P/N 8-078-927-07
effective 5/15/97

Installation and Service Instructions for 87,700 Series Double C-Face Coupler Brake

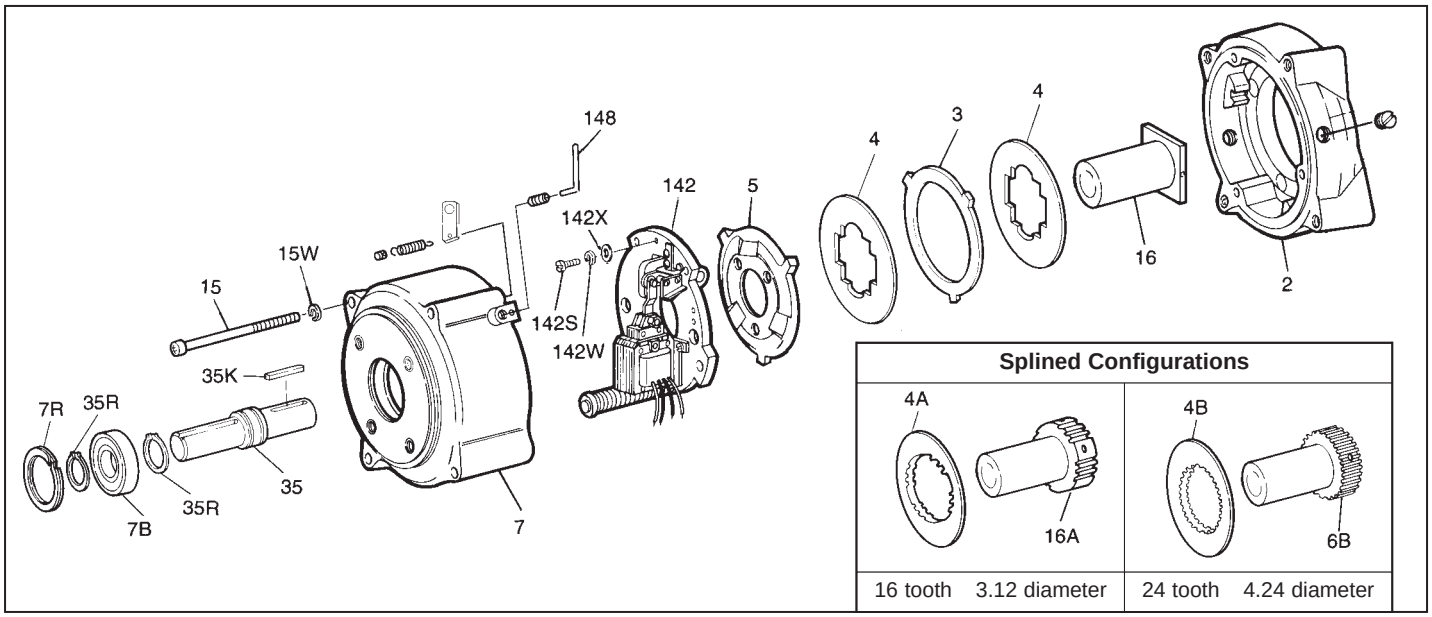


Figure 1

Important

Please read these instructions carefully before installing, operating, or servicing your Stearns brake. Failure to comply with these instructions could cause injury to personnel and/or damage to property if the brake is installed or operated incorrectly. For definition of limited warranty/ liability, contact Rexnord Industries, Inc., Stearns Division, 5150 S. International Dr., Cudahy, WI 53110, (414) 272-1100.

Caution

1. Installation and servicing must be made in compliance with all local safety codes including Occupational Safety and Health Act (OSHA). All wiring and electrical connections must comply with the National Electric Code (NEC) and local electric codes in effect.
2. Do not install the brake in atmospheres containing explosive gases or dusts.
3. To prevent an electrical hazard, disconnect power source before working on the brake. If power disconnect point is out of sight, lock disconnect in the *off* position and tag to prevent accidental application of power.
4. Make certain power source conforms to the requirements specified on the brake nameplate.
5. Be careful when touching the exterior of an operating brake. Allow sufficient time for brake to cool before disassembly. Surfaces may be hot enough to be painful or cause injury.
6. Do not operate brake with housing removed. All moving parts should be guarded.
7. Installation and servicing should be performed only by qualified personnel familiar with the construction and operation of the brake.
8. For proper performance and operation, only genuine Stearns parts should be used for repairs and replacements.
9. After usage, the brake interior will contain burnt and degraded friction material dust. This dust must be removed before servicing or adjusting the brake.

   DO NOT BLOW OFF DUST using an air hose. It is important to avoid dispersing dust into the air or inhaling it, as this may be dangerous to your health.

   a) Wear a filtered mask or a respirator while removing dust from the inside of a brake.

   b) Use a vacuum cleaner or a soft brush to remove dust from the brake. When brushing, avoid causing the dust to become airborne. Collect the dust in a container, such as a bag, which can be sealed off.

General Description

The 87,700 Series coupler is a spring-set, electrically released, self adjusting brake. The double C-face allows the brake to directly couple a C-face motor to a C-face gear reducer. Or, for in-line application, the brake can be mounted directly to a foot mounted C-face motor, using the bearing mounted output shaft as an in-line drive shaft.

Note: Coupler brake is designed for in-line applications only. Do not apply overhung or side load to brake output shaft.

Operating Principle

The 87,700 Series brake utilizes one, two or three rotating friction discs driven by a hub which is mounted on the motor shaft. The solenoid air gap is factory set, and normally requires no resetting even when changing friction discs. A wrap spring clutch permits the solenoid air gap to be adjusted automatically to compensate for friction disc wear or normal expansion.

When brake is wired into motor circuit, starting the motor will energize the solenoid and compress the pressure spring. This action removes the force against the disc pack components and allows the friction discs to rotate freely. De-energizing the motor de-energizes the solenoid and restores pressure spring force against the disc pack, thereby stopping and holding the load.

When the motor is *off* and the load is to be moved without energizing the motor, the manual release lever should be used. This removes the holding torque from the motor shaft, allowing it to be rotated by hand, however drag may be noted. The brake will remain in the manual release position until the release lever is returned manually to their *set* position or until the brake is re-energized electrically and the release lever or rod returns to its *set* position automatically.

Note: The motor should not be run with the brake in the manual release position to avoid overheating of friction disc(s).

I. Installation Procedure

Note 1: Check face of motor to which brake is to be mounted, to be sure NEMA dimensions of 0.004" T.I.R. on concentricity and face run out are met. Shaft run out is to be within 0.002" T.I.R. Maximum shaft end float is 0.020". Use standard length NEMA shaft.

Note 2: The effectiveness of the dust-tight waterproof brake enclosure depends on a fully enclosed motor C-face as the brake face is not sealed.

A. Remove hub (16) from brake assembly. With key (not furnished) in place on motor shaft, slide hub (square, or splined, end first) onto shaft to 1" (± 1/32") of standard

motor C-face. Securely tighten both set screws to 156 in-lbs on 5/16" and 290 in-lbs on 3/8".

Note 3: On most applications, particularly in vertical position, a set screw dimple drilled into shaft is recommended.

B. Remove housing bolts (15), lock washers (15W) and housing (7).

C. Depress solenoid plunger (29) and tie plunger to frame (79).

D. Remove entire support plate assembly (142) by evenly unscrewing screws (142S). Remove screws, conical spring washers (142W), and flat washers (142X).

E. Remove pressure plate (5), friction disc (4) and stationary disc (3).

Note 4: Brakes with a single friction disc do not have stationary discs. Vertically mounted brakes will have special pins which hold spacer springs and, in some cases, spring washers (except one disc vertical below). Note color coded sequence of springs and location of washers, if used, or refer to Sheet 301.3 for proper assembly of vertical mounting components.

F. Attach endplate (2) to NEMA C-face of motor using four 1/2-13 socket head cap screws and medium spring lock washers (not supplied) torque per manufacturer's specifications. (Head of cap screws must not project above friction surface.)

Note 5: If motor, with or without reducer, is to be ceiling mounted after assembly, entire brake will have to be rotated 180° or "upside down" so it will be positioned with solenoid plunger (29) above frame when final assembly is mounted on ceiling. Similarly, for horizontal wall mounting, rotate 90°.

G. Reassemble friction discs (be sure friction discs slide freely, file I.D. if necessary), springs (if vertical), stationary discs, and pressure plate in correct sequence and position. All parts must slide freely. The universal mounting pressure plate presently used has three tapered reliefs on outboard face. However, some older brakes used a pressure plate with a single tapered relief marked *top*, which must be installed with relief in area of sector gear (31).

H. Mount support plate assembly, torque screws to 50 in-lbs in endplate. Conical spring washer installed under the screw head. Flat washer used under the conical spring washer only with aluminum support plate. Be sure that assembly is mounted with the solenoid in a vertical position (plunger above frame) as shown when brake is horizontal. If plunger is not tied down and has allowed the mechanism to overadjust, it will have to be reset before mounting support plate. In this case the lever arm (17) throat will be near, or touching, the pinion (32) teeth. Refer to Figure 6 and *Self-Adjust Maintenance*. Loosen pressure spring cap screw (19) until pressure spring (11) is free, mount support plate assembly to endplate, and retighten spring cap screw until snug. Do not overtighten! Torque to a maximum of 100 in-lbs.

I. Remove plunger tie-down. Manually lift solenoid plunger to maximum travel and release. Complete electrical connections, (See Section on *Electrical Connection of Brake*.) Depress solenoid plunger manually or electrically, and allow it to snap up. Repeat this process several times to set air gap on solenoid. (Check *Self-Adjust Maintenance* Section for proper gap measurement, or corrective action for improper gap.)

J. See Section on *Electrical Connection of Brake*, Note 2.

K. Assemble housing and shaft assembly, rotating shaft (35) to engage key (35K) into hub keyway. Be sure housing is assembled with manual release on right hand (solenoid) side (looking at output shaft side) or release lever (148) will not latch. Replace housing bolts and tighten evenly to 118 lb-ft of torque.

L. For reducer application, mount and secure brake/motor combination to mounting face of reducer.

For alignment when brake shaft is direct-connected to another shaft by a coupling refer to coupling manufacturer's suggested procedure. Side or overhung load is not permitted. Consult factory for reversing applications.

II. Electrical Connection of Brake

CAUTION 1: Inverter Motor and Special Control Systems. This brake contains either a single phase AC coil or DC coil that requires instantaneous power within ± 10% of rating at the coil. A separate power source is required when this brake is used in conjunction with a motor or control system that limits voltage or current input (i.e. inverter motors) or causes a ramping of the power supply.

CAUTION 2: Class H coils with terminals. Do not bend lead wire crimp connection as this causes a fatigue in the metal which may break under vibration.

Note 1: Brake coil connections described here cover common motor connections. For nonstandard motors or control connections, contact respective supplier or Stearns Division.

Note 2: Be sure lead wires to coil are not tight or pinched, and that leads will not be rubbed by friction disc, trapped between solenoid plunger and frame, caught between lever arm and endplate, or by linkage.

Note 3: On brakes with space heater, connect to appropriate power source. Heater is to be energized continuously, including storage periods, if rust may occur.

A. AC coils, single voltage

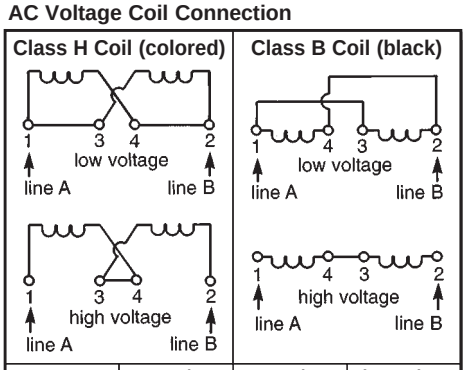
1. Dual voltage coils may be factory preconnected for high voltage unless otherwise specified on brake purchase order. Checking coil connection is suggested.

2. On single voltage coils, connect coil to any two leads on single or three-phase motors of the same voltage as the brake. Refer to brake nameplate and coil number for correct voltage and frequency. See Figure 2 for dual voltage coil connection and connect to any two leads of single or three-phase motor of the same voltage. The brake can also be wired to external switch contacts providing proper voltage other than that used to control the motor. Normally, the motor and brake contacts are interlocked.

B. Connecting AC solenoid coils on dual voltage 230/460 three-phase motors

To use a 230 volt coil (or a 230/460 dual voltage coil connected for 230 volts) with a 230/460 dual voltage three-phase motor, the brake leads are connected across two motor terminals as shown, or other equivalent combinations. If a 230 volt brake coil is connected as shown in Figures 3 and 4 the motor can be operated on either 230 volts or 460 volts with no effect on brake operation.

AC Voltage Coil Connection



For	Power Line A	Power Line B	Tie Leads
Low voltage	1 and 3	2 and 4	–
High voltage	1	2	3 and 4

Figure 2

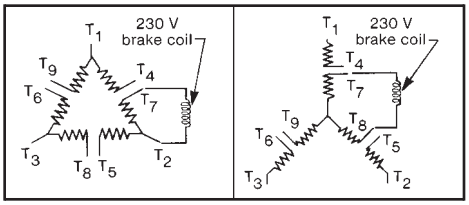


Figure 3 *Figure 4*

C. DC coils - all models

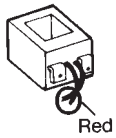
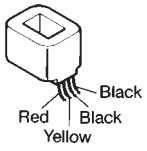
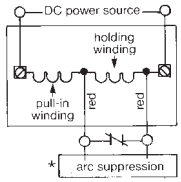
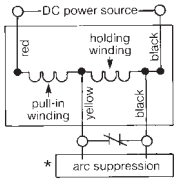
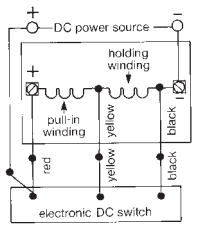
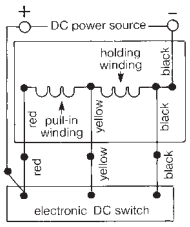
1. All Stearns DC coils are single voltage dual winding. A high current pull-in winding is initially energized to start the plunger movement, while a low current holding winding is momentarily shunted from the circuit until the plunger has pulled in. The older design incorporated a mechanical switch mounted to the solenoid frame and actuated by an arm mounted to the plunger to bring the holding winding into the circuit. In addition, coils over 48 Vdc have an arc suppression module in parallel with the switch contacts to protect the contacts from arc erosion and suppress EMI. The polarity of the incoming power supply is immaterial with the mechanical switch. The new electronic switch design incorporates an electronic timing circuit to allow the plunger to pull in, then electrically switch to the holding winding. Polarity of the power supply to the electronic switch and coil must be maintained. Refer to Figure 5 for proper wiring.

   Caution! Never use a series resistor to drop power supply voltage to the coil as brake malfunction will result.

2. Due to high initial current demands of a DC solenoid, a separate DC power source of adequate current capacity is usually required.

   Caution! For electrical release of brake, apply full rated coil voltage instantly. Do not increase voltage slowly.

DC Voltage Coil Connection

Class H	Class B
	
Mechanical Switch *(Old Style)*	
	
Electronic Switch** *(New Style)*	
	

*Arc suppression used for coil above 48 Vdc.
**Follow polarity for switch to operate.

Figure 5

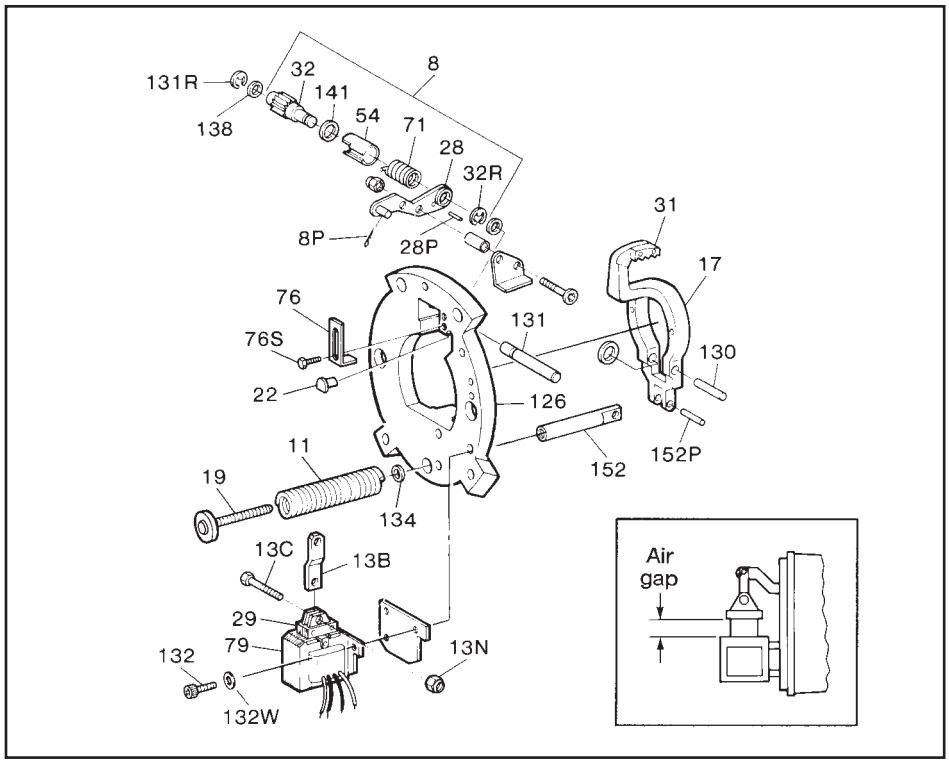


Figure 6

III. General Maintenance

Warning! Any mechanism or load held in position by the brake should be secured to prevent possible injury to personnel or damage to equipment before any disassembly of the brake is attempted or the manual release lever is operated on the brake. Observe all *cautions* listed at the beginning of this manual.

Note 1: Replacement part kits for many items are available and contain retrofit instructions.

Note 2: Do not lubricate any part of the brake as this may cause a malfunction and/or loss of torque.

A. Coil replacement

All standard NEMA AC voltage coils are available in kits. Select coil kit from appropriate replacement parts list for the particular brake series being serviced.

All standard NEMA DC voltage coils are available in assemblies and may also be obtained from appropriate parts list.

B. Friction disc replacement

Note: Replace friction discs in single disc brakes when wear surface area is one half the original disc thickness (1/4”). In multiple disc brakes, replace all friction discs when throat of lever arm (17) is within 1/16” of touching teeth of pinion (32).

1. Replacement friction discs for use with either square or splined brake hubs are available in kits. Select applicable kit from appropriate parts list for the brake being serviced.
2. If brake uses metal carrier rings with bonded friction linings (P/N 5-18-7001-00) for use with splined hub obtain required quantity. Then proceed as follows:

   a) Observe cautions and warnings preceding *Installation Procedure*, Section I. Follow Steps L and K then disconnect solenoid lead wires.

   b) Continue with Steps C through E and Steps G through L. Be sure to reconnect coil leads before replacing housing (7).

C. Other standard replacement parts

The standard 87,700 Series brakes use replacement part kits or components depending on the items involved. Consult Parts List P/N 8-078-917-07 (Sheet 366) for material needed.

D. Self-adjust maintenance
(See Figure 6)

Since the self-adjust brake automatically adjusts itself for friction disc wear, maintenance is held to a minimum. The solenoid is factory set with a 13/16” to 15/16” air gap, and requires no resetting, even when changing friction discs. The gap is determined by the position of wrap spring stop (76). Should air gap change, follow the steps listed below:

1. If (stop) screws (76S) had been loosened and retightened, the air gap may require resetting. The gap is measured between mating surfaces of plunger (29) and solenoid frame (79), and may be increased by raising slightly, or decreased by lowering slightly, wrap spring stop (76). Be sure to retighten (stop) screws (76S). Manually lift plunger to maximum travel and release. Depress plunger, manually or electrically, and allow it to snap up. Repeat several times, then recheck air gap for factory setting of 13/16” to 15/16”.

   Note: To measure solenoid air gap on vertically mounted brakes, grasp solenoid link to hold plunger in a free horizontal position and move toward solenoid frame until spring pressure is felt. Holding firmly in this position measure air gap between mating (ground) surface on solenoid frame and solenoid plunger. Adjust to proper gap as directed in *Self-Adjust Maintenance*. Check gap by again holding plunger as directed.

2. Tang of wrap spring (71) must be below, and must make contact with, wrap spring stop (76) when solenoid lever (28) is manually raised. If stop is bent outward, allowing tang to bypass it, rebend to square position, assemble correctly, and reset solenoid air gap as described in Paragraph 1.

3. Should air gap have decreased or disappeared, the solenoid lever and pinion assembly (8) may have become contaminated due to lubrication or residue as a result of overheating of brake. Cleaning is required. Loosen pressure spring nut (19) until pressure spring (11) is free. Remove support plate assembly (142). Remove cotter pin (8P) from solenoid lever (28) and retaining ring (131R) from pivot pin (131). Note location of spacer washer (138) if used, and push pivot pin out to free affected assembly. Remove retaining ring (32R) from pinion (32) and disassemble. Parts should be thoroughly cleaned in a clean solvent that does not leave a film M.E.K. or equivalent. Dry all parts thoroughly and reassemble. Rotate pinion and wrap spring clockwise until tang (A) is aligned with centerline of the upper hole of the lever arm. Refer to Figure 7. Reassemble in reverse order of Steps in this Paragraph. Do not retighten cap screw (19) until support plate assembly is mounted on endplate. Refer to Steps H and I of *Installation Procedure* to complete assembly.

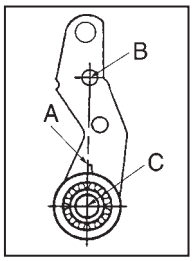


Figure 7

4. Check condition and positioning of pinion (32) and rack (part of lever arm assembly

[17]). Replace parts as necessary with complete assemblies.

E. Solenoid lever and pinion assembly replacement

If pinion (32) teeth are worn, replace entire assembly (8). Consult appropriate parts list for kit number. Check sector gear of lever arm (17) for wear.

If sector gear teeth of lever arm (17) are worn, replace entire lever arm assembly available as a kit from appropriate repair parts list. Also check pinion (32) teeth for wear. See Item 8.

F. Pressure spring stud and nut replacement

On older designs of these brakes, item (152) was a threaded shoulder stud nut (19), item (152P) was a solid pin. These items have been replaced by a spring tube, cap screw and spring pin. Replacement of any individual component requires replacement of all three older style components. Consult appropriate repair parts list for complete retrofit kit.

IV. Troubleshooting

A. If brake does not stop properly or overheats, check the following:

1. Is manual release engaged, and is motor energized?
2. Friction discs may be excessively worn, charred or broken.
3. Hub may have become loose and shifted on shaft.
4. Is hub clean and do friction discs slide freely?
5. Are controls which govern start of brake cycles operating properly?
6. Are limit switches, electric eyes, etc. functioning properly?
7. On vertically mounted brakes, are springs in place in disc pack? See P/N 8-078-937-05 (Sheet 301.3).
8. Have mounting faces loosened?
9. Pressure spring may be improperly assembled or broken.
10. Is solenoid air gap adjusted correctly? (See *Self-Adjust Maintenance*, Section III, Item D.)
11. Check linkage for binding. The approximate pressure applied to the top of the solenoid link to move plunger is:

#5 coil	3 lbs
#6 coil (15 lb-ft)	5-1/2 lbs
#6 coil (25 lb-ft)	9 lbs
#8 coil	16 lbs

If excessive force is required, determine cause of binding and correct. Do not overlook bent, worn or broken plunger guides as a possible cause for binding.

12. Solenoid lever stop (22) must be in place on support plate.
13. Solenoid may not be energizing and release the brake. Check voltage at the coil and compare to the coil and/or nameplate voltage rating.
14. Whether brake is AC or DC a voltage drop may be occurring. If excessive drop in voltage is noted, check wire size of power source. Correct as needed.

    Note: A method to check voltage at coil is to insert a block of wood of the approximate thickness of the solenoid air gap between the solenoid frame and plunger. (The block will prevent brake from releasing when coil is energized.) Connect voltmeter leads at the coil terminals or lead wires. Energize coil. Voltmeter needle will not fluctuate and reading can be taken. Reading should be taken immediately and the coil de-energized to prevent overheating of the coil. Compare voltage reading with coil rating.
15. If brake is DC solenoid style, check switch actuation and condition of coil. The switch should open with the following approximate air gap. (This is plunger travel remaining before plunger seats to frame.) Solenoid size is used for reference.

#5 or 8 solenoid	3/16” to 7/32”
#6 solenoid	7/32” to 1/4”

If actuating arm is bent, replace plunger. Check switch contacts. If pitted, replace switch.

16. Check slots of endplate for wear at the areas where stationary discs are in contact. Grooves in the slots can cause hang-up or even breakage of ears of stationary discs. If grooving is noted, replace endplate.
17. Check that heads of mounting bolts do not extend above wear surface of endplate.
18. On vertical above brakes, check the vertical mounting pins to be sure shoulder of pin is flush with wear surface of endplate. Be sure pins are straight and the pressure plate and stationary disc(s) are free to slide on the pins. Be sure springs and spacers are installed in proper order. See P/N 8-078-937-05 (Sheet 301.3)
19. Check pressure spring length to insure correct compressed height. Approximate original spring lengths are given in the following table so that correct setting may be verified and corrected if necessary. With worn friction discs, add amount of wear to the approximate spring length shown in table.

Color	Torque (lb-ft)	Compressed Spring Length
Blue or Black	6	3-1/2”
Blue	10	3-5/16”
Yellow	15	3-9/16”
Red	25 & 50	3-3/8”
Green	35, 75 & 105	3-3/8”
Black	10	3-1/4”
White	15	3-1/4”
Orange	25 & 50	3-1/4”
Purple	35, 75 & 105	3-1/4”

20. If a heater is supplied and excess rusting has occurred in brake, check power source to heater to be sure it is operating and that heater is not burned out.
21. If stopping time is more than two seconds (rule of thumb) and/or the application is more than five stops per minute, check thermal requirements of load versus thermal rating of brake.
22. Use Loctite® 242 to secure link screw nut (13N) to link screw (13C) if vibration causes nut to loosen.

B. If brake hums, solenoid pulls in slowly, or coil burns out, check the following:

1. Voltage supply at coil versus coil rating.
2. Is solenoid air gap excessive? (See *Self-Adjust Maintenance*.)
3. Shading coils may be broken.
4. Plunger guides may be excessively worn. Does solenoid plunger rub on solenoid frame laminations? If so, replace plunger guides.
5. Solenoid frame and plunger may be excessively worn.
6. Is solenoid dirty?
7. Solenoid mounting screws may have become loose, causing frame to shift and plunger to seat improperly.
8. Sector gear and pinion teeth may be jamming due to excessive tooth wear.
9. Excessive voltage drop when motor starts. Check size of lead wires for motor starting current and solenoid inrush current. See Section IV-A, Item 11, 12, 14 and 15.

C. If brake is noisy during stopping:

1. Check mounting face run out, mounting rabbet eccentricity and shaft run out. See *Installation Procedure*, Section I, Note 1. Correct as required.
2. Check for signs of the outside diameter of the friction disc(s) rubbing on the inside diameter of the endplate. This would indicate brake is eccentric with respect to the motor shaft and/or the shaft is deflecting during a stop. Check alignment and shaft diameter. Also check for worn motor bearings. If realignment does not correct the problem, a larger diameter shaft may be required. Shaft deflection may also be caused by excessive overhang of brake from motor bearing. Additional shaft support may be required.
3. In cases where motor shaft extends through a fan casing or guard, the clearance hole may not be adequate. Rubbing of the shaft may occur causing a noise during a stop. If required, enlarge clearance hole.
4. Check for bad motor bearings. Replace if necessary. Check for excessive shaft endfloat. Correct as required.

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