DC 20000

Warning

Forward this manual to the person responsible for Installation, Operation and Maintenance of the product described herein. Without access to this information, faulty Installation, Operation or Maintenance may result in personal injury or equipment damage.

Installation, Operation and Maintenance of Airflex® Model DC Element Assemblies

Caution:

Use Only Genuine Airflex Replacement Parts

The Airflex Division of Eaton Corporation recommends the use of genuine Airflex replacement parts. The use of non-genuine Airflex replacement parts could result in substandard product performance, and may void your Eaton warranty. For optimum performance, contact Airflex:

In the U.S.A. and Canada: 1-**800-AIRFLEX (247-3539)**
Outside the U.S.A. and Canada: **(216) 281-2211**
Internet: **www.AIRFLEX.com**

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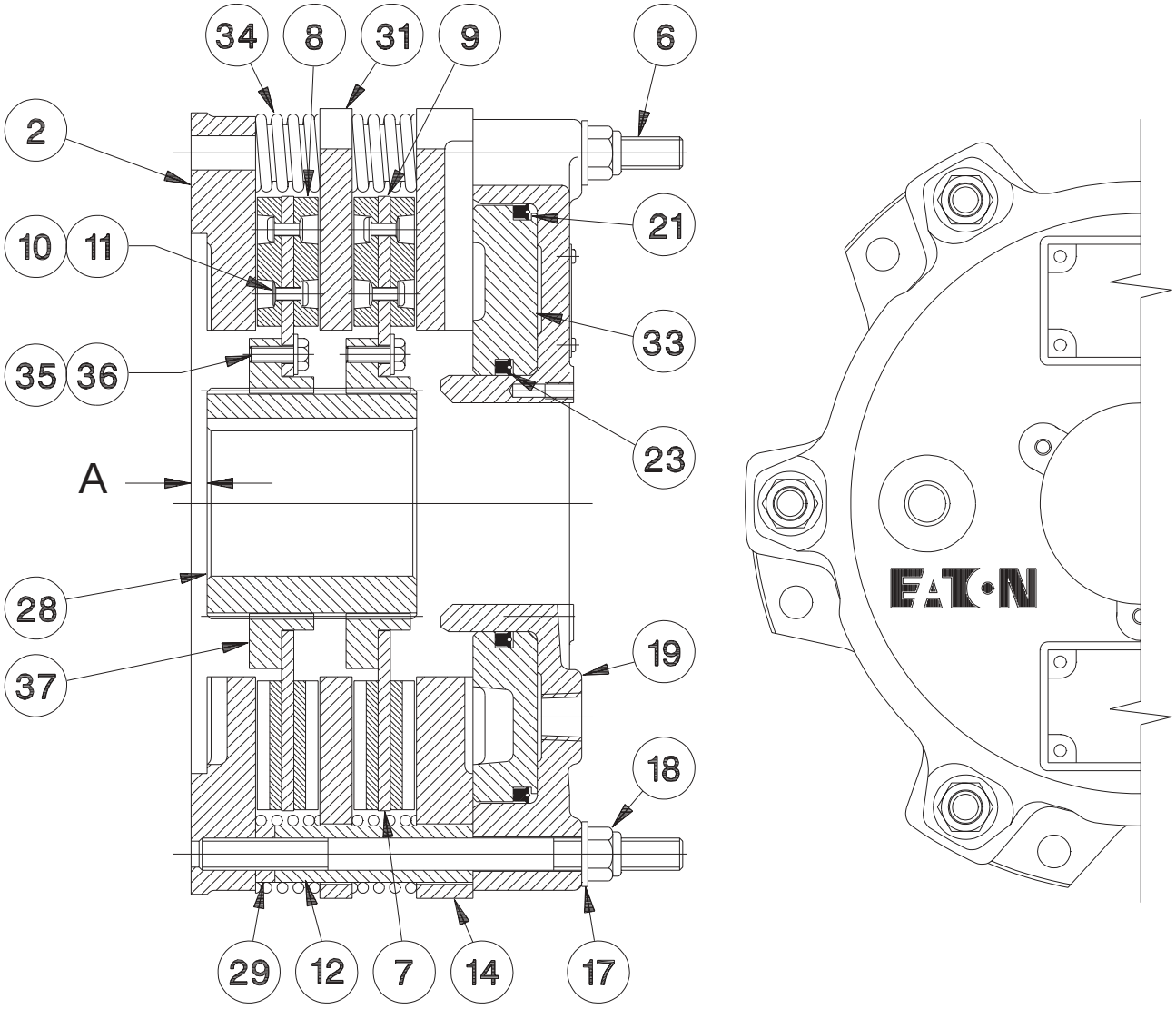

Fig. 1
(209DC shown)

Item	Description	Item	Description	Item	Description
2	Mounting Flange	14	Pressure Plate	29	Wear Spacer
6	Stud	17	Flat Washer	31	Reaction Plate
7	Friction Disc Assembly	18	Locknut	33	Piston
8	Friction Disc	19	Cylinder	34	Spring
9	Friction Disc Core	21	Polypak Seal	35	Washer
10	Rivet	23	Polypak Seal	36	Hex Head Screw
11	Washer	28	Gear	37	Ring Gear
12	Clamp Tube				

1.0 INTRODUCTION

Throughout this manual there are a number of HAZARD WARNINGS that must be read and adhered to in order to prevent possible personal injury and/or damage to the equipment. Three signal words "**DANGER**", "**WARNING**", and "**CAUTION**" are used to indicate the severity of the hazard, and are preceded by the safety alert symbol ⚠
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⚠ DANGER

Denotes the most serious injury hazard, and is used when serious injury or death WILL result from misuse or failure to follow specific instructions.

⚠ WARNING

Used when serious injury or death MAY result from misuse or failure to follow specific instructions.

⚠ CAUTION

Used when injury or product/equipment damage may result from misuse or failure to follow specific instructions.

It is the responsibility and the duty of all personnel involved in the installation, operation and maintenance of the equipment on which this device is used to fully understand the ⚠ **DANGER** , ⚠ **WARNING** , and ⚠ **CAUTION** procedures by which hazards are to be avoided.

1.1 Description

1.1.1 The Airflex DC element assembly is designed and manufactured to provide dependable clutch or brake service in a multitude of industrial applications. The use of PolyPak® seals allows actuation to be controlled by either pneumatic or hydraulic systems.

1.1.2 All Airflex DC elements are supplied with long wearing, NON-ASBESTOS friction material.

1.1.3 Airflex DC elements are available in five basic sizes and can be supplied as single or multiple disc units. The model number identifies the number of discs and the friction disc diameter. For example, 209DC indicates the element uses two nine inch diameter friction disc assemblies. When size, such as 9DC is referred to in this manual, it means that the information given applies to all DC models using the nine inch diameter friction discs; i.e., 109DC, 209DC, etc.

1.1.4 This manual includes metric equivalents usually shown in parentheses ( ) following the U.S. measurement system value. Be sure to use the correct value.

1.2 How it Works

1.2.1 The mounting flange is typically attached to the driven component (or reaction bracket when used as a brake), and the gear is mounted on a bearing supported shaft.

1.2.2 Refer to Figure 1. As air pressure is applied through the ports in the cylinder (19), the piston (33) and pressure plate (14) move towards the mounting flange (2). The movement of the pressure plate compresses the springs (34). When the pressure is sufficient to overcome the force of the springs, clamp force is applied to the friction disc assembly (7) which rides on the gear (28). On multi-disc models, additional friction disc assemblies and reaction plates (31) are clamped between the pressure plate and mounting flange.

As pressure is exhausted, the springs force the pressure plate (and reaction plates on multiple disc units) away from the mounting flange, releasing the clamp force from the friction disc assemblies.

2.0 INSTALLATION

2.1 Mounting Arrangements

2.1.1 Figure 2 illustrates a typical DC brake application. The gear is attached to the shaft which is to be stopped. The element is attached to a rigid reaction bracket or the machine frame.

2.1.2 When used as a clutch, a means of connecting the air piping to element is necessary. Figures 3 and 4 show DC elements with rotorseal adapters.

2.1.3 Some three and four disc elements may require support on the cylinder end of the element in certain high torque applications. Contact the factory for specific application information.

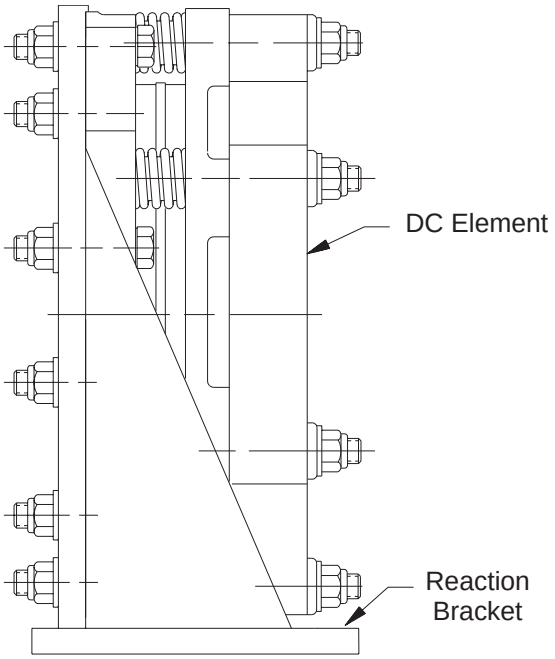


Fig. 2

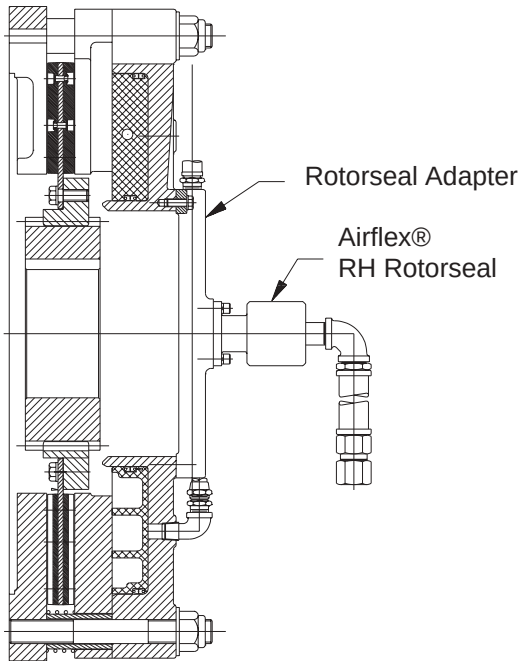


Fig. 3

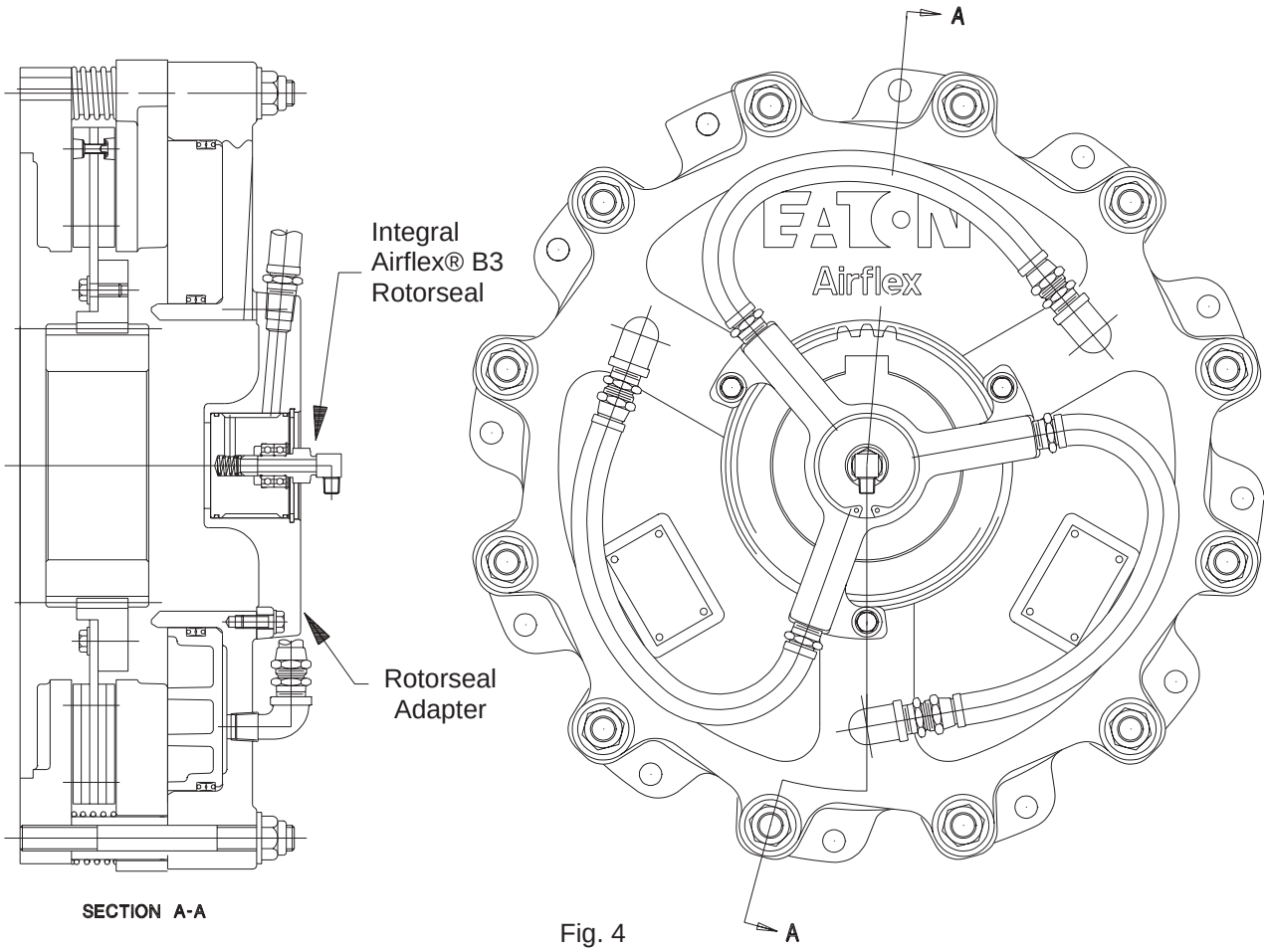


Fig. 4

2.2 Preparation

2.2.1 Table 1 shows the relationship between the element mounting surface and the end of the gear (dimension “A” on Figure 1). The gear is bored and keyed for a resulting Class FN2S interference fit for inch shafting and ISO System S7h6 for metric shafting.

TABLE 1
“A” Dimension, inches (mm)

Size	Single Disc	Dual Disc
9DC	0.25 (6)	0.25 (6)
15DC	0.38 (10)	0.38 (10)
20DC *	0.75 (19)	0.00 (0)
25DC *	0.75 (19)	0.38 (10)
38DC *	1.25 (32)	0.00 (0)
* Three and four disc elements: 0.00 (0,00)		

2.2.2 Table 2 shows the mounting flange register dimensions. Corresponding pilots should be machined on the flywheel or reaction bracket to aid in alignment. Note that a male or female register may be used on sizes 9 and 15 only.

TABLE 2
Mounting Flange
Register Diameter, inches (mm)

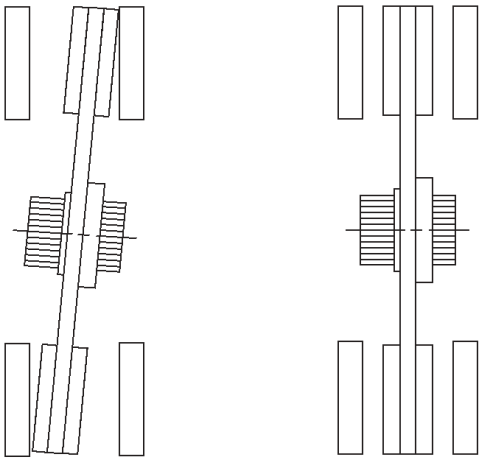
Size	Female Register*	Male Register
9DC	8.375 (212,7)	12.125/12.122 (308,0/307,9)
15DC	14.375 (365,1)	18.375/18.370 (466,7/466,6)
20DC	18.250 (463,5)	N/A
25DC	24.375 (619,1)	N/A
38DC	36.375 (923,9)	N/A
* +.003"/-.000" (+0,08/-0,00) Register Depth: 0.25 (6,3) for sizes 9,25, &38 0.38 (10) for sizes 15 & 20.		

2.2.3 Alignment

2.2.3.1 For proper operation and service life, shaft alignment - in the case of a clutch application - and alignment of the mounting flange to the shaft the gear is mounted on should be held within the limits shown on Table 3. Note that concentricity and perpendicularity values are expressed as TIR values (Total Indicator Reading).

⚠ CAUTION

Proper alignment is necessary to assure the friction discs track properly. Improper alignment will result in excessive wear to the friction material and its mating surfaces, gear and



Incorrect Track Correct Track

Fig. 5

TABLE 3
Alignment Requirements, inches (mm)

Size	Concentricity (Parallel, TIR) of Shaft and Element	Perpendicularity (Angular, TIR) of Mounting Flange to Shaft *
9DC	0.005 (0,13)	0.005 (0,13)
15DC	0.010 (0,25)	0.007 (0,18)
20DC	0.010 (0,25)	0.010 (0,25)
25DC	0.010 (0,25)	0.012 (0,30)
38DC	0.010 (0,25)	0.019 (0,48)
* Perpendicularity measured near the O.D. of the mounting flange.		

2.2.3.2 To aid in obtaining accurate readings, a rigid bracket should be fabricated for mounting a dial indicator when checking alignment.

2.2.3.3 On many applications, thermal growth of adjoining machinery may result in unacceptable shaft alignment. It is always good practice to make a “hot alignment” check.

2.2.3.4 Bearing or machinery manufacturers may require different alignment tolerances. Use the tightest tolerances of those recommended.

2.3 Mounting

2.3.1 To facilitate the mounting process of multiple-disc elements, the friction disc assemblies should be aligned with the gear and centered in the DC element. With the element laying on a flat surface, mounting flange down, lower the gear (28) carefully into the element to align the splines on the friction disc assemblies. Adjust the discs so that they are centered in the element. Apply and maintain an air pressure of about 25 PSIG (1.7 bar) to the cylinder. This will engage and hold the discs in position to facilitate installation. Remove the gear.

Warning:

Maximum allowable air pressure is 120 psig (8.2 bar). Application of pressure exceeding maximum allowable may result in damage to the element.

2.3.2 Ensure the shaft is free of nicks or burrs and the key fits properly in the shaft and gear. Tap the key into the shaft keyway.

2.3.3 Apply a light coat of anti-seizing compound to the shaft and key.

2.3.4 Press the gear onto the shaft, making sure the "A" dimension between the gear and the mounting surface is maintained. See Figure 1 and Table 1. Heating the gear uniformly to approximately 250°F (121°C) will expand the bore and ease assembly.

2.3.5 Apply a light coat of Molub-Alloy OG Heavy grease, or equivalent, to the gear teeth and slide the DC assembly onto the gear.

2.3.6 Attach the mounting flange (2) to the brake mounting surface using the appropriate fasteners. Release the air pressure applied in 2.3.1 and torque the fasteners to the specified value. See Table 4.

Danger:

Use only the proper number and grade fasteners shown in Table 4. Use of commercial grade (Grade 2) fasteners where Grade 8 fasteners are specified may result in failure of the fasteners and a sudden and drastic reduction in brake torque.

TABLE 4
Fastener Description and Assembly Torque, Ft-Lb. (Nm)

Size	Fastener	Description	Torque *
9DC	Item #18	1/2-13NC-3	60 (81)
	Item #36	1/4-20NC-2 Grade 8	12 (16)
	Mounting Screw	1/2-13NC-2 Grade 8	70 (95)
15DC	Item #18	3/4-10NC-3	150 (203)
	Item #36	3/8-16NC-2 Grade 8	40 (54)
	Mounting Screw	5/8-11NC-2 Grade 8	138 (187)
20DC	Item #18	3/4-10NC-3	150 (203)
	Item #36	3/8-16NC-2 Grade 8	40 (54)
	Mounting Screw	5/8-11NC-2 Grade 8	138 (187)
125DC 225DC	Item #18	1 1/8-7NC-3	500 (677)
	Item #36	1/2-13NC-2 Grade 8	70 (95)
	Mounting Screw	5/8-11NC-2 Grade 8	138 (187)
325DC 425DC	Mounting Screw	3/4-10NC2	200 (271)
38DC	Item #18	1 3/8-6NC-3	750 (1015)
	Item #36	3/4-10NC-2 Grade 8	200 (271)
	Mounting Screw	1-8 NC-2 Grade 8	500 (677)

* All torque values shown as lubed. Use 30 wt. oil or anti-sieze compound. Item 36, use Loctite #262 only.

2.4 Air Supply Systems

Warning:

Maximum allowable air pressure is 120 psig (8.2 bar). Operation of the DC at pressures exceeding 120 psig may result in damage to the element components.

2.4.1 Since the air control arrangement will vary from one application to the next, a specific description cannot be presented here. Following are some general guidelines for installing the air control components.

2.4.1.1 Use full size piping consistent with the control valve and/or rotorseal size. All piping should be free of metal chips, cutting compound and any other foreign matter. Pipe ends should be reamed after cutting to eliminate possible restrictions.

TABLE 5 Cylinder Port Description		
Element Size	**Pipe Size, NPT**	**Number of Ports**
9DC	3/8"-18	2
15DC	1/2"-14	2
20DC	1/2"-14	3
25DC	1/2"-14	3
38DC	3/4"-14	3

2.4.1.2 Refer to Table 5 for size and quantity of cylinder ports.

2.4.1.3 Keep the number of elbows to a minimum to ensure consistent response.

2.4.1.4 Spool type solenoid valves are not recommended. Use poppet type valves and locate as close as possible to the element.

Warning:

If the DC element is being used on a mechanical power press, special valving may be required.

2.4.1.5 If the DC element is being used on a cyclic application, an air receiver tank should be installed in the air supply line and isolated (check valve) from other air consuming equipment. The tank should be located as close as possible (pipe length less than five feet (1.5 meters)) to the element to ensure consistent clutch or brake response.

2.4.1.6 The final connection to the rotorseal, if applicable, must be made with flexible hose.

2.4.1.7 The DC element does not require lubricated air; however the solenoid valve may. Consult the valve manufacturer.

2.4.1.8 If a flow control valve is used, it must have free flow (indicated by the arrow on the valve body) directed away from the element.

2.4.1.9 If used as a brake, a pressure switch should be located in the air supply line to the DC, and interlocked with the equipment electrical controls .

2.5 Hydraulic Actuation Systems

2.5.1 Many of the guidelines applicable to pneumatic system design are applicable to hydraulic systems. Refer to section 2.4.

2.5.2 Hydraulically actuated elements must incorporate an accumulator or desurger in the pressure line to prevent pressure spikes. Since accumulator selection is dependent upon the entire system arrangement, sizing recommendations cannot be stated in this manual.

2.5.3 The circuit should be designed to ensure retraction of the piston at disengagement.

Warning:

When used as a clutch, a hydraulic head pressure may build up in the cylinder at higher speeds, preventing full release of the element. Contact the factory when contemplating use of the DC element as a hydraulically actuated clutch.

2.5.4 The seals used in the DC elements are compatible with petroleum or mineral based hydraulic fluids, and DOT-5 brake fluid.

Caution:

The seals are NOT compatible with DOT-3 brake fluid. Use of incompatible fluids will result in seal damage.

3.0 OPERATION

3.1 Pressure and Speed Limits

3.1.1 Maximum applied pressure is 120 psig (8.2 bar).

Warning:

Maximum applied pressure is 120 psig (8.2 bar). Operation at pressures exceeding maximum may result in damage to the DC components.

3.1.2 Maximum disc and element speeds are shown on Table 6.

Warning:

Operation at speeds exceeding the maximum allowable, as shown on Table 6, may result in exposure to personal injury or product/equipment damage.

TABLE 6
Maximum Speeds, RPM

Element Size	Maximum Disc Speed	Maximum Element Speed
9DC	3000	1600
15DC	2400	1050
20DC	1850	850
25DC	1400	650
38DC	950	450

3.1.3 When used as a clutch to engage counter rotating shafts, engagement speed differential may be limited. Contact the factory for specific application approval.

3.2 Initial Operation

3.2.1 The non-asbestos friction material used on DC elements may not develop rated torque, as a short wear in period is required.

Caution:

The non-asbestos friction material used on Airflex DC elements may not develop rated torque initially, as a short wear in period is required. Machine operation should therefore be monitored closely until the friction material wears in.

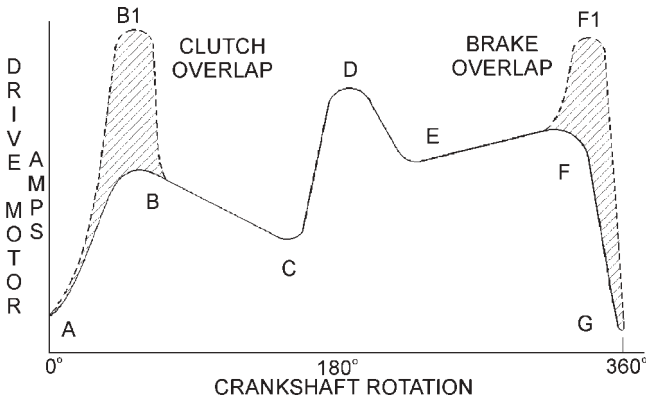
3.2.2 If element engagement appears harsh, a flow control valve may be installed in the supply line. When using a flow control valve, install it so restricted flow is towards the element and free flow is away from the element.

Caution:

Excessive restriction of the flow on braking applications will result in long stopping times and inconsistent stopping position.

TYPICAL MOTOR AMPERE CURVE

SOLID LINE - NORMAL CURRENT FLUCTUATIONS DURING COMPLETE CYCLE
DOTTED LINE - ABNORMAL CURRENT SURGES INDICATING OVERLAP



A-B	Normal Motor Amp Surge - During Acceleration
A-B1	Abnormal Surge Indicates Clutch Overlap
B-C	Ram on Downstroke - Motor Amps Drop
C-D	Ampere Surge as Dies Make Contact
E-F	Ram Moving up Backstroke
F-G	Clutch Release, Brake Set-Normal Drop to No Load Amps
F-F1-G	Ampere Surge Indicates Brake Overlap

Fig.6

3.2.3 If the DC element is used in combination with another clutch or brake, clutch/brake overlap may occur which will result in excessive heat generation and motor overload. Overlap may be detected by monitoring the drive motor current at the beginning and end of each machine cycle. A current surge at the beginning of the cycle usually indicates clutch overlap which can be corrected by restricting the air flow to the clutch or increasing the air pressure to the brake. A current surge at the end of the machine cycle usually indicates brake overlap which can be corrected by installing and adjusting a flow control valve in the brake air supply line. Figure 6 illustrates clutch and brake overlap.

3.3 Periodic Inspection

3.3.1 As the friction material wears, actuation time will slightly increase due to the increase in piston travel. Adjustment of the actuation controls (flow control or limit switch) may be necessary. See the MAINTENANCE section for the friction material wear limit, wear adjustment and replacement procedures.

TABLE 7
Wear Limits for DC Components

Item	Description	Wear Limit	Remarks
#7 Friction Disc Assembly	Friction Material	Fully worn at bottom of dust groove. See Fig 7. Friction material must also be replaced when contaminated with oil or grease.	Dual disc brakes have adjustment provision. See section 4.2.
#2 Mounting Flange	Friction Wear Surface	Maximum wear is: .031 in. (.80 mm) for sizes 9 & 15. .045 in. (1.20mm) for sizes 20, 25 & 38.	Wear will be in form of circular grooves on iron surface.
#14 Pressure Plate	Friction Wear Surface	Maximum wear is: .031 in. (.80 mm) for sizes 9 & 15. .045 in. (1.20mm) for sizes 20, 25 & 38.	Wear wil be in the form of circular grooves on iron surface.
	Reaction Holes	Maximum wear is .031 in. (.80 mm).	Wear will be in the form of elongation of the holes. Original hole diameters are shown on the table below.
#31 Reaction Plate	Friction Wear Surfaces	Maximum wear (each side) is: .031 in. (.80 mm) for sizes 9 & 15. .045 in. (1.12 mm) for sizes 20, 25 & 38.	Wear will be in form of circular grooves on iron surface.
	Reaction Holes	Maximum wear is .031 in. (.80 mm).	Wear will be in the form of elongation of the holes. Original hole diameters are shown on the table below.
#12 Clamp Tube	Reaction Area	Maximum wear is .015 in. (.38 mm).	Wear will be in the form of a notch or step on the side of the tube.
#19 Cylinder	Seal Area	Maximum wear is .005 in. (.13 mm).	Wear will be in the form of grooves where the seals contact.
#34 Spring	Spring Free Height	Minimum free height shown on the table below.	Original free height shown on the table below. Springs must be replaced in complete sets.
#28 & 37 Gear and Ring Gear	Gear Backlash	Maximum allowable total backlash is: .040 in. (1,0 mm) for sizes 9 & 15. .060 in (1,5 mm) for sizes 20, 25 &38	Backlash is measured at the pitch diameter. Replace the ring gear and gear together. If step is worn in gear, gear must be replaced.

Item Reference	Description	Element Size				
		9DC	15DC	20DC	25DC	38DC
14 & 30	Original Reaction Hole Diameters in the Pressure Plate and Reaction Plate	.938 (23,83)	1.312 (33,33)	1.343 (34,11)	1.688 (42,87)	2.063 (54,40)
34	Original Free Height	1.32 (33,53)	1.50 (38,10)	1.66 (42,16)	1.85 (46,99)	2.85 (72,39)
34	Minimum Free Height	1.23 (31,24)	1.40 (35,56)	1.52 (38,61)	1.70 (43,18)	2.60 (66,04)

3.3.2 The friction discs should be protected from contamination by oil, grease, dirt or excessive moisture.

Warning:

Contamination of the friction material will significantly reduce the torque capacity of the element and/or result in erratic torque.

3.3.3 Periodically observe the friction disc assembly with the element released. Dragging friction discs may be caused by wear or contamination at the gear/ring gear contact areas.

3.3.4 Periodically check for leakage in the area of the cylinder seals (21,23). For replacement, refer to the MAINTENANCE section.

3.3.5 Pneumatic (or hydraulic) and electrical control interlocks should be periodically checked for correct settings and operation.

4.0 MAINTENANCE

Warning:

Prior to performing any maintenance on the DC element, make sure the equipment is in, and will remain in, a safe condition.

4.1 Wear Limits

4.1.1 Wear limits for the DC components are shown on Table 7. If any wear limit has been reached or exceeded, that component must be repaired or replaced.

4.2 Wear Adjustment

4.2.1 On both single and multiple disc units, the friction material must be replaced when worn to the bottom of the groove on the friction lining. See Figure 7.

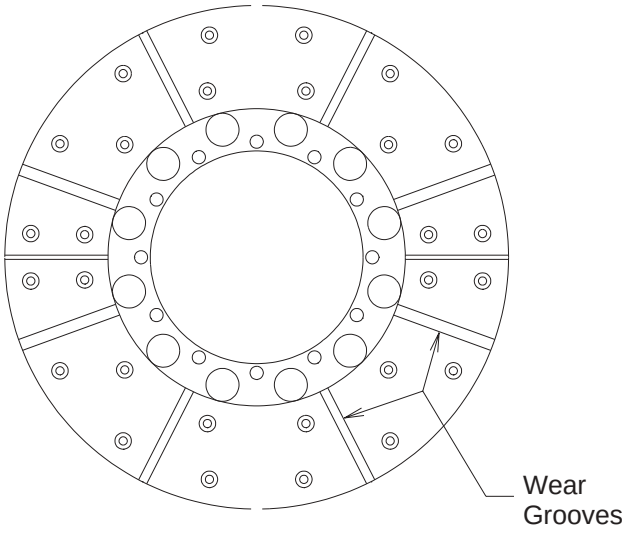


Fig. 7

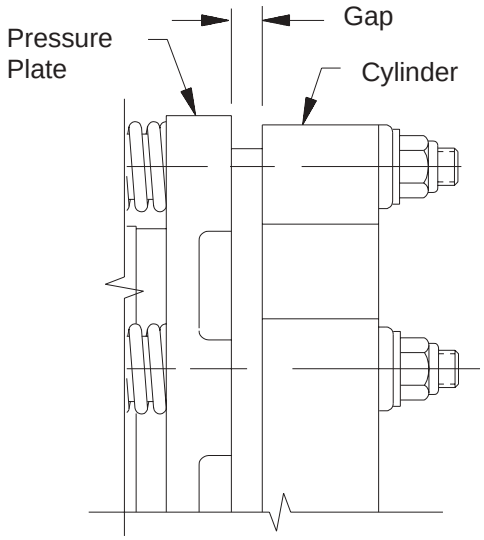


Fig. 8

TABLE 8
Wear Gap Values

Size		209	309	215	315	220	320	420	225	325	425	238	338	438
Max Gap	Inch	.50	.56	.50	.56	.64	.71	.78	.68	.77	.86	.81	.97	1.12
	(mm)	12,7	14,2	12,7	14,2	16,3	18,0	19,8	17,3	19,6	21,8	20,6	24,6	28,4
New Gap	Inch	.12	.18	.12	.18	.14	.21	.28	.18	.27	.36	.31	.47	.62
	(mm)	3,0	4,6	3,0	4,6	3,6	5,3	7,1	4,6	6,9	9,1	7,9	11,9	15,7

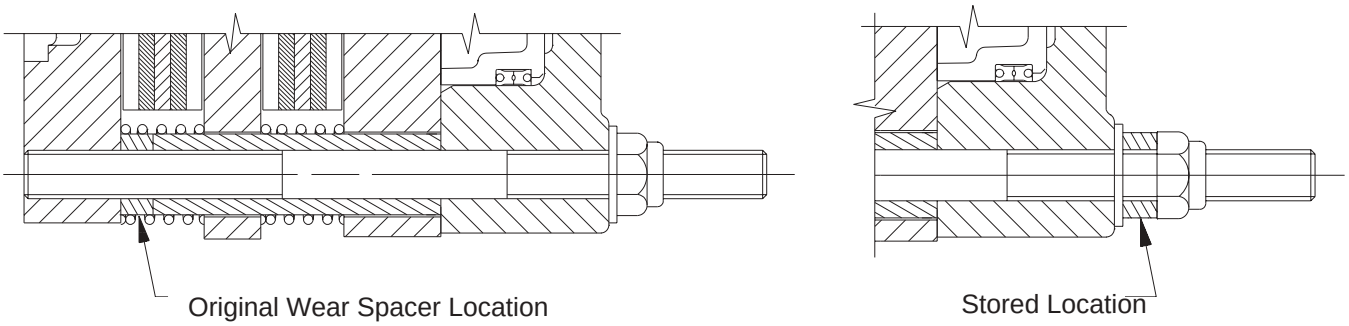


Fig. 9

4.2.2 On multiple disc elements, a wear adjustment is required when the friction material is partially worn. To determine when adjustment is required, apply approximately 25 PSIG (1.7 bar) pressure to the cylinder to engage the element. Measure the gap between the cylinder (19) and the pressure plate (14), as shown on Figure 8. If the gap exceeds the limit shown in Table 7 AND none of the friction discs are worn to the bottom of the wear groove, adjust per the following procedures.

Warning:

If a wear adjustment is not made, the piston may be allowed to travel past the end of the cylinder, resulting in a sudden loss of pressure and a complete loss in torque.

4.2.3 Disconnect the supply lines from the rotorseal adapter or cylinder.

4.2.4 While supporting the cylinder, loosen the locknuts (18) ONE TURN AT A TIME and in an alternating (crosswise) pattern until the spring force is relieved. Remove the locknuts and washers (17) from the studs.

Note: If a stud (6) should happen to come loose, remove it completely, clean the threads on the stud and the threads in the mounting flange. Apply Loctite® Primer Grade “T” to the stud threads. After the threads have dried, assemble to the mounting flange using Loctite® #271. The end of the stud must not extend past the mounting surface on the mounting flange.

Caution:

Loctite® #271 must be shaken prior to application.

Caution:

Loctite® #271 may irritate sensitive skin. Refer to the product label for proper safety precautions.

4.2.5 Slide the cylinder, piston and pressure plate (14) off of the studs. Set aside in a clean area making sure not to damage the friction material wear surface on the pressure plate.

4.2.6 Remove the friction disc assemblies, reaction plates (31) and springs (34) and set aside.

4.2.7 Slide the clamp tubes (12) and one set of wear spacers (29) off of the studs.

4.2.8 Re-install the clamp tubes over the studs. The unused wear spacers are stored under the locknuts (18) for re-use after replacing the friction discs. See Figure 9.

4.2.9 Clean the gear teeth and lubricate with a LIGHT coat of Molub-Alloy OG Heavy grease, or equivalent.

4.2.10 Slide the friction disc assembly onto the gear, noting the orientation of the heads of the screws attaching the friction disc to the ring gear (37). See Fig. 10 and Table 9 for ring gear / screw head orientation.

Warning:

Improper orientation of the ring gears may result in drastic loss of torque.

4.2.11 Place a spring (34) over every other clamp tube and slide the reaction plate onto the clamp tubes.

TABLE 9
Friction Disc Assembly Screw Head Orientation

Number of Discs in Element	Element Size				
	9DC	15DC	20DC	25DC	38DC
1	C	M	M	M	M
2	CC	CM	CM	CM	CM
3	All towards mounting flange.				
4					

Legend: M = Screw heads toward mounting flange.
C = Screw heads toward cylinder.
Note: Friction disc order listed from that closest to the mounting flange to cylinder.
i.e.: Fig 10 would be C,M.

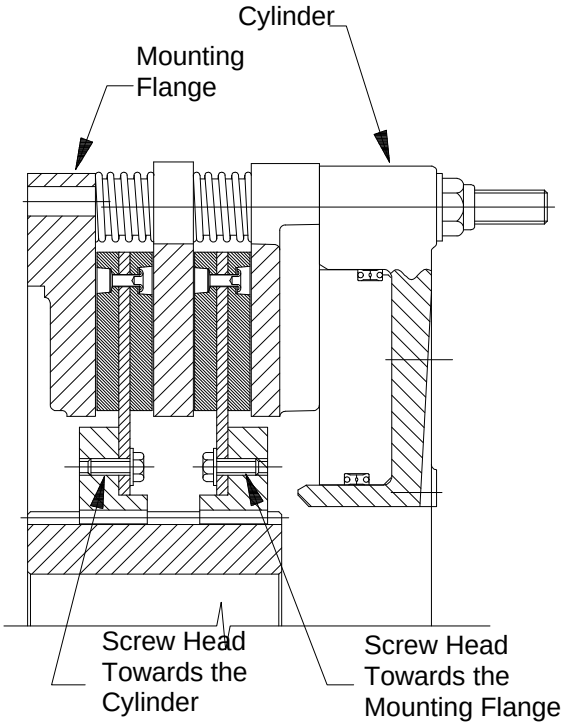


Fig. 10

4.2.12 On multiple disc brakes, repeat steps 4.2.10 and 4.2.11 until all discs, reaction plates, and springs have been assembled.

4.2.13 Slide the pressure plate (14) onto the clamp tubes and the cylinder/piston assembly onto the studs.

4.2.14 Lubricate the threads on the ends of the studs with 30 wt. oil or anti-seizing compound and install the locknuts (18), washers (17) and the wear spacers removed in section 4.2.7. The wear spacers are "stored" under the locknuts for use after replacing friction discs. See Figure 9.

4.2.15 Tighten the locknuts, ONE TURN AT A TIME and in an alternating (crosswise) pattern, until the cylinder is seated against the clamp tubes. Torque the locknuts to the appropriate value. See Table 4.

Note: If maintenance is performed with the element mounted in the horizontal position, support the weight of the cylinder, piston and pressure plate while tightening the locknuts.

Caution:

The locknuts (18) must be tightened gradually to prevent damage to the DC components.

Caution:

For horizontally mounted elements, failure to support the cylinder and pressure plate while tightening the locknuts may result in binding of the pressure plate or reaction plate.

4.2.16 Attach the actuation system supply lines, and check for proper actuation and release of the element. There should be no binding of the pressure plate, reaction plates, friction discs or piston.

4.2.17 Actuate the element, and verify that the adjustment has been properly performed. The gap should be greater than or equal to the "new" gap, and less than the wear adjustment limit, when properly adjusted.

Caution:

Premature wear adjustment may result in insufficient running clearances and subsequent overheating of components when the element is in the released position.

4.3 Friction Material Replacement

4.3.1 Disassemble the DC element per 4.2.3 through 4.2.6.

4.3.2 Remove the screws (36) and washers (35) attaching the friction disc subassembly (7) to the ring gear (37) and remove the friction disc subassembly. Inspect and replace the ring gear if necessary.

4.3.3 Thoroughly clean the threaded holes in the ring gear and the threads on the screws (36).

4.3.4 Friction disc cores may be relined with new friction material per the following instructions. Refer to Table 10 for the appropriate friction disc replacement kit part number.

Caution:

Use only genuine Airflex friction material. Use of material not of Airflex origin may result in unpredictable performance.

Table 10
Friction Disc Repair Kits

Element Size	Kit Part Number	Rivet Setting Tool
9DC	107742D	153 x 1095
15DC	107743D	153 x 1096
20DC	107744D	
25DC	107745D	
38DC	Replace Disc Assembly	
Note: One kit required for each Disc Assembly.		

4.3.4.1. Drill out the old rivets and remove and discard the old friction discs.

4.3.4.2 Refer to Figure 11 and carefully examine the counterbored holes in the new friction disc. One set of counterbored holes is tapered and designed to accept the rivet head, while the other set of counterbored holes is flat bottomed and designed to accept the clinched end of the rivet.

4.3.4.3 Position the friction discs on both sides of the disc core and align the rivet holes. Remember, a tapered counterbored hole on one friction disc will mate with a flat-bottomed counterbored hole on the opposite friction disc.

Caution:

Manual setting of the rivets using a punch very frequently results in splitting of the clinched end of the rivet. When this occurs, the rivet will ultimately fail in service due to fatigue. It is therefore recommended that rivets be set using an automatic rivet setting machine.

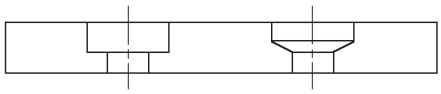


Fig. 11

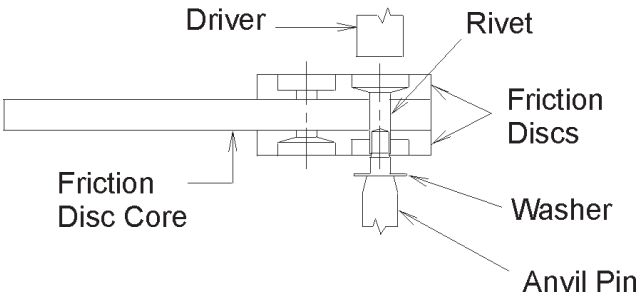


Fig. 12

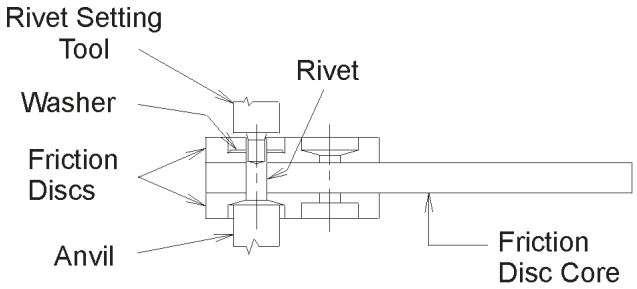


Fig.13

4.3.4.4 Insert a rivet through any hole and set using a washer on the clinched end of the rivet. Be sure to note the type of counterbored hole to determine the position of the rivet head. See Figures 12 and 13. Figure 12 shows machine-setting and Figure 13 shows setting the rivet manually. When setting manually, use an arbor press and keep the setting tool square to avoid splitting the rivet.

Caution:

The clinched end of the rivet must have a washer in place prior to clinching. Failure to use the washer or use of excessive force when clinching the rivet will fracture the friction lining.

4.3.4.5 The remaining rivets may be installed in any reasonable sequence following 4.3.4.4.

4.3.5 Attach a new or re-lined friction disc subassembly to the ring gear using Loctite® #262 on the screw threads. Torque the screws (36) to the value shown on Table 4.

Warning:

Use only the proper size and grade screws to attach the friction disc sub-assembly to the ring gear. Use of commercial (Grade 2) screws where Grade 8 screws are specified may result in failure of the screws and a sudden loss of brake torque.

4.3.6 Re-assemble the DC element in the as-new or unadjusted position. All wear spacers should be installed between the clamp tubes and mounting flange. Note the orientation of ring gear screw heads, per Table 9.

4.3.7 Actuate the element to check for proper adjustment. Due to wear of the iron components (mounting flange, reaction plate and pressure plate), wear adjustment may be required. Adjust if necesarry.

Caution:

Improper adjustment may result in excessive piston travel and sudden loss of torque.

4.4 Cylinder Seal Replacement

4.4.1 Disconnect the actuation supply lines.

4.4.2 While supporting the cylinder, loosen the locknuts (18) one turn at a time and in an alternating (crosswise) pattern until the spring force is relieved.

4.4.3 Remove the locknuts and washers (17) and slide the cylinder and piston assembly off of the studs.

4.4.4 Place the cylinder and piston assembly with the piston facing down on blocks approximately 6" (150 mm) high. The blocks must only contact the cylinder so that the piston will be free to move out of the cylinder bore.

4.4.5 If a regulated air line is available, the piston

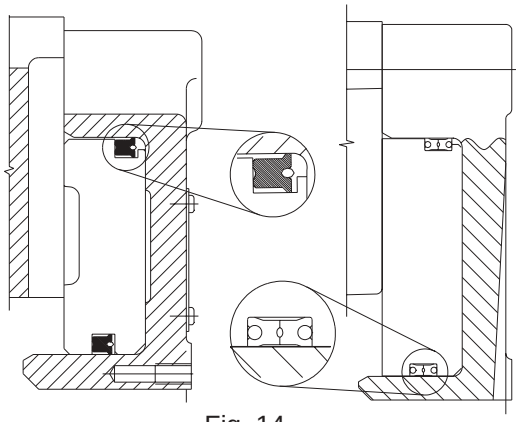


Fig. 14

can be partially ejected form the cylinder by applying no more than 15 PSIG (1.0 bar) to the cylinder.

Warning:

Application of a higher pressure may result in personal injury or damage to the components.

4.4.6 To complete the removal of the piston from the cylinder, open all air inlets. Insert a 0.50" (12mm) diameter by 6" (150 mm) long wooden dowel into each air inlet and gently tap each dowel with a mallet in an alternating sequence so that the piston moves evenly out of the cylinder. Be careful not to damage the sealing surfaces of the piston or cylinder by cocking the piston in the cylinder.

4.4.7 Carefully examine the seal surfaces in the cylinder. If the surfaces have worn to point as indicated on Table 8, the cylinder must be replaced. Small nicks or scratches must be sanded smooth to prevent air leakage.

4.4.8 Noting the orientation of the seal lips, remove the cylinder seals (21,23) from the piston and thoroughly clean the seal grooves.

4.4.9 Apply a thin, even coat of Parker “O” Lube to the sealing surfaces of the cylinder, seal grooves and chamfer on the piston, and the seals.

4.4.10 Install the new seals into the piston grooves, noting the orientation of the seal lips, per Figure 14.

4.4.11 Position the cylinder so that the cavity faces upward.

4.4.12 Carefully place the piston onto the cylinder with the chamfered edge of the inner diameter facing downward into the cylinder. Take special care to avoid damaging the seal lips.

4.4.13 Gradually apply an evenly distributed force to press the piston into the cylinder.

Caution:

Cocking of the piston while installing it into the cylinder may damage the sealing surfaces.

4.4.14 Follow steps 4.2.13 thru 4.2.17 to complete the assembly.

5.0 ORDERING INFORMATION/ TECHNICAL ASSISTANCE

5.1 Equipment Reference

5.1.1 In any correspondence regarding Airflex Equipment, refer to the information on the product nameplate and call or write:

Eaton Corporation
Airflex Division
9919 Clinton Road
Cleveland, Ohio 44144

Tel.: (216) 281-2211
(800) AIRFLEX & (800) 824-1586
Fax: (216) 281-3890

6.0 PARTS LISTS

6.1 Basic Assemblies

ITEM	DESCRIPTION	109DC (146239B)		209DC (146240B)		115DC (146225B)		215DC (146226B)	
		Part Number	Qty	Part Number	Qty	Part Number	Qty	Part Number	Qty
2	Mounting Flange	512554	1	512554	1	512462	1	512462	1
6	Stud	245 x 0044	6	245 x 0045	6	245 x 0060	6	245 x 0057	6
7	Friction Disc Assembly ①	512567	1	512567	2	512293	1	512293	2
8	Friction Disc ②	512565	2	512565	2	512305	2	512305	2
9	Friction Disc Core ②	512566	1	512566	1	512303	1	512303	1
10	Rivet ②	130 x 0093	20	130 x 0093	20	130 x 0094	28	130 x 0094	28
11	Washer ②	67 x 0036	20	67 x 0036	20	67 x 0043	28	67 x 0043	28
12	Clamp Tube	307694-03	6	307694-04	6	306956-05	6	306956-06	6
14	Pressure Plate	512525	1	512525	1	512453	1	512453	1
17	Flat Washer	67 x 0041	6	67 x 0041	6	67 x 0040	6	67 x 0040	6
18	Locknut	110 x 0024	6	110 x 0024	6	110 x 0030	6	110 x 0030	6
19	Cylinder	512483	1	512483	1	512296	1	512296	1
21	Inner PolyPac Seal	402 x 0001	1	402 x 0001	1	402 x 0003	1	402 x 0003	1
23	Outer PolyPac Seal	402 x 0002	1	402 x 0002	1	402 x 0004	1	402 x 0004	1
28	Gear ③	415313-####	—-	415510-####	—-	415454-####	—-	415302-####	—-
29	Wear Spacer	—-	—-	307710-02	6	—-	—-	308155-01	6
31	Reaction Plate	—-	—-	512541	1	—-	—-	512340	1
33	Piston	512500	1	512500	1	512302	1	512302	1
34	Spring	307709	6	307709	12	307641	6	307641	12
35	Washer	67 x 0001	12	67 x 0001	24	67 x 0003	12	67 x 0003	24
36	Hex Head Screw	197 x 0005	12	197 x 0005	24	197 x 0207	12	197 x 0207	24
37	Ring Gear	415309	1	415309	2	415118	1	415118	2

① Sub-assembly of items 8, 9, 10 & 11.
② Quantity listed is number required for **one** friction disc sub-assembly (7).
③ Not included with element.

ITEM	DESCRIPTION	120DC (146301B)		220DC (146317B)		320DC (146366B)		420DC (146390B)	
		Part Number	Qty	Part Number	Qty	Part Number	Qty	Part Number	Qty
2	Mounting Flange	512752	1	512752	1	512752	1	512752	1
6	Stud	245 x 0058	12	245 x 0062	12	245 x 84	12	245 x 83	12
7	Friction Disc. Assembly ①	512768	1	512768	2	512768	3	512768	4
8	Friction Disc ②	512766	2	512766	2	512766	2	512766	2
9	Friction Disc Core ②	512767	1	512767	1	512767	1	512767	1
10	Rivet ②	130 x 0094	40	130 x 0094	40	130 x 0094	40	130 x 0094	40
11	Washer ②	67 x 39	40	67 x 39	40	67 x 39	40	67 x 39	40
12	Clamp Tube	306956-09	12	306956-10	12	306956-19	12	306956-30	12
14	Pressure Plate	512765	1	512765	1	512765	1	512765	1
17	Flat Washer	153 x 727	12	153 x 727	12	153 x 727	12	153 x 727	12
18	Locknut	110 x 0030	12	110 x 0030	12	110 x 0030	12	110 x 0030	12
19	Cylinder	512693	1	512693	1	512693	1	512693	1
21	Inner PolyPac Seal	402 x 0021	2	402 x 0021	2	402 x 0021	2	402 x 0021	2
23	Outer PolyPac Seal	402 x 0022	2	402 x 0022	2	402 x 0022	2	402 x 0022	2
28	Gear ③	415900-####	—-	416059-####	—-	416304-####	—-	416472-####	—-
29	Wear Spacer	—-	—-	308155-02	12	308155-02	24	308155-02	36
31	Reaction Plate	—-	—-	512763	1	512763	2	512763	3
33	Piston	512761	1	512761	1	512761	1	512761	1
34	Spring	307996	12	307996	24	307996	36	307996	48
35	Washer	67 x 0003	16	67 x 0003	32	67 x 0003	48	67 x 0003	64
36	Hex Head Screw	197 x 0207	16	197 x 0207	32	197 x 0207	48	197 x 0207	64
37	Ring Gear	513193	1	513193	2	513193	3	513193	4

① Sub-Assembly of items 8, 9, 10 & 11.
② Quantity listed is number required for **one** friction disc sub-assembly (7).
③ Not included with element.

ITEM	DESCRIPTION	125DC (146316B)		225DC (146355B)		325DC (146354B)		425DC (146389B)	
		Part Number	Qty	Part Number	Qty	Part Number	Qty	Part Number	Qty
2	Mounting Flange	513276	1	513276	1	513926	1	513926	1
6	Stud	245 x 0068	12	245 x 0078	12	245 x 0088	12	245 x 109	12
7	Friction Disc Assembly ①	513293	1	513293	2	513293	3	513293	4
8	Friction Disc ②	513291	2	513291	2	513291	2	513291	2
9	Friction Disc Core ②	513292	1	513292	1	513292	1	513292	1
10	Rivet ②	130 x 0094	64	130 x 0094	64	130 x 0094	64	130 x 0094	64
11	Washer ②	67 x 0039	64	67 x 0039	64	67 x 0039	64	67 x 0039	64
12	Clamp Tube	306542-15	12	306542-16	12	306542-22	12	306542-35	12
14	Pressure Plate	513321	1	513321	1	513321	1	513321	1
17	Flat Washer	153 x 0641	12	153 x 0641	12	153 x 0641	12	153 x 0641	12
18	Locknut	110 x 0073	12	110 x 0073	12	110 x 0073	12	110 x 0073	12
19	Cylinder	513264	1	513264	1	513264	1	513264	1
21	Inner PolyPac Seal	402 x 0023	2	402 x 0023	2	402 x 0023	2	402 x 0023	2
23	Outer PolyPac Seal	402 x 0024	2	402 x 0024	2	402 x 0024	2	402 x 0024	2
28	Gear ③	416073-####	—-	416074-####	—-	416223-####	—-	416477-####	—-
29	Wear Spacer	—-	—-	308170-01	12	308170-01	24	308170-01	36
31	Reaction Plate	—-	—-	513319	1	513319	2	513319	3
33	Piston	513317	1	513317	1	513317	1	513317	1
34	Spring	308037	12	308037	24	308037	36	308037	48
35	Washer	67 x 0005	18	67 x 0005	36	67 x 0005	54	67 x 0005	72
36	Hex Head Screw	197 x 0409	18	197 x 0409	36	197 x 0408	54	197 x 0408	72
37	Ring Gear	513278	1	513278	2	513797	3	513797	4

① Sub-assembly of items 8, 9, 10 & 11.
② Quantity listed is number required for **one** friction disc sub-assembly (7).
③ Not included with element.

ITEM	DESCRIPTION	138DC (146307B)		238DC (146336B)		338DC (146360B)		438DC (146388B)	
		Part Number	Qty	Part Number	Qty	Part Number	Qty	Part Number	Qty
2	Mounting Flange	513137	1	513137	1	513137	1	513137	1
6	Stud	245 x 0074	16	245 x 0075	16	245 x 0076	16	245 x 108	16
7	Friction Disc Assembly ①	514024	1	514024	2	514024	3	514024	4
12	Clamp Tube	307941-06	16	307941-07	16	307941-05	16	307941-14	16
14	Pressure Plate	513205	1	513205	1	513205	1	513205	1
17	Flat Washer	67 x 0042	16	67 x 0042	16	67 x 0042	16	67 x 0042	16
18	Locknut	110 x 0075	16	110 x 0075	16	110 x 0075	16	110 x 0075	16
19	Cylinder	513988	1	513988	1	513988	1	513988	1
21	Inner PolyPac Seal	402 x 0005	2	402 x 0005	2	402 x 0005	2	402 x 0005	2
23	Outer PolyPac Seal	402 x 0006	2	402 x 0006	2	402 x 0006	2	402 x 0006	2
28	Gear ②	416068-####	—-	416069-####	—-	416241-####	—-	416461-####	—-
29	Wear Spacer	—-	—-	308150-02	16	308150-02	32	308150-05	48
31	Reaction Plate	—-	—-	513139	1	513139	2	513139	3
33	Piston	512858	1	512858	1	512858	1	512858	1
34	Spring	307940	16	307940	32	307940	48	307940	64
35	Washer	67 x 0009	24	67 x 0009	48	67 x 0009	72	67 x 0009	96
36	Hex Head Screw	197 x 0709	24	197 x 0709	48	197 x 0709	72	197 x 0709	96
37	Ring Gear	513154	1	513154	2	513811	3	513811	4

① Friction discs are bonded to core. Replace entire assembly
② Not included with element.

6.2 Repair Kits

Description	Element Size				
	9DC	15DC	20DC	25DC	38DC
Friction Disc Kit ①	107742D	107743D	107744D	107745D	N/A
Cylinder Seal Kit ②	107671C	107672C	107726C	107727C	107662C

① Components for friction disc replacement for one friction disc sub-assembly (7). Requires rivet setting tool. See Section 4.3 and Table 10.
② Includes seals and seal lubricant.

Airflex®

Form ML-318
Revised September 3, 1997

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