Installation, Operation and Maintenance of Airflex® 229 DBA Brake Assemblies with Cone-style Disc Centering Option

Horizontal 822 and 824 Frame Drag and Hoist Motors

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.

Caution:

Use Only Genuine Airflex® Replacement Parts

The Airflex Division of Danfoss 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 Danfoss warranty.

ENGINEERING TOMORROW

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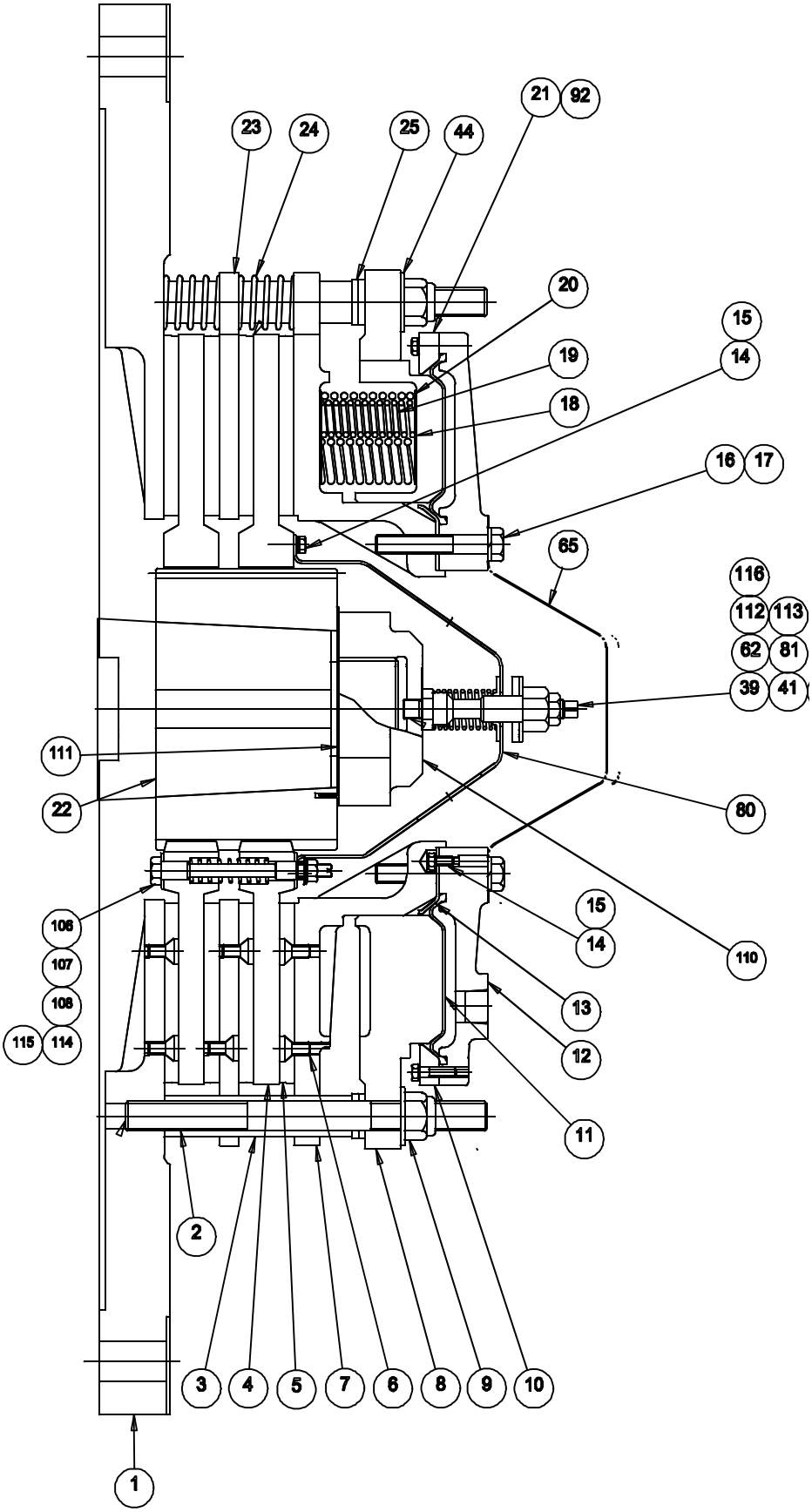

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Fig. 1

TABLE 1 - PARTS LISTS				
Item	**Qty.**	**Description**	**Part Number**	
		229DBA Brake Assembly	146163FA (824 Motors)	146163FD (822 Motors)
1	1	Mounting Flange	414246	414245
2	12	Stud	307261-05	307261-05
3	12	Clamp Tube	306542-21	306542-21
4	2	Disc	413579	413579
5	4	Friction Disc	414665	414665
6	144	Flat Head Screw	294 x 407	294 x 407
7	1	Pressure Plate	510619	510619
8	1	Spring Housing	510616	510616
9	12	Lock Nut	110 x 73	110 x 73
10	8	Outer Clamp Ring	414922	414922
11	1	Diaphragm	407517-02	407517-02
12	1	End Plate	413581	413581
13	1	Inner Clamp Ring	407684-02	407684-02
14	10	Hex Head Screw	1 x 205	1 x 205
15	10	Lockwasher	68 x 7	68 x 7
16	8	Hex Head Screw	203806	203806
17	8	Lockwasher	68 x 25	68 x 25
18	24	Spring Retainer Plate	413583	413583
19	30	Inner Spring	307044	307044
20	30	Outer Spring	307045	307045
21	24	Hex Head Screw	1 x 209	1 x 209
22	1	Gear (not included w/assy)	413801-08	413801-07
23	1	Reaction Plate	413586	413586
24	12	Reaction Spring	306909	306909
25	24	Wear Spacer	307952	307952
39	1	Centering Spring	204125	204125
41	1	Hex Jam Nut	61 x 9	61 x 9
44	12	Flat Washer	153 x 641	153 x 641
62	1	Centering Screw	416215	416531
80	1	Disc Centering Cone	416406	416406
81	1	Flat Washer	67 x 32	67 x 32
92	24	Flat Washer	67 x 3	67 x 3
106	3	Shoulder Bolt	308076	308076
107	3	Spring	71 x 137	71 x 137
108	3	Wear Ring	308075	308075
110	1	Motor Shaft Nut	416078	416078
111	1	Motor Shaft Lockwasher	416082	416082
112	1	Sleeve Nut	308067	308067
113	1	Poly Washer	308068	308068
114	6	Washer	308079	308079
115	3	Flange Hex Nut	153 x 1149	153 x 1149
116	1	Spring Retainer	204164	204164

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 equipment. Three signal words "**DANGER**", "**WARNING**", and "**CAUTION**" are used to indicate the severity of a hazard, and are preceded by the safety alert symbol ⚠.

⚠ DANGER

Denotes the most serious 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 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 DBA brake is designed to provide braking in heavy-duty industrial applications. The brake is spring applied and air released, thus, stopping the machinery if a loss of air supply occurs.

1.1.1 The brakes described in this manual have been modified specifically for use on dragline applications, for installation on horizontally mounted 822 and 824 frame motors.

1.1.2 Included with these brakes is a cone-style disc centering device. The disc centering device has been designed to minimize wear of the friction surfaces caused by the brake discs dragging against the friction material while the brake is in the fully released position. Although a certain amount of disc dragging is acceptable, high cable payout speeds can generate excessive heat at the disc surfaces and accelerate friction material wear.

1.1.3 The design of the cone-style disc centering components allows for simple installation and set-up of the brakes.

1.1.4 Wear adjustment of the 229 DBA brake is provided to maintain optimum torque capacity.

1.2 How it Works

1.2.1 Referring to Figure 1, the gear (22) is mounted on the shaft which is to be stopped and the brake assembly is attached to the motor frame.

1.2.2 Air pressure is applied through the ports in the end plate (12) into the diaphragm cavity. As the air pressure increases, the end plate and pressure plate (7), which are attached to each other with screws (16) and lockwashers (17), move away from the mounting flange (1). The pressure plate compresses the springs (19)(20) against the stationary spring housing (8) and the clamp force is removed from the discs (4) which ride on the gear. The discs are then free to rotate. As the pressure plate continues to move away from the mounting flange, the reaction plate (23) and discs are repositioned by means of spacers, springs and positioning screws.

1.2.3 As air pressure is exhausted from the brake, the springs (19)(20) force the pressure plate toward the mounting flange. The spring forces within the brake overcome the spring forces positioning the discs and reaction plate, allowing the discs to slide axially towards the mounting flange and become clamped between the friction discs.

2.0 INSTALLATION

⚠ Danger:

Prior to installation of the DBA Brake, make sure that the machinery will remain in a secured position. Failure to do so could result in serious personal injury or possibly death.

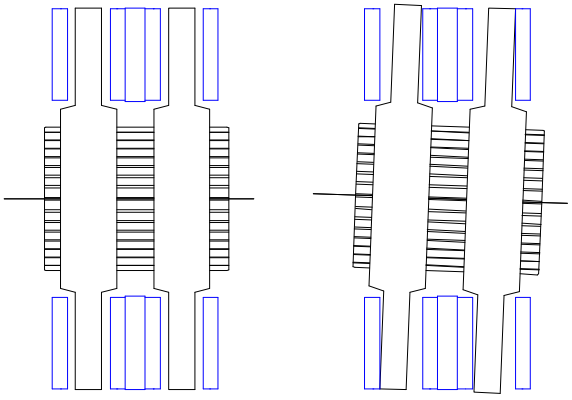
2.1 Preparation

2.1.1 Inspect the mounting lugs on the motor for broken welds or improper location. All mounting lugs should be flat and within a common perpendicular plane to the motor shaft.

2.1.2 For proper operation and service life, the DBA Brake must be mounted concentrically and at right angles to the shaft. Concentricity of shaft and brake should be held to within .010". Perpendicularity of the mounting flange (1) should be held within .014"TIR, referenced from the shaft centerline to the machined surface just outside of the friction disc.

Caution:

Proper alignment is necessary to assure that the discs (4) will track properly. Improper alignment will result in excessive wear to the friction discs (5), discs (4) and gear (22). See Figure 2.



Correct Track Incorrect Track

Fig. 2

2.1.3 Ensure that the motor shaft is clean and free of nicks or burrs and that the key fits properly in the shaft and gear. Tap the key into the shaft keyway and position the gear on the shaft to check for binding of the key. Correct if necessary.

2.1.4 When modifying existing DBA brakes with retro-fit kits, all components in the kits should be installed prior to mounting the brake on the motor. See Table 1 for kit components.

2.2 Gear Mounting

2.2.1 Mount the gear cold by placing it on the shaft and snapping it in position by hand. Measure the cold position of the gear, using a micrometer depth gauge, as on Figure 3. Mark the position of the depth gauge, so that measurements can be taken from the same position after the gear has been mounted.

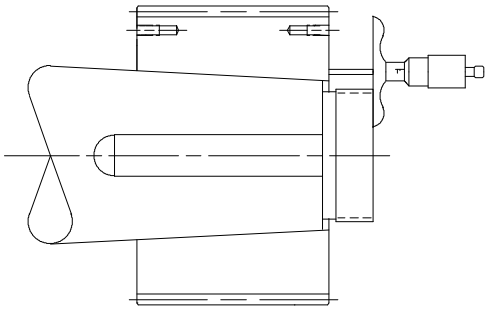


Fig. 3

2.2.2 Remove the gear from the shaft and heat it in an oven to a temperature approximately 110°F above that of the temperature of the shaft. For example if the shaft temperature is 70°F, heat the gear to a stable temperature of approximately 180°F for mounting.

Note: This temperature difference is estimated only and can be adjusted to maintain the advance specified in the following procedures.

2.2.3 After making sure the bore is clean, mount the heated gear on the shaft. When the gear is nearly engaged with the taper fit, snap it forcibly in place with a quick push.

2.2.4 After allowing the gear to cool, check the position of the gear on the shaft with the micrometer depth gauge. Subtract the reading obtained in 2.2.3 from this dimension. The difference between the two readings should be .040" + /- .010". If the advance is not within .030" to .050", the gear should be pulled and remounted.

2.2.5 Secure the gear to the shaft with the motor shaft nut (110) and lockwasher (111), tightening the nut firmly. Bend the lockwasher against one flat of the nut.

2.3 Mounting the Brake

2.3.1 Mount a magnetic base dial indicator on the motor housing, positioning the tip of the indicator on either the inside face on the end of the gear (mounted on the brake end of the motor) or that of the coupling hub on the driving end of the motor.

2.3.2 Determine the total armature endplay by thrusting the motor shaft axially to the mechanical limits. Leave the shaft thrust out (towards the brake end of the motor) and record the total thrust clearance in Table 2. This value will be used in the set-up procedures.

Note: If armature endplay is beyond manufacturers maximum specification of 11/64", repairs may be required. Consult the motor manufacturer for corrective procedures.

⚠ Warning:

Bearing clearances in excess of manufacturer's maximum specification of 11/64" may result in premature wear or damage to the brake components.

⚠ Caution:

Excessive jacking or prying when checking armature endplay may result in damage to bearings, bearing cartridges, or related components.

2.3.3 Lubricate the splines on the gear (22) with a LIGHT coat of Molub-Alloy OG Heavy, or equivalent grease.

⚠ Warning:

Excessive grease application on the driving gear (22) may result in contamination of the friction material. Grease on the discs or the friction discs will significantly reduce the torque capacity of the brake and decrease its ability to hold the machinery in a safe position.

2.3.4 Apply Loctite 242 to the threads on the centering screw (62) that will screw into the motor shaft nut. See Fig. 1.

Note: The centering screw and related components should already be assembled in the brake prior to installation. For proper orientation of these components, see Section 4.4, Centering Screw Arrangement.

TABLE 2 - Gap Calculation	
Description	**Result**
1) Total shaft float measured in 2.5.2	
2) Total float divided by 2	
3) Add the result from the value determined in step 2 to .375". This is the sleeve nut gap, brake engaged.	

2.3.5 Using a lifting strap around the brake, hoist the brake into postion (approximate weight is 1200 pounds), and slide it onto the gear until the centering stud reaches the motor shaft nut. Position the centering stud in the corresponding hole and screw it into the nut while continuing to slide the brake over the gear. Torque the centering stud to 50 ft.-lb., dry.

Note: The lifting holes in the spring housing are intended for lifting the pressure plate-spring housing-end plate subassembly ONLY. They should not be used to lift the entire brake assembly.

⚠ Warning:

Do not lift the entire brake assembly using the lifting holes in the spring housing (8).

2.3.6 Assemble the brake to the motor with four 1-1/2-6NC x 5.00" Grade 8 hex head screws (use 4.00" long screws for 822 frame applications) and flat washers. Torque the mounting fasteners to 800 ft.-lb., dry.

Note: It may be necessary to apply air pressure (100 psi) to release the brake in order to properly position the mounting flange holes.

⚠ Warning:

Maximum applied air pressure to the brake is 120 psi.

⚠ Warning:

Be sure the brake components are properly supported prior to releasing the brake.

Caution:

Pinch points exist when applying and releasing air pressure to the brake assembly.

2.3.7 Prior to putting the brake into service, disc centering adjustment will be required. Adjust the discs per section 2.4 after installation of the air supply as outlined in section 2.5.

Warning:

Failure to adjust the brake properly may cause premature wear of the brake components. Excessive heat may be generated from improper adjustment, resulting in damage to the brake and possible loss of torque.

2.4 Disc Centering Adjustment

2.4.1 With the brake engaged measure the gap between the disc centering cone (80) and the poly flat washer (113). See Fig. 9. The motor shaft should be thrust out (towards the brake end) to its axial limit when determining this dimension.

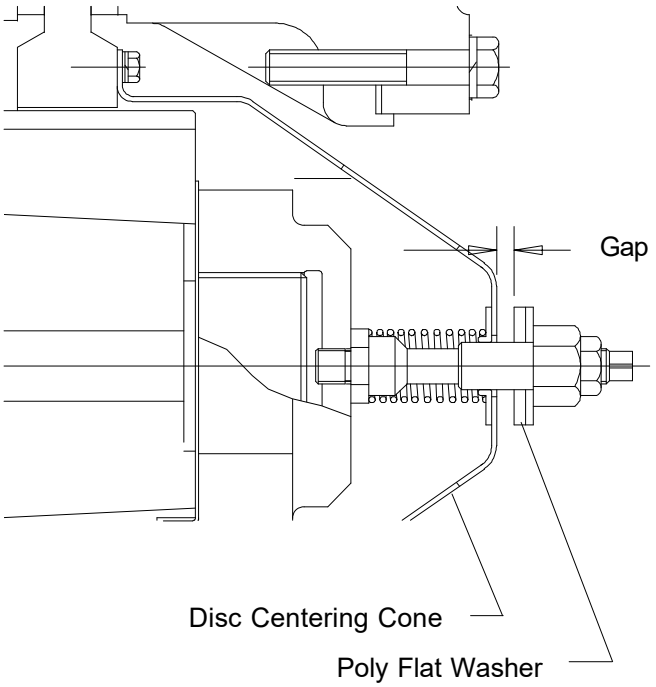


Fig. 4

Caution:

Improper motor shaft location will result in improper shimming of the brake, and subsequent brake damage.

2.4.2 Compare the gap measured in 2.4.1 to that calculated in Table 2, step 3. If necessary, adjust the gap to within + /-.010 of the value determined by turning the sleeve nut. When the value has been achieved, secure the sleeve nut onto the stud by tightening the hex jam nut to 50 ft.-lbs.

2.4.3 Apply 100 psi air pressure to fully release the brake. The gap between the cone and the poly flat washer should close.

2.4.4 Thrust the motor shaft axially to the mechanical limits while the brake is released. Observe the outer gaps between the discs (4) and adjoining friction disc (5) as the shaft reaches each limit. There should be clearance at all times. Leave the shaft thrust out (towards the brake end of the motor) , exhaust the air pressure to engage the brake, and recheck the gap as in 2.4.1. Adjust per 2.4.2 if necessary.

Note: Lack of clearance between discs and friction discs indicates improper assembly, or excessively worn bearings or related components. Identify and correct prior to operating the machinery.

Note: During initial start up, monitor the axial travel of the discs between the mounting flange and the pressure plate. Due to vari-

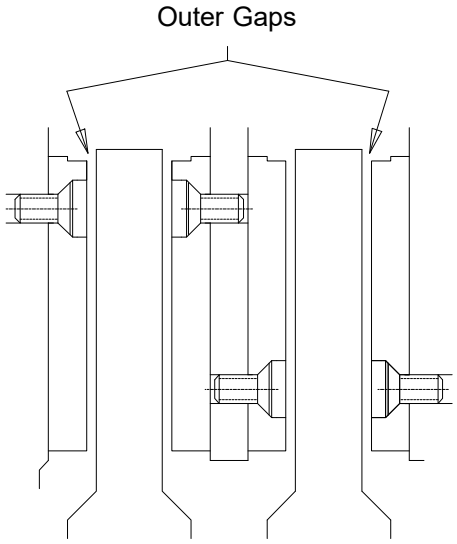


Fig. 5

ous influences including gearing, couplings, or alignment of the motor to the pinion, the motor may drift axially. If the discs remain in constant contact with the friction material, adjustment of the brake or motor bearing repair may be required. The discs should rotate freely, with no contact to the friction material while the brakes are fully disengaged.

Warning:

Failure to adjust the brake properly may cause premature wear of the brake components. Excessive heat may be generated from improper adjustment, resulting in damage to the brake and possible loss of torque.

Caution:

Armature endplay in excess of manufacturers maximum specification of 11/64" may result in premature wear or damage to the brake components.

2.5 Air Supply System

Warning:

Maximum allowable air pressure is 120 psig (8.2 bar). Operation of the 229DBA at pressures exceeding 120psig may result in damage to the brake components.

Caution:

Minimum releasing pressure is 100psig (6.8 bar). Operation at pressures below minimum will result in brake drag and excessive heat and wear.

Brake response is dependent upon a good air system arrangement. Following are some general guidelines for installing the air control components.

2.5.1 229 DBA brakes have three 1" 11-1/2NPT ports in the end plate. Two of the ports can be plugged, and the air line routed to the lowest port.

2.5.2 Use full size piping consistent with the air inlet. Pneumatic piping should be free of foreign material such as pipe thread sealer, metal chips, etc.

2.5.3 Pipe length should be kept to a minimum. Excessive piping, pipe elbows, and other restrictions will slow down the response time of the brake.

2.5.4 The final connection to the brake inlet port must be made with a flexible hose.

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

2.5.6 The DBA brake does not require lubricated air; however the solenoid valve may. Consult the valve manufacturer.

2.5.7 Use of an in-line air filter is recommended to help prevent excessive moisture and contamination from entering the solenoid valve and brake.

2.5.8 Filters and regulators should be located prior to the solenoid valve, to ensure proper brake response.

Warning:

Locating filters or regulators between the brake and solenoid valve may result in inadequate brake response.

2.5.9 A pressure switch should be located in the air supply line to the brake and interlocked with the equipment electrical controls.

3.0 OPERATION

3.1 Wear-in Procedures

3.1.1 The non-asbestos friction material used on DBA brakes may not develop rated torque initially, as a short wear-in period is required.

Caution:

The non-asbestos friction material used on Airflex DBA brakes 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.

3.1.2 Burnishing of the friction material may be desired, if full torque of the brake is required at initial start up. Burnishing procedures are as follows:

3.1.2.1 Apply 55 psig air pressure (for 100 psi release brakes) to the brake to allow the brake to slip while the motor is running.

3.1.2.2 Run the motor at 100 RPM for approximately 1 1/2 to 2 1/2 minutes or until a moderate amount of smoke can be seen. DO NOT ALLOW THE BRAKE TO SLIP FOR MORE THAN 2 1/2 MINUTES.

Caution:

Excessive slipping of the brake will result in damage to the brake components.

3.1.2.3 Apply full air pressure to completely disengage the brake. Smoke rising from the brake as it is released should be expected.

3.1.2.4 Allow the brake discs to cool to 120 - 150 degrees F. The use of fans or clean, dry compressed air can be used to accelerate the cooling process.

Caution:

Use proper safety protection when using forced ventilation.

3.1.2.5 Repeat steps 3.1.2.1 thru 3.1.2.4 a minimum of two more times.

3.1.2.6 Allow the brake to completely cool to ambient temperature prior to testing the torque capacity of the brake or returning it to service.

3.1.3 During initial start up, monitor the axial travel of the discs between the mounting flange and the pressure plate. If the discs tend to favor one side (mounting flange or pressure plate), or remain in constant contact with the friction material, centering screw adjustment may be required. The discs should rotate freely, with no contact to the friction material while the brakes are fully disengaged.

Warning:

Failure to adjust the brake properly may cause premature wear of the brake components. Excessive heat may be generated from improper adjustment, resulting in damage to the brake and possible loss of torque.

3.2 Periodic Inspection

3.2.1 A wear adjustment is required when the friction material is approximately half worn. Friction material must be replaced when worn to the step on the O.D. of the friction disc. See the MAINTENANCE section for wear limits, wear adjustment and friction material replacement procedures.

Warning:

If wear adjustment is not made, the brake torque may deteriorate to the point where the equipment will not stop properly.

3.2.2 Periodically observe the discs with the brake released. Dragging discs may be caused by broken springs, poor adjustment, excessive motor shaft float, or other excessively worn or damaged components. Repair or replace components as required.

3.2.3 Periodically check for air leakage of the diaphragm. For replacement, refer to 4.6.

3.2.4 Pneumatic and electrical control interlocks should be periodically checked for correct settings and operation.

TABLE 3 - WEAR LIMITS			
Item	**Item Description**	**Wear Description**	**Wear Limit**
3	Clamp Tubes	Maximum wear on O. D. Wear will be in the form of grooving from contact with the reaction plate or spring housing.	.030"
4	29 DBA Disc	Minimum thickness.	.940"
4/22	Disc Splines / Gear	Maximum total backlash, measured at pitch diameter.	.070"
23	Reaction Plate	Maximum elongation of reaction holes.	.060"
19	Inner Spring	Minimum free height.	5.32"
20	Outer Spring		5.32"
24	Reaction Spring		2.37"
39	Centering Spring		3.65"
107	Spring		2.31"

4.0 MAINTENANCE

Danger:

Prior to peforming any maintenance procedures on the DBA Brake, make sure that the machinery will remain in a secured position. Failure to do so could result in serious personal injury or possibly death.

Caution:

When replacing components, use only genuine Airflex replacement parts. Use of other materials may severely effect performance.

4.1 Wear Limits

4.1.1 Wear limits for the DBA components are listed in Table 3. If any wear limit has been reached or exceeded, that component must be repaired or replaced.

4.2 Wear Adjustment Procedure

4.2.1 Brake adjustment is required as the friction material wears. To determine when adjustment is required, measure the gap "X" between the pressure plate and the mounting flange with the brake engaged (air released), as shown on Figure 6. Compare the measured gap to the values listed in Table 4. Adjust the brake by re-arranging the wear spacers and spacer plates to the appropriate positions per the following procedures.

Note: Friction discs worn to or beyond the wear indicating step shown on Figure 7 must be replaced. If any of the friction discs are replaced, it is recommended that all four friction discs be replaced as a set, and the brake adjusted to the original position, as described in the INSTALLATION section.

Warning:

If wear adjustment is not made or brake is not taken out of sevice when wear limits have been reached, the brake torque may deteriorate to the point where the equipment will not stop properly.

Warning:

Premature adjustment of the brake may result in insufficient running clearances between the discs and the friction discs.

Caution:

Final brake wear limit may be reached prior to friction discs reaching the wear steps shown on Figure 7.

4.2.2 Disconnect the air supply lines from the brake.

4.2.3 While supporting the spring housing, loosen the locknuts (9) ONE TURN AT A TIME and in an alternating (crosswise) pattern until the spring force is relieved. Remove the locknuts and washers (44).

TABLE 4 - Wear Adjustment Positions					
Adjustment Position	**Measured Gap "X"**	**Component:**	**Wear Ring (108)**	**Brake Wear Spacers (25)**	
		Location:	**On Shoulder Screw (106)**	A	B
X_0	Greater than 4.76"	Quantity:	2	2	0
X_1	Less than or equal to 4.76"		1	1	1
X_2	Less than or equal to 4.50"		0	0	2
Rebuild	Less than or equal to 4.24"		Rebuild brake with new components and re-install per Section 2.0, INSTALLATION		
See Figures 1 and 8 for wear ring and spacer locations.					

Caution:

The locknuts must be loosened gradually to prevent damage to the brake components.

4.2.4 Slide the end plate, spring housing and pressure plate off of the studs as an assembly, removing the wear spacers (25). Set the assembly aside on a clean, dry area, making sure not to damage the friction material wear surface on the pressure plate.

Note: If a stud (2) should happen to come loose, remove it completely and clean the threads in the mounting flange. Apply Loctite Loc-Quic Primer Grade "T" to the stud threads. After the threads have dried, apply Loctite #277 and install the stud until it bottoms in the threaded hole in the mounting flange.

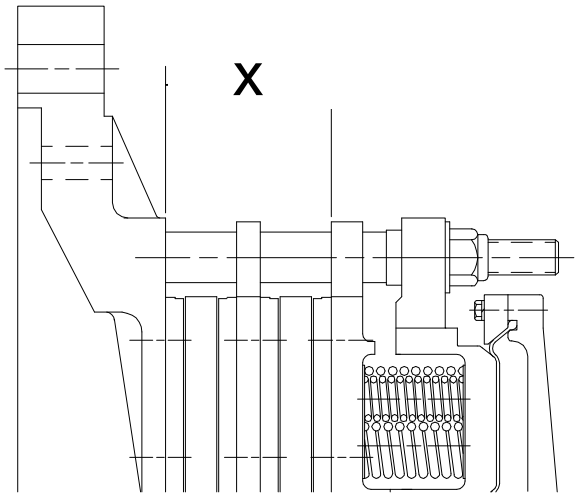


Fig. 6

Caution:

Loctite #277 must be shaken prior to application.

Caution:

Loctite #277 may irritate sensitive skin. Refer to the product label for proper safety precautions.

4.2.5 Loosen and remove the flange hex nut (115) on ONE of the shoulder bolts (106). Also remove the washer (114).

4.2.6 Remove a wear ring (108) from the shoulder bolt. Assemble the washer (114) back onto the shoulder bolt. Apply Loctite 242 to the threads of the shoulder bolt and reassemble the flange hex nut (115) to the shoulder bolt, tightening the nut to 20 ft.-lbs. Be sure that the washer (114) slides

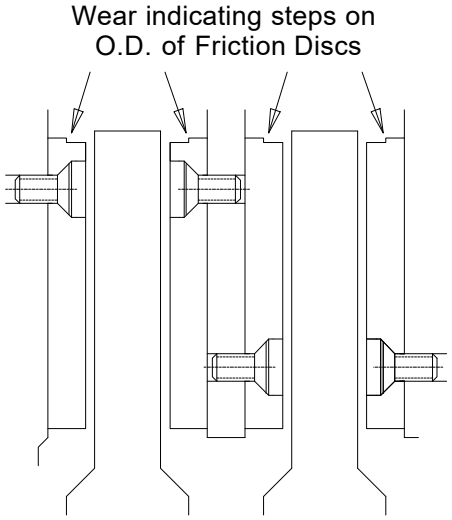


Fig. 7

over the end of the shoulder bolt and is not pinched between the hex nut and bolt during tightening. See Figure 1.

⚠ Caution:

Do not overtighten the flange hex nut. Failure of the shoulder bolt could occur from excessive tightening.

4.2.7 Repeat steps 4.2.5 and 4.2.6 for the remaining two shoulder bolts.

Note: The wear rings (108) that are removed during these procedures should be stored for later use when the brake is rebuilt with new friction discs.

4.2.8 Using the value obtained by measuring gap "X" in 4.2.1, refer to Table 4 and Figure 8 and determine the proper quantity and location of the wear spacers (25).

4.2.9 Lubricate the threads on the ends of the studs (2) with 30 wt. oil or Never Seez®.

4.2.10 Hoist the pressure plate, spring housing and end plate assembly into position, noting the orientation of the air inlet to the mounting flange, and slide the assembly over the studs and clamp tubes, placing the required number of wear spacers (25) onto the studs between the pressure plate and spring housing (position A on Figure 8). See Table 4 for proper quantity.

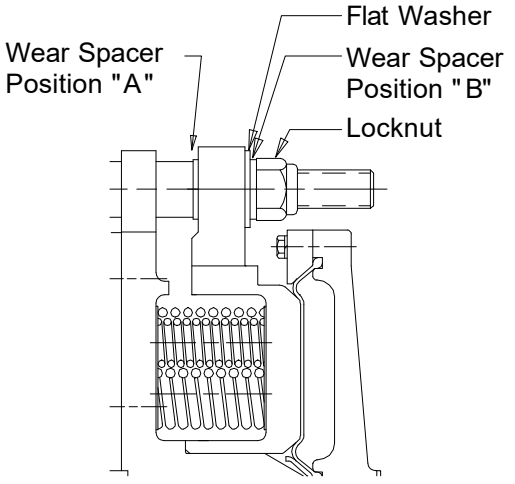


Fig. 8

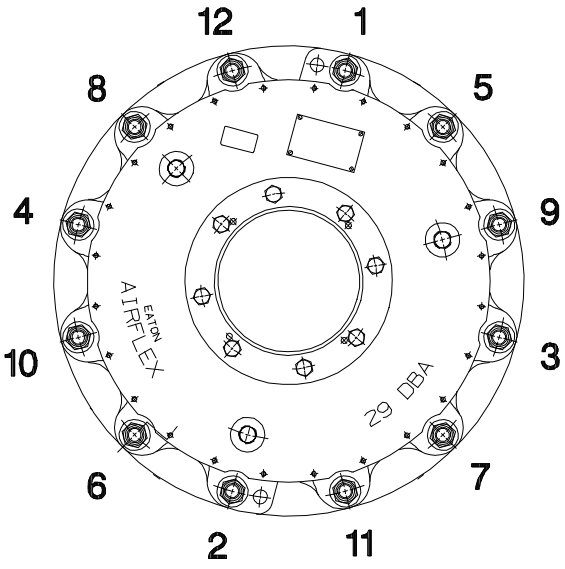


Fig. 9

4.2.11 Install the washers (44), remaining wear spacers (25), and locknuts (9) removed previously. The wear spacers are stored under the locknuts (position "B") for re-use after replacing the friction discs. See Figure 8.

4.2.12 While supporting the weight of the pressure plate, spring housing and end plate assembly, tighten the locknuts ONE TURN AT A TIME and in a crosswise pattern, until the spring housing is seated against the clamp tubes. Torque the locknuts to 500 ft.-lb., lubed. See Figure 8.

⚠ Caution:

The locknuts must be tightened gradually to prevent damage to the brake components.

4.2.13 Upon returning the brake to service, monitor the operation and clearances of the brake, as in section 2.4. Adjust if required.

4.3 Friction Disc Replacement

Caution:

Use only genuine Airflex friction material. Use of friction material not of Airflex origin may result in unpredictable brake performance and/or excessive wear of the brake components.

Friction disc replacement is required when worn to the wear indicating step shown on Figure 6, or if oil or grease have contaminated the surface.

4.3.1 Disconnect the air supply lines from the brake.

4.3.2 Remove the brake from the motor and place it on a level working suface, with the mounting flange facing down.

Note: It will be necessary to loosen and remove the centering screw from the motor shaft nut while removing the brake.

Caution:

Failure to remove the centering screw from the motor shaft nut may result in damage to the screw or other brake components.

4.3.3 Loosen the locknuts (9) ONE TURN AT A TIME and in an alternating (crosswise) pattern until the spring force is relieved. Remove the locknuts, wear spacers (25) and washers (44).

Caution:

The locknuts must be loosened gradually to prevent damage to the brake components.

4.3.4 Lift the end plate, spring housing and pressure plate off of the studs as an assembly. Set the assembly aside on a clean, dry area, making sure not to damage the friction material wear surface on the pressure plate.

Note: If a stud (2) should happen to come loose, remove it completely and clean the threads in the mounting flange. Apply Loctite Loc-Quic Primer Grade "T" to the stud threads. After the threads have dried, apply Loctite #277 and install the stud until it bottoms in the threaded hole in the mounting flange.

Caution:

Loctite #277 must be shaken prior to application.

Caution:

Loctite #277 may irritate sensitive skin. Refer to the product label for proper safety precautions.

4.3.5 Remove the hex head screws (14) and lockwashers (15) securing the disc centering cone (80) to the disc. Remove the disc centering cone.

4.3.6 Loosen and remove the shoulder bolts (106) securing the discs to one another.

4.3.7 Remove the first disc.

4.3.8 Remove the reaction springs (24) and reaction plate (23) from the studs.

4.3.9 Remove the springs (107) from the counterbores in the second disc and set aside. Remove the second disc.

4.3.10 Inspect the brake components for wear or damage. Replace as required. For wear limits of components, see Table 3.

4.3.11 Remove the old friction discs (5) and replace them with new friction discs. Apply Loctite #262 to the threads of screws (6), install and torque the screws to 20 ft.-lb.

Caution:

Before installing screws, make sure that the screw threads and threaded holes are clean to ensure that the new screws will lock properly.

Caution:

Loctite #262 must be shaken prior to application.

Caution:

Loctite #262 may irritate sensitive skin. Refer to the product label for proper safety precautions.

4.3.12 Position the first disc (4) on the mounting flange/friction disc assembly with the counterbores facing up. Center the disc on the friction material.

4.3.13 Insert the springs (107) into the disc counterbores.

4.3.14 Place a reaction spring (24) over every other clamp tube (3) and slide the reaction plate (23) over the clamp tubes. Place the remaining reaction springs over the clamp tubes.

Caution:

Springs (24) are to be assembled on every other stud (2). The springs on either side of the reaction plate must be assembled on the same stud with the clamp tubes. Improper assembly will result in cocking of the reaction plate (23) and uneven brake release.

4.3.15 Noting the orientation of the large counterbores in the second disc, align the disc with the three springs installed in the first disc and lower it onto the reaction plate.

4.3.16 Assemble a washer (114) onto a shoulder bolt (106) and insert the bolt up through the discs and spring. See Figure 1 for the bolt orientation.

4.3.17 Install two wear rings (108) over the threaded end of the shoulder bolt. Apply Loctite 242 to the bolt threads. Assemble a washer (114) and a flange hex nut (115) onto the shoulder bolt and tighten the nut to 20 ft.-lb. Be sure that the washer (114) slides over the end of the shoulder bolt and is not pinched between the hex nut and bolt during tightening. See Figure 1.

Caution:

Do not overtighten the flange hex nut. Failure of the shoulder bolt could occur from excessive tightening.

4.3.18 Repeat steps 4.3.16 and 4.3.17 and for the remaining two shoulder bolts.

4.3.19 Apply Loctite®#242 to the threads of the shoulder screws and insert the screws through the disc counterbores, springs, and wear spacers. Tighten the shoulder screws to 50 ft.lb.

4.3.20 Attach the disc centering cone to the disc with hex head screws (14) and lockwashers (15) after applying Loctite®#242 to the screw threads. Torque the screws to 20 ft.-lb.

4.3.21 Lubricate the threads on the ends of the studs with 30 wt. oil or Never Seez®.

4.3.22 Hoist the pressure plate, spring housing and end plate assembly into position. Noting the orientation of the air inlet to the mounting flange, lower the assembly over the studs and clamp tubes, placing the wear spacers (25) onto the studs between the pressure plate and spring housing. See Figure 11. The wear spacers will not pass through the holes in the spring housing.

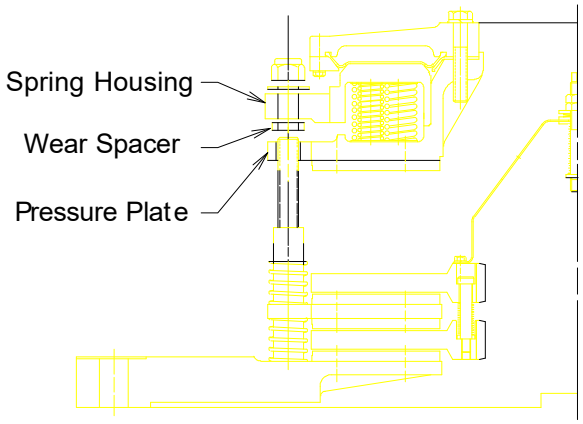


Fig. 11

4.3.23 Assemble the washers (44) and locknuts (9) onto the studs. Tighten the locknuts ONE TURN AT A TIME and in a crosswise pattern as on Figure 8, until the spring housing is seated against the wear spacers. Torque the locknuts to 500 ft.-lb., lubed.

Caution:

The locknuts must be tightened gradually to prevent damage to the brake components.

4.3.24 Re-install the brake per 2.0, INSTALLATION.

4.3.25 Upon returning the brake to service, monitor the operation and clearances of the brake, as in 2.4. Adjust if required.

4.4 Centering Screw Arrangement

229 DBA brakes with cone-style disc centering are shipped from the factory with the centering screw (62) assembled, for ease of installation. If the centering screw has been removed for maintenance purposes, the following procedures should be followed to ensure proper orientation of the components, prior to assembly of the centering cone onto the brake disc.

4.4.1 Inspect the components for damage. Replace if necessary.

4.4.2 Slide the metal flat washer (81) onto the sleeve nut (112) and then assemble the poly flat washer (113) onto the sleeve nut, against the metal washer.

4.4.3 Slide the centering spring (39) and the spring retainer (116) onto the centering screw. Note the orientation of the spring retainer. The lip at the indside diameter should engage inside of the end of the spring.

4.4.4 Insert the centering screw through the center hole in the disc centering cone (80).

4.4.5 Assemble the sleeve nut onto the centering screw until all components are lightly clamped into position (hand tight). Assemble the hex jam nut (41) onto the centering screw and tighten it against the sleeve nut until snug.

4.5 Spring Replacement

4.5.1 While supporting the spring housing, loosen the locknuts (9) ONE TURN AT A TIME and in an alternating (crosswise) pattern until the spring force is relieved. Remove the locknuts, wear spacers (25) and washers (44).

Note: Wear spacers may be in the the original or adjusted position. Make a note of the wear spacer location, so they may be reassembled in the proper position.

Caution:

The locknuts must be loosened gradually to prevent damage to the brake components.

4.5.2 Remove the end plate (12), spring housing (8), and the pressure plate (7) as an assembly and place it on a clean working surface with the end plate (12) facing up.

4.5.3 Match mark the pressure plate, spring housing and end plate to one another.

4.5.4 Remove the hex head screws (16) and lockwashers (17) in a crosswise sequence, ONE TURN AT A TIME. With these removed, the end plate (12), diaphragm (11) and attached components can be removed as an assembly.

Warning:

These screws must be loosened gradually and evenly.

4.5.5 Remove the spring housing (8), exposing the springs (19) and (20) and spring retainer plates (18).

Caution:

Before removing the old springs, make note of the number used and the position that they are in so that the new springs may be installed similarly for proper brake functioning.

4.5.6 Noting their orientation, remove the spring retainer plates (18), exposing the springs.

4.5.7 Remove the springs and check the free height. If the free height of any spring is less than the value shown on Table 2, the entire complement of springs must be replaced.

4.5.8 Clean the rubbing surfaces between the spring housing (8) and the pressure plate (7) and the spring housing and the diaphragm (11) and coat with Amsoil® long life, multi-purpose, moly-compound synthetic grease.

4.5.9 Place springs (19) and (20) on the bosses of the spring retainer plates that remain in the pressure plate.

Note: Retainer plates overlap one another in pairs, so that five bosses remain in each spring pocket.

Caution:

No spring retainer plates (18) should cross over the ribs in the pressure plate or spring housing (8).

4.5.10 Arrange the remaining spring retainer plates onto the springs so that they correspond with the retainer plates in the pressure plate.

4.5.11 Align the match marks and carefully lower the spring housing (8) over the pressure plate.

4.5.12 Align the match marks and place the end plate/diaphragm assembly in position.

4.5.13 Lubricate the threads of the hex head screws (16) with 30 wt. oil or Never Seez® and install, making sure the lockwashers (17) are in place. Tighten the screws one turn at a time using a crosswise pattern. Torque the screws to 150 ft.-lb., lubed.

Warning:

These screws must be tightened gradually and evenly .

4.5.14 Noting the position of the air inlets, hoist the end plate, spring housing and pressure plate assembly into position and slide it over the clamp tubes, placing the wear spacers (25) onto the studs in the appropriate position. Refer to Section 4.2 for wear adjustment procedures.

4.5.15 Lubricate stud threads with 30 wt. oil or Never Seez®. Assemble the washers (44) and locknuts (9) onto the studs. While supporting the the weight of the pressure plate, spring housing and end plate assembly, tighten the locknuts ONE TURN AT A TIME and in a crosswise pattern, until the spring housing is seated against the clamp tubes. Torque the locknuts using the sequence shown on Figure 8 to 500 ft.-lbs.

Caution:

The locknuts must be tightened gradually to prevent damage to the brake components.

4.6 Diaphragm Replacement

The end plate/diaphragm assembly can be removed without removal or disassembly of the spring housing and pressure plate, provided the locknuts (9) remain secured.

Caution:

Throughout the following procedures, do not loosen the locknuts (9). If spring housing/pressure plate disassembly is desired, refer to section 4.5.

4.6.1 While supporting the end plate, remove the hex head screws (16) and lockwashers.

4.6.2 Remove the end plate/diaphragm assembly. Place it on a clean working surface with the diaphragm facing up.

4.6.3 Remove hex head screws (21) and lockwashers (15) and outer clamp ring segments (10).

4.6.4 Remove the hex head screws (14), lockwashers (15) and inner clamp ring (13).

4.6.5 Remove the diaphragm (11) and clean the end plate and clamp rings, smoothing any nicks or burrs.

4.6.6 Install the new diaphragm on the end plate, making sure the beaded edges of the diaphragm are seated properly in the grooves.

4.6.7 Position the outer clamp ring segments on the end plate.

4.6.8 Apply Loctite[J] #242 to the threads of the hex head screws (21). Attach the clamp ring segments with the screws and washers (92), and torque to 20 ft.-lb.

4.6.9 Attach the inner clamp ring (13) with hex head screws (14) and lockwashers (15). Torque the hex head screws to 20 ft.-lb., dry.

4.6.10 Clean the rubbing surfaces between the spring housing (8) and the diaphragm (11) and coat with Amsoil® long life, multi-purpose moly-compound synthetic grease.

4.6.11 Position the end plate assembly on the pressure plate. Align the match marks, making sure that the heads of the hex head screws (14) will fit into the corresponding counterbores in the pressure plate.

4.6.12 Assemble the end plate to the pressure plate with hex head screws (16) and lockwashers (17). Using a crosswise sequence, torque the screws to 150 ft.-lb., lubed.

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.

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