiliary arm (item 14), as shown in Figure 2.

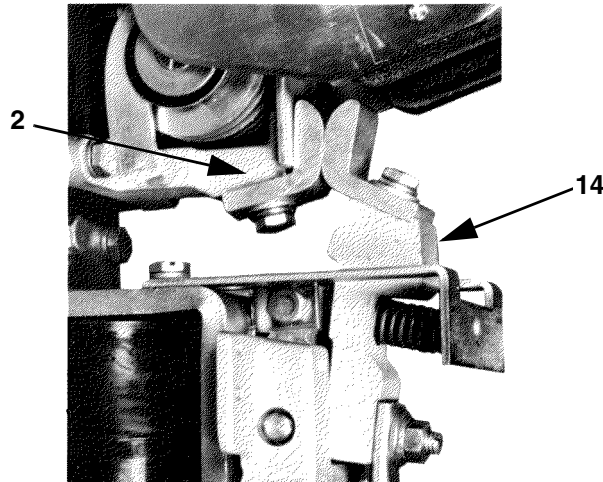


Figure 2 Contact Tip Alignment

3. Visually verify that stationary contact tip is seated against stationary contact support on the blowout coil assembly (item 2).
4. Visually verify that contact tip surfaces are vertically and horizontally aligned.
5. Pivot arc chute down to its proper position.

⚠ CAUTION

PRODUCT DAMAGE.
Operating contactor with arc chute up may decrease contact tip life or cause product damage. Failure to observe this precaution could result in product damage and shortened product life.

Electrical Interlock Adjustment

Refer to Figure 3 when adjusting the electrical interlocks.

1. Remove all power. Visually inspect that electrical interlock (item 46) has proper follow-up. With new electrical interlock contacts, moving contacts (item 49) should provide at least 1/16" follow-up on each stationary contact when contact arm reaches its limit of travel, either completely closed or completely opened (see Figure 3).
2. Visually verify that power contact tips open before the normally-open electrical interlock contacts close.
3. Electrical interlock follow-up can be adjusted by bending stationary contacts (items 53 & 54).

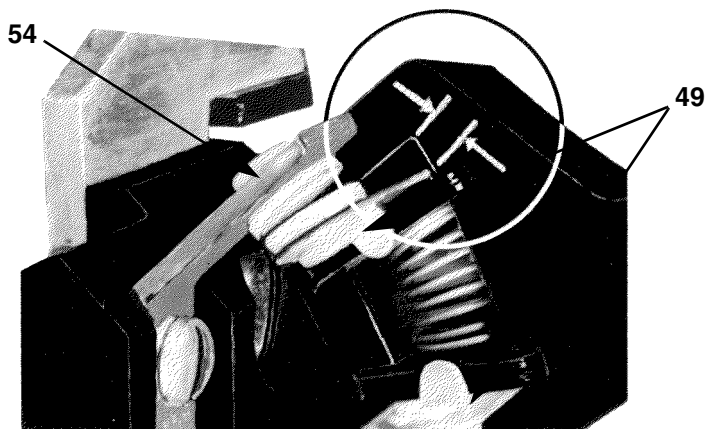


Figure 3 Electrical Interlock Contact Follow-Up

MAINTENANCE

This section describes some of the maintenance procedures that may be required for Class 7004 Type MGAO3 contactors. No lubrication is required since these contactors have permanently lubricated, oil impregnated bearings.

⚠ DANGER

HAZARDOUS VOLTAGE.

To prevent electric shock or burn, disconnect power to contactor before inspecting contact tips or replacing any parts. Metal parts of contactor may be at line voltage. Failure to observe this precaution will result in severe personal injury or death!

Contact Tip Inspection

Replace contact tips when the contact follow-up is less than 1/16" (see Figure 4).

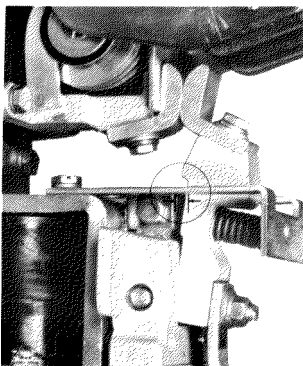


Figure 4 Power Contact Tip Follow-Up

Contact Tip Replacement

1. Remove all power. Pivot arc chute upward.
2. While holding armature plate closed, remove the removable contact tip by removing the silicon bronze hex head cap screw and lock washer on auxiliary arm (item 14).
3. Remove stationary contact tip by removing the silicon bronze hex head cap screw and lock washer on blowout coil assembly (item 2).
4. Install new stationary contact tip using the silicon bronze hex head cap screw and lock washer.

5. While holding armature plate closed, install new movable contact tip using the silicon bronze hex head cap screw and lock washer.
6. Manually operate contactor and visually verify that contact tips are aligned. Contact tips must meet squarely, as described in "Contact Tip Alignment" on page 4.
7. Pivot arc chute down to its proper position.

▲ CAUTION

PRODUCT DAMAGE.

Operating contactor with arc chute up may decrease contact tip life or cause product damage. Failure to observe this precaution could result in product damage and shortened product life.
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Coil Replacement

1. Remove all power. Disconnect coil leads.
2. Disconnect top end of shunt (item 21) by removing hex head nut, lock washer, washer and shunt.
3. Disconnect armature plate from contact arm by removing hex head screw, lock washer and washer. Armature plate does not have to be removed from contactor.
4. Remove auxiliary arm spring retainer and auxiliary arm by removing hex head screws and lock washers.
5. Slide out contact arm pin (item 24) after removing hex head nut, lock washer, and set screw (item 26).
6. Remove contact arm assembly (item 22).
7. Remove magnet frame (item 38) from contactor by removing hex head cap screws (item 43) and lock washers (8).
8. Remove the silicon bronze hex head cap screw (item 58) on front of magnet core and remove lock washer (item 57), core cap spacer (item 34), core cap (item 35) and coil (item 36).
9. Install new coil using core cap, core cap spacer and lock washer. Tighten silicon bronze hex head screw. Note that steel core cap, which is thicker than the non-magnetic phosphor bronze spacer, must be installed against coil (see Figure 6 on page 11). Visually verify that spring washer (item 37) is positioned so outside edge is against coil (item 36) and not against magnet frame.
10. Replace magnet frame on contactor using lock washers and hex head screws.
11. Replace contact arm.
12. Replace contact arm pin and tighten set screw and hex head nut.
13. Visually verify that auxiliary arm pin is centered and set screw is tight.
14. Replace auxiliary arm spring retainer and spring using lock washers and hex head screws. Visually verify that auxiliary arm spring is properly seated between auxiliary arm spring retainer and auxiliary arm, as shown in Figure 4.
15. Connect top end of shunt by replacing washer, lock washer and hex head nut.
16. Reconnect coil leads.

Arc Chute Replacement

1. Remove all power. Disconnect arc chute wires by removing the hex head cap screw (item 42), washer (item 19), lock washer (item 29), arc chute and shunt (item 21).
2. Disassemble arc chute wires from the contactor base.
3. Remove arc chute by removing hex head nut (item 12), lock washer (item 8), hex head screw (item 40) and arc chute.
4. Install new arc chute using hex head cap screw and lock washer and secure with hex head nut.

5. Reposition arc chute wires along the contactor base.
6. Reconnect arc chute wires and shunt using washer, lock washer and hex head cap screw (see Figure 5).

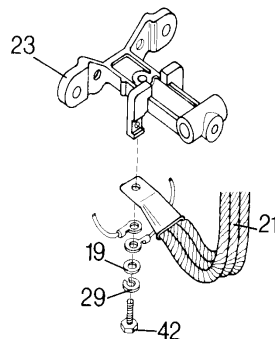


Figure 5 Assembling the Arc Chute Wires and Shunt

▲ CAUTION

CONTACTOR OVERHEATING.

For proper connection, shunt must be seated directly against contact arm support. Failure to observe this precaution will result in contactor overheating.

7. Pivot arc chute down to its proper position.

▲ CAUTION

PRODUCT DAMAGE.

Operating contactor with arc chute up may decrease contact tip life or cause product damage. Failure to observe this precaution could result in product damage and shortened product life.

Shunt Replacement

Replace the shunt (item 21) when the flexible braided wires are broken or burned or if wires are loose in the terminal connectors on either end of the shunt.

1. Remove all power. Disconnect bottom end of shunt (item 21) by removing hex head cap screw, lock washer, washer, arc chute wires and shunt.
2. Disconnect top end of shunt by removing hex head nut, lock washer, washer and shunt.
3. Visually verify that auxiliary arm pin (item 27) is centered and set screw (item 18) is tight.
4. Install new shunt. Connect top end of shunt by replacing washer, lock washer and hex head nut.
5. Connect bottom end of shunt by replacing shunt, arc chute wires, washer, lock washer and hex head cap screw (see Figure 5).

▲ CAUTION

CONTACTOR OVERHEATING.

For proper connection, shunt must be seated directly against contact arm support. Failure to observe this precaution will result in contactor overheating.

Electrical Interlock
Replacement

Replace the electrical interlock assembly when inspection of the contact tips shows that they are burned or badly pitted. It is recommended that the entire electrical interlock assembly be replaced from a kit. However, the contact tip assemblies can also be replaced.

Electrical Interlock Assembly
Replacement

1. Remove all power. Loosen terminal clamps and screws (item 54) and remove terminal leads from the stationary contact assembly. Note the position of the leads so they can be properly replaced.
2. Remove the movable contact assembly by removing the slotted screws (item 47), lock washers (item 48) and washers (item 56).
3. Remove the stationary contact assembly by removing the slotted screw (item 55).
4. Install new stationary contact assembly and slotted screw, making sure to position stationary contact assembly as shown in Figure 6 on page 11.
5. Install new movable contact assembly and replace the washers, lock washers and slotted screws, positioning the movable contact assembly as shown in Figure 6 on page 11.
6. Manually operate the contactor and check the moving contacts for follow-up and sequencing according to "Electrical Interlock Adjustment" on page 4.
7. Replace the terminal leads.

Electrical Interlock Contact
Tip Replacement

1. To replace the contact tips, the electrical interlock assembly must be removed from the contactor.
2. Remove both sets of movable contact tips (item 49) from movable contact assembly by compressing the spring (item 51) and retainers (item 50) and sliding out movable contact tips.
3. Install both sets of new movable contact tips by compressing the spring and retainers and sliding in the movable contact tips.
4. Remove both top stationary contact tips (item 54) from stationary contact assembly by removing the screws and washers that hold them in place.
5. Remove terminal clamps and screws from top stationary contact tips.
6. Install both new top stationary contact tips by replacing the top stationary contact tips, screws, terminal clamps and their screws.
7. Remove both bottom stationary contact tips (item 53) from stationary contact assembly by removing screws and terminal clamps.
8. Install both new bottom stationary contact tips by replacing the stationary contact tips, terminal clamps and screws.
9. Manually operate contactor and check moving contacts for follow-up and sequencing according to "Electrical Interlock Adjustment" on page 4.
10. Replace terminal leads.

Auxiliary Arm Spring
Replacement

1. Remove all power. Pivot arc chute upward.
2. Remove auxiliary arm spring retainer (item 16) by removing hex head screws and lock washers.
3. Remove auxiliary arm spring (item 15) from auxiliary arm.
4. Install new auxiliary arm spring on the auxiliary arm.
5. Replace auxiliary arm spring retainer using hex head screws and lock washers. Visually verify that auxiliary arm spring is properly seated between the auxiliary arm spring retainer and auxiliary arm, as shown in Figure 4 on page 5.
6. Pivot arc chute down to its proper position.

⚠ CAUTION

PRODUCT DAMAGE.
Operating contactor with arc chute up may decrease contact tip life or cause product damage. Failure to observe this precaution could result in product damage and shortened product life.

TROUBLESHOOTING

When troubleshooting, refer to Table 1 on page 1 for contactor ratings and Table 2 on page 1 for coil ratings.

⚠ DANGER

HAZARDOUS VOLTAGE.
Troubleshooting procedures marked with an asterisk (*) require application of power. To prevent electric shock or burn, do not touch contactor with power applied. Failure to observe this precaution will result in severe personal injury or death!

Table 5 Troubleshooting Procedure

Problem	Possible Causes	Corrective Action
Contacts will not open or operation is sluggish.	Improper or inoperative coil.	Visually verify coil part number and measure resistance to determine if coil is inoperative.
	*Low control circuit voltage.	Measure control circuit voltage. It must be at least 80% of rated coil voltage. If it is zero, the problem is elsewhere in the circuit.
	Loose connection in control circuit.	Inspect connections and tighten if loose.
	Mechanical interference or binding.	Inspect for mechanical interference or binding: Manually close armature plate and check that cap screw head on core of magnet frame assembly clears the hole in the armature plate. Manually close armature plate and check that auxiliary arm bearings are not binding.
Contact tips overheat, short contact tip life.	Loose connections.	Inspect contact tips and shunt connections and tighten if loose.
	Movable or stationary contact tip not properly aligned.	Align contact tips according to "Contact Tip Alignment" on page 4.
	Foreign matter on contact surfaces.	Remove foreign matter.
	Contact tips worn beyond recommended limits.	Inspect for contact wear according to "Contact Tip Inspection" on page 5.
	Contact surfaces severely scored or burned.	Inspect contact surfaces and file as required.
	Arc chute not properly installed.	Visually verify that arc chute is pivoted to the fully down position.
	Inoperative auxiliary arm spring.	Replace the spring.
	*Normal load currents below 5% of rated current for contactor.	Use a smaller size contactor.
Operating coil overhauls.	Improper or inoperative coil.	Visually verify coil part number and measure resistance to determine if coil is inoperative.
	*High voltage condition on coil.	Measure control circuit voltage. It must not exceed 110% of rated coil voltage.
	Loose connection at coil terminals.	Check connection and tighten if loose.

*See danger statement above.

ORDERING
INSTRUCTIONS

When ordering parts, specify quantity, part number and description of part, giving complete nameplate data of the device. To identify parts, see Figure 6 on page 11.

Table 6 Parts List

Item	Description	Part Number	Quantity
1	Arc chute	C51019 - 217 - 50	
2	Blowout coil assembly	C51019 - 157 - 50	
3	Blowout coil guard	C51019 - 237 - 01	
4	1/4" - 20 x 1/2" pan head screw with captive lock washer	■	1
5	1/4" - 20 x 7/8" slotted hex head cap screw	■	2
6	1/4" lock washer	■	4
7	5/16" - 18 x 1" slotted hex head cap screw	■	2
8	5/16" lock washer	■	19
9	1/4" - 20 x 3/8" flat head brass screw	21203 - 20120	1
†10	Contact tip kit (copper), includes: 2 sets of tips and hardware	Class 9998 Type MG1 or	
	Bulk pack of 30 copper contact tip	D51019 - 260 - 53 or	
	Contact tip kit (silver), includes: 2 sets of tips and hardware	Class 9998 Type MG2	
11	3/8" - 16 x 7/8" silicon bronze hex head cap screw	21407 - 24280	2
12	5/16" - 18 hex nut	■	
13	3/8" silicon bronze lock washer	■	2
14	Auxiliary arm	B51019 - 255 - 50	
15	Auxiliary arm spring	B50502 - 602 - 32	
16	Auxiliary arm spring retainer	C51019 - 270 - 01	
17	1/4" - 20 x 3/8" slotted hex head cap screw	■	2
18	3/8" - 16 x 2" headless slotted half dog point set screw	21802 - 20480	
19	3/8" plain washer	■	2
20	3/8" - 16 hex nut	■	2
21	Connector	B51019 - 204 - 51	
22	Contact arm	B51019 - 214 - 50	
23	Contact arm support	B51019 - 229 - 50	
24	Contact arm pin	A51019 - 251 - 06	
25	Bearing	29005 - 32220	2
26	3/8" - 16 x 1" headless slotted half dog point set screw	21802 - 24320	
27	Auxiliary arm pin	A51019 - 251 - 05	
28	Bearing	29005 - 24161	2
29	3/8" lock washer	■	3
30	Armature plate	A51019 - 233 - 01	
31	5/16" - 18 x 3/4" hex head cap screw	■	2
32	Nameplate (copper tips)	B51139 - 242 - 43 or	
	Nameplate (silver tips)	B51139 - 242 - 44	
33	6" - 23 x 1/4" pan head screw	■	2
34	Core cap spacer (phosphor bronze)	B50502 - 006 - 11	
35	Core cap (steel)	A51019 - 292 - 01	
†36	Operating coil 230/240 V	D51019 - 243 - 53 or	
	Operating coil 115/120 V	D51019 - 243 - 56	
37	Spring washer	A51019 - 041 - 01	
38	Magnet frame	C51019 - 248 - 50	
39	Contact base	E51019 - 238 - 50	
40	5/16" - 18 x 2-1/2" hex head cap screw	■	
41	5/16" - 18 x 1/2" slotted hex head cap screw	■	2
42	3/8" x 16 x 7/8" hex head cap screw	21401 - 20240	
43	5/16" - 18 x 5/8" hex head cap screw	■	2
44	Core cap base	A51019 - 311 - 01	
45	5/16" plain washer	■	
†46	Electrical interlock kit	Class 9999 Type MX11 or	
	Bulk package of replacement electrical interlock, includes:	C51075 - 038 - 54	
	10 movable contact tips (item 49)	■	
	10 bottom stationary contact tips (item 53)	■	
	10 top stationary contact tips (item 54)	■	
	4 spring retainers (item 50)	■	
	2 springs (item 51)	■	
47	#10 - 24 x 1" pan head screw	■	2
48	#10 lock washer	■	2
49	Movable contact tip	■	2
50	Spring retainer	■	2
51	Spring	■	
52	#10 - 24 x 1/2" pan head screw with captive lock washer	■	1
53	Bottom stationary contact tip	■	2
54	Top stationary contact tip	■	2
55	#10 - 24 x 1/2" captive screw assy w/ long shank & captive lock washer	■	1
56	#10 plain washer	■	3
57	5/16" bronze lock washer	■	
58	5/16" - 18 x 3/4" bronze hex head cap screw	■	

- Obtain standard hardware, listed without Square D part number, from a local hardware supplier.
- † Parts recommended for general maintenance.
- The following user modification kits are also available for this contactor:
 - Class 9999 Type MK2 pneumatic timer kit
 - Class 9999 Type ML4 power lug kit consisting of 4 clam shell lugs.

EXPLODED ASSEMBLY
DRAWING

Figure 6 identifies items in the parts list and in the maintenance and adjustment procedures.

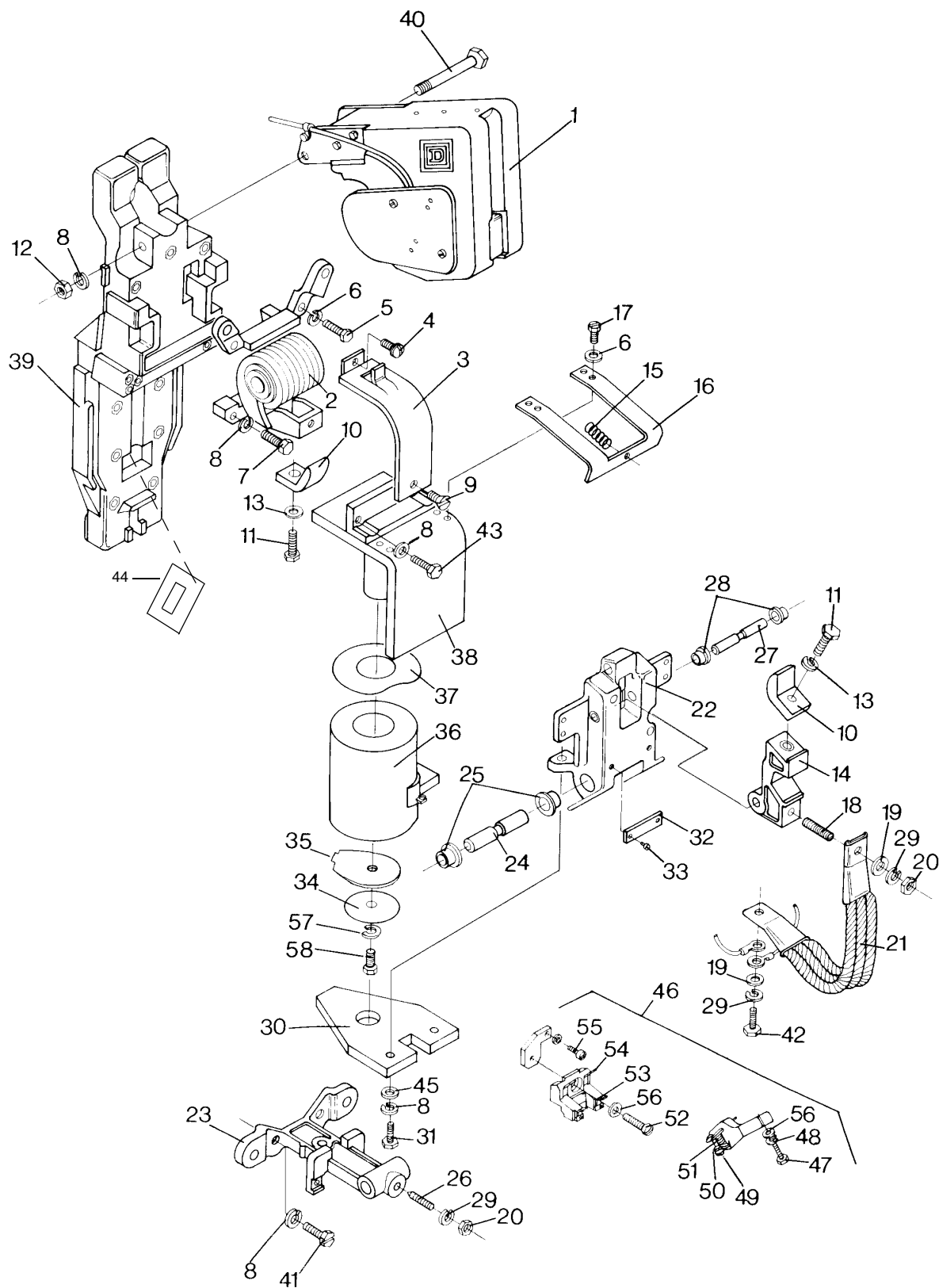


Figure 6 Contactor Assembly Drawing

PLEASE NOTE:

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