

CONTACTORS

KS-5323, KS-5323-01, KS-5694 AND KS-15572 REQUIREMENTS AND ADJUSTING PROCEDURES

1. GENERAL

1.01 This section covers KS-5323, KS-5323-01, KS-5694, and KS-15572 Cutler-Hammer magnetic contactors used with motor-driven charging generators and rectifiers.

1.02 This section is reissued to clarify 1.07 and to revise the list of tools, gauges, and materials. This reissue does not affect the Equipment Test List.

1.03 Reference shall be made to Sections 020-010-711, 040-630-701, and 040-631-701 for additional information necessary for the proper application of the requirements listed herein.

#1.04 Requirements and associated procedures marked with a number sign (#) need not be checked by the installer, unless it is thought that the requirement is not being met, or performance indicates that such a check is advisable.

***1.05** Requirements and associated procedures marked with an asterisk (*) need not be checked during maintenance, unless performance indicates that such a check is advisable.

1.06 On 20- and 50-ampere contactors, the arcing contacts are silver-plated and also serve as the main contacts. On other sizes, the main contacts are laminated brushes contacting a silver-plated or silver-faced contact plate. All but 20-ampere contactors have magnetic blowouts and arcing shields. Typical contactors are shown in Fig. 1 and 2.

1.07 When cleaning or making any mechanical adjustment, disconnect the contactor from all power sources and loads.

2. REQUIREMENTS

***2.01** *Mounting:* The contactor shall be fastened securely to the panel.

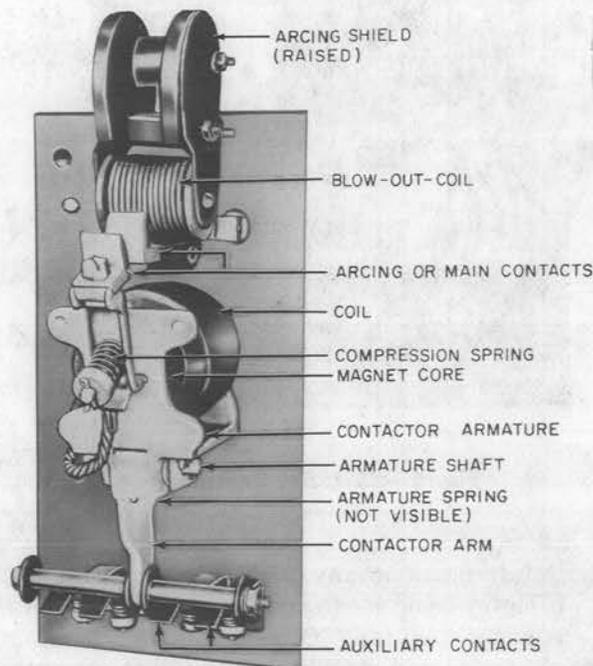


Fig. 1—Typical Contactor

Check with wrench or screwdriver, as required.

2.02 *Contact Surfaces*

- (a) Contact surfaces shall be clean and free from burrs.

Check annually.

- (b) Auxiliary contacts and laminated brush contacts, if any, shall be lubricated sparingly with petrolatum.

Note: If the operation of the contactor is infrequent, the contact surfaces may oxidize and cause high-contact resistance between the laminated brush and the contact plate, which leads to overheating. If contactor operation

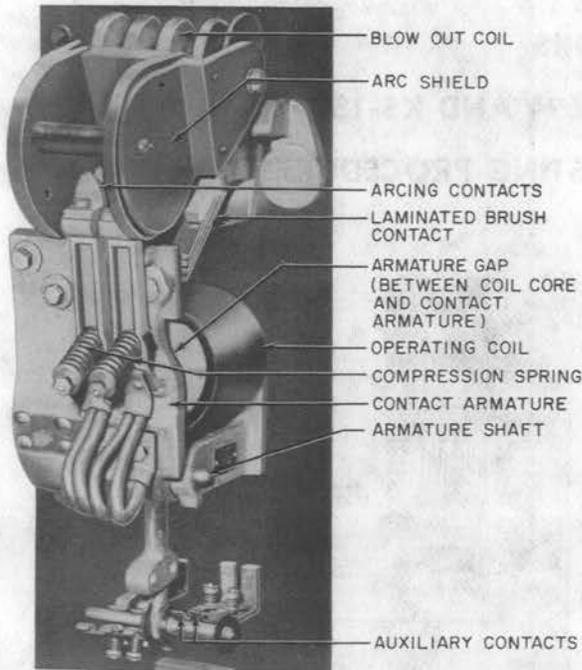


Fig. 2—KS-15572 Contactor

is infrequent in any particular application, it is highly desirable to periodically (once a month is suggested) take the associated machine out of service and manually operate the contactor several times. The wiping action of the contacts will tend to remove any oxidation which is being formed. Lubricant is not specified for arcing contacts since it would increase burning and shorten their life.

2.03 Contact Pressure

- (a) With the contactor in its operated position, the compression spring shall provide positive contact pressure for the arcing contacts.
- (b) With the contactor in its operated position, the laminated brush type contact, if any, shall have flexed noticeably after making contact. The brush shall be flexed so that the individual laminations are separated at the contact end.
- (c) With the contactor in its open position, the auxiliary contact springs shall be noticeably compressed. Failure of the contactor to close reliably may be due to faulty operation of the auxiliary contacts. The auxiliary holding contacts should remain in contact (shorting the associated

holding resistor) until the contactor is about 90 per cent operated. The gap between the shorting bar and the normally closed auxiliary contacts which short the coil series resistor shall be 1/8-inch maximum when the contactor is fully operated. See dimension X in Fig. 4.

#2.04 Contact Length

- (a) Contacts on 20-ampere switches shall be long enough to make firm positive contact.
- (b) On contactors larger than 20 amperes, the distance (A in Fig. 3) between the back edges of the arcing contacts with the contactor closed shall be at least the minimum shown in the following table.

Contactor Rating Amperes	"A" Min Inches
50	1-13/16
100	2-13/16
200	1-11/16
400	1-11/16
800	2-5/32
1000	2-1/8
1500	2-1/8

Use rule or scale.

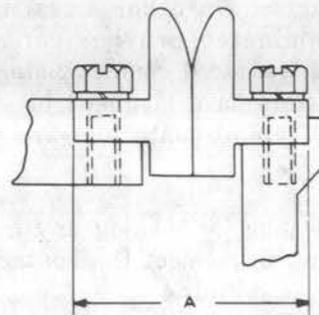


Fig. 3—Arcing Contacts

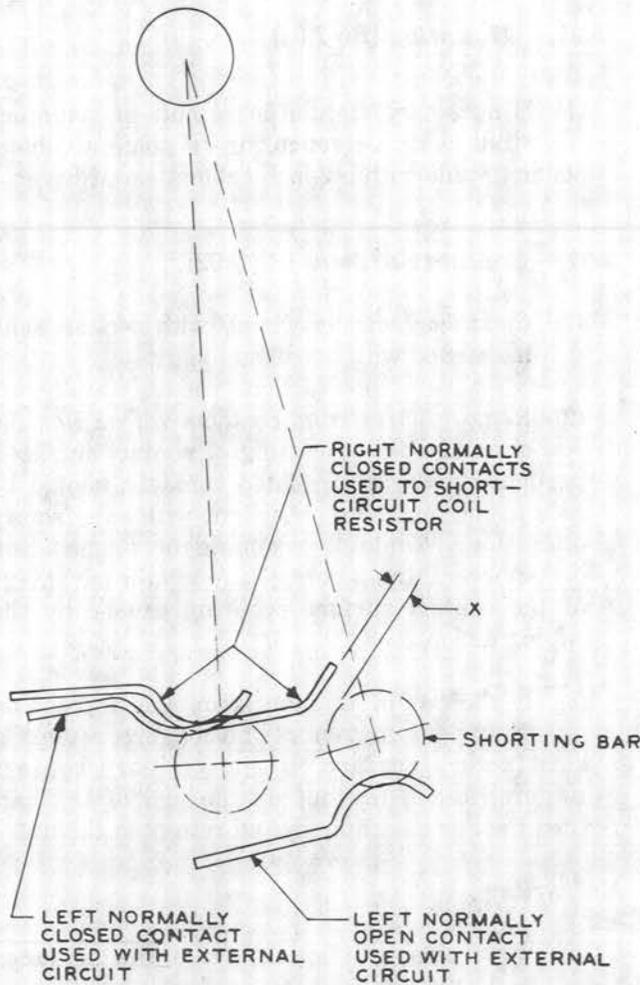


Fig. 4—Auxiliary Contact Arrangement

2.05 Armature Gap

(a) Where contactors are equipped with laminated brush contacts, the clearance between the armature and the center of the operating coil as the contact plate just touches the longest brush leaf shall be as follows.

CONTACTOR RATING AMPERES	MIN INCHES	MAX INCHES
200 and 400	0.090	0.105
800, 1000, and 1500	0.145	0.160

Use gauge.

2.06 Temperature

(a) The temperature of the main laminated brush contact, if any, shall not exceed 105C (221F). The temperature of any current-carrying part shall not be excessive.

Use thermometer.

(b) If the temperature of any current-carrying part becomes excessive, the voltage drop across the associated current-carrying junction shall be measured with the KS-8039 voltmeter. The voltage drop across any current-carrying junction shall not exceed 0.03 volts.

Use voltmeter.

Caution: Various parts in the contactor reach temperatures which can cause severe burns.

2.07 Electrical Requirements

(a) The contactor shall meet the electrical requirements specified in the circuit requirements table.

(b) Where electrical requirements are not specified, the contactor shall close positively when the generator voltage applied to the operating coil is equal to the value shown in the table below.

Nominal Voltage of Generator	Operate Voltage of Contactor
24	20
48	44
130	120

(c) The contactor shall open when potential is removed from the shunt winding.

Use dc voltmeter.

3. ADJUSTING PROCEDURES

3.001 List of Tools, Gauges, Materials, and Test Apparatus

SECTION 026-350-701

CODE OR SPEC NO.	DESCRIPTION	*3.01 Mounting (Rq 2.01)
TOOLS		
417A	1/4- by 3/8-inch open double-end flat wrench	(1) If necessary, tighten loose nuts of mounting studs with a wrench, or on some auxiliary contact studs with a 3-inch cabinet screwdriver.
418A	5/16- by 7/32-inch open double-end flat wrench	3.02 Contact Surfaces (Rq 2.02)
KS-2663	File	(1) Clean contacts by wiping with a clean cloth moistened with petroleum spirits.
KS-6367	7/16- by 5/8-inch open double-end flat wrench	(2) Remove burrs from contacts with a fine file or sandpaper. Dressing of contact surfaces, particularly the silver-plated contacts, should be held to the minimum consistent with satisfactory operation. Contactors should be opened and closed several times periodically to take advantage of the contact surface scouring caused by the wiping action.
—	B Long-nose pliers	(3) If the bar of the contactor arm (except on 20-ampere contactors) no longer presents a satisfactory surface to the auxiliary contact fingers, loosen the nut on the end of the bar, turn the bar as required, and retighten the nut.
—	3-inch C screwdriver	Use wrench.
—	5-inch E screwdriver	(4) Wipe excess lubricant from the surfaces adjacent to the contact surface.
GAUGES		
168R	0.090-inch, nonmagnetic thickness gauge	
KS-8039	Volt-Milliammeter, DC, Weston special model 622	
R-1032, Detail 1	Thermometer	
R-2310	0.105-inch and 0.125-inch thickness gauge	
R-8550	6-inch steel scale	3.03 Contact Pressure (Rq 2.03)
—	0.144-inch twist drill	(1) If failure of arcing contacts to make positive contact is due to short contacts, replace contacts. (See 2.04.) If failure is due to poor compression in the compression spring, replace the spring.
—	0.161-inch twist drill	(2) Replace a main laminated brush contact if it does not flex when contactor is operated. Failure to flex may be due to the brush being worn until too short, or to loss of temper caused by overheating. (See 2.06.) It is recommended that when a brush is replaced the associated contact plate should also be replaced.
—	Voltmeter, DC, Weston model 931, ranges 300-150-75-30	(3) On contactors larger than 20 amperes, shape the auxiliary contact fingers with pliers if necessary to obtain positive contact when contactor is open. On 20-ampere contactors, replace
MATERIALS		
KS-14666	Cleaning cloth	
KS-6232	Light mineral oil	
KS-7860	Petroleum spirits	
—	4/0 sandpaper	
—	Petrolatum	

auxiliary contacts if they do not make positive contact.

- (4) The holding contacts must be shaped so that the shorting bar maintains contact until the contactor is almost closed but must break the circuit when the contactor is fully operated. The inertia of the moving parts assures final closure of the contactor but early opening of the holding contacts will cause erratic operation.

#3.04 *Contact Length* (Rq 2.04)

- (1) Replace contacts not of required length. Use a wrench or 5-inch screwdriver, as required.

3.05 *Armature Gap* (Rq 2.05)

- (1) **200- and 400-ampere Size:** To check for proper operating coil and armature clearance, disconnect the power supply from the contactor and manually hold operated the armature at a point where the armature just touches the longest contact brush leaf. Insert the 168R gauge between the center of the operating coil and the armature. Remove the 168R gauge. Repeat with the R-2310 gauge. If the 168R gauge does not fit, the operating coil clearance is insufficient and removal of washers, as described in (3), is required. If the R-2310 gauge when inserted is loose, the clearance is excessive and washers should be added as in (3).

- (2) **800-, 1000-, and 1500-ampere Size:** With the contactor disconnected and held operated as in (1), insert the 0.144-inch twist drill shank between the center of the operating coil and the armature. Remove the 0.144-inch twist drill and insert the 0.161-inch twist drill shank between the center of the operating coil and the armature. Remove the 0.161-inch twist drill. If the 0.144-inch twist drill shank does not fit, the operating coil clearance is insufficient and removal of washers, as described in (3), is required. If the 0.161-inch twist drill shank when inserted is loose, the clearance is excessive and washers should be added as in (3).

- (3) When it becomes necessary to add or remove washers to adjust the operating coil clearance, disconnect the contactor from the power supply. With pliers remove the compression spring retaining cotter pin from the main lever spring

stud or studs. On contactors less than 800 amperes rating it will be necessary to exert a pressure on the cupped washer to compress the compression spring and release tension on the cotter pin. On contactors of 800-ampere rating or larger remove the nut from the main lever spring studs. Remove the cupped washer and compression spring. Lower the arcing contact arm so as to provide a clear working space. With a wrench remove the nut or nuts and washers (located behind the armature) which hold the contact plate to the main lever. Separate the contact plate from the main lever. Remove or add sufficient washers on the contact plate stud or studs to bring the operating coil clearance within limits. (See 2.05.) Reassemble in reverse order, recheck the operating coil clearance as in 2.05, and reconnect the power supply.

Note: Where the contact plate is equipped with two or more studs, an equal number of washers should be added or removed on each contact plate stud.

3.06 *Temperature* (Rq 2.06)

- (1) To check the temperature, hold the thermometer bulb against the brush, covering that part of the bulb not in contact with the brush with a small felt pad. If the temperature is high enough to cause the felt to smoke or char, asbestos on the face of the pad is suggested. If the temperature is too high, apply the following procedures.
- (2) Check the condition of contact surfaces and contact pressures. (See 2.02 and 2.03.)
- (3) Check the maximum load the contact is forced to carry. If it exceeds the ampere nameplate rating, the brush may lose temper and fail to give satisfactory operation. If overload cannot be avoided, refer to supervisor.
- (4) Check the temperature of stud to bus bar joint on rear of panel. If it is higher than the brush temperature, refer to the supervisor who may want to consider remaking external connections to the contactor. Also check the temperature of all bolted current-carrying connections on the front of the contactor panel. If temperatures are high, refer to (5) below.

(5) If heating of any of the associated parts of the contactor is experienced, the following procedure is recommended. First measure the voltage drop across the made contacts of the laminated brush and the contact plate, measuring between the contact support structures. This should not exceed 0.03 volts. Next measure the drop across all current-carrying junctions of the contactor. A reading of over 0.03 volts indicates a poor or loose connection and the part should be disassembled, sanded lightly if necessary, cleaned with petroleum spirits, dried thoroughly, and reassembled, being sure to recheck the drop across the connection.

3.07 Electrical Requirements (Rq 2.07)

(1) Periodically apply a drop or two of light mineral oil to each end of the armature shaft. If binding persists, remove cotter pin with pliers, take out shaft, and clean shaft and associated parts with a cloth moistened with petroleum spirits. In extreme cases of corrosion, 4/0 sandpaper may be used for cleaning. Oil

the shaft before reassembly. Check whether or not the armature spring has sufficient tension to return the armature to its open position. Check that there is no dirt or foreign material between the pole face and the armature to interfere with proper closing. Replace parts as necessary.

(2) When checking operate voltage, disconnect the voltage regulator (where furnished) and obtain the desired voltage by manually operating the field rheostat of the generator.

(3) If the contactor does not close, check (1) above and then test for open circuit using a voltmeter. Connect the voltmeter in parallel with the coil, and if the voltmeter shows no reading when voltage is applied, the external circuit is open. Check the operation of the associated reverse current relay. Having determined that the circuit is not open, connect the voltmeter in series with the coil. No reading on the voltmeter indicates the coil is open and should be replaced.