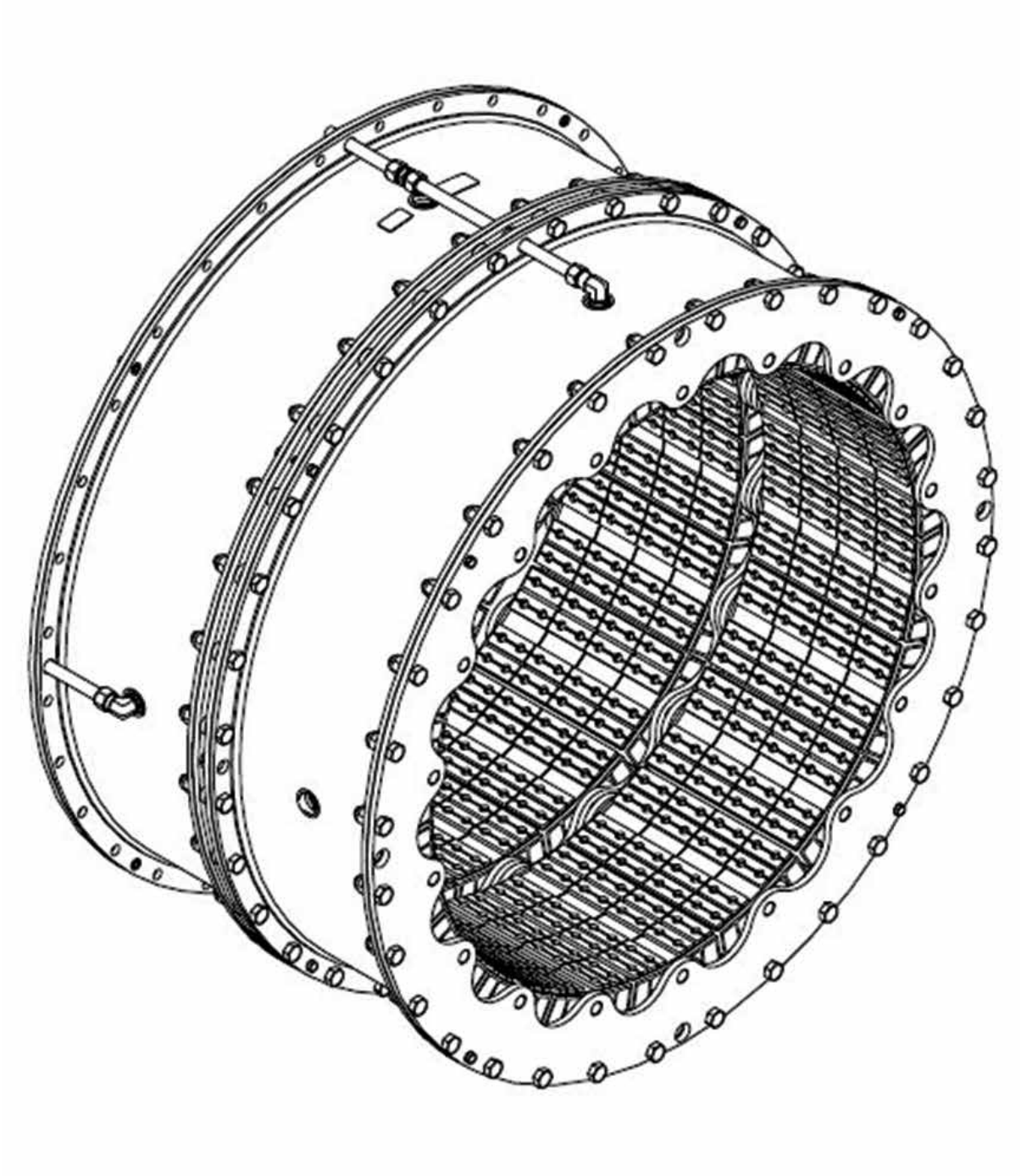
HEVC 5005 - Installation, operation and maintenance manual

Airflex HEVC 5005

204261



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General information

⚠ 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.

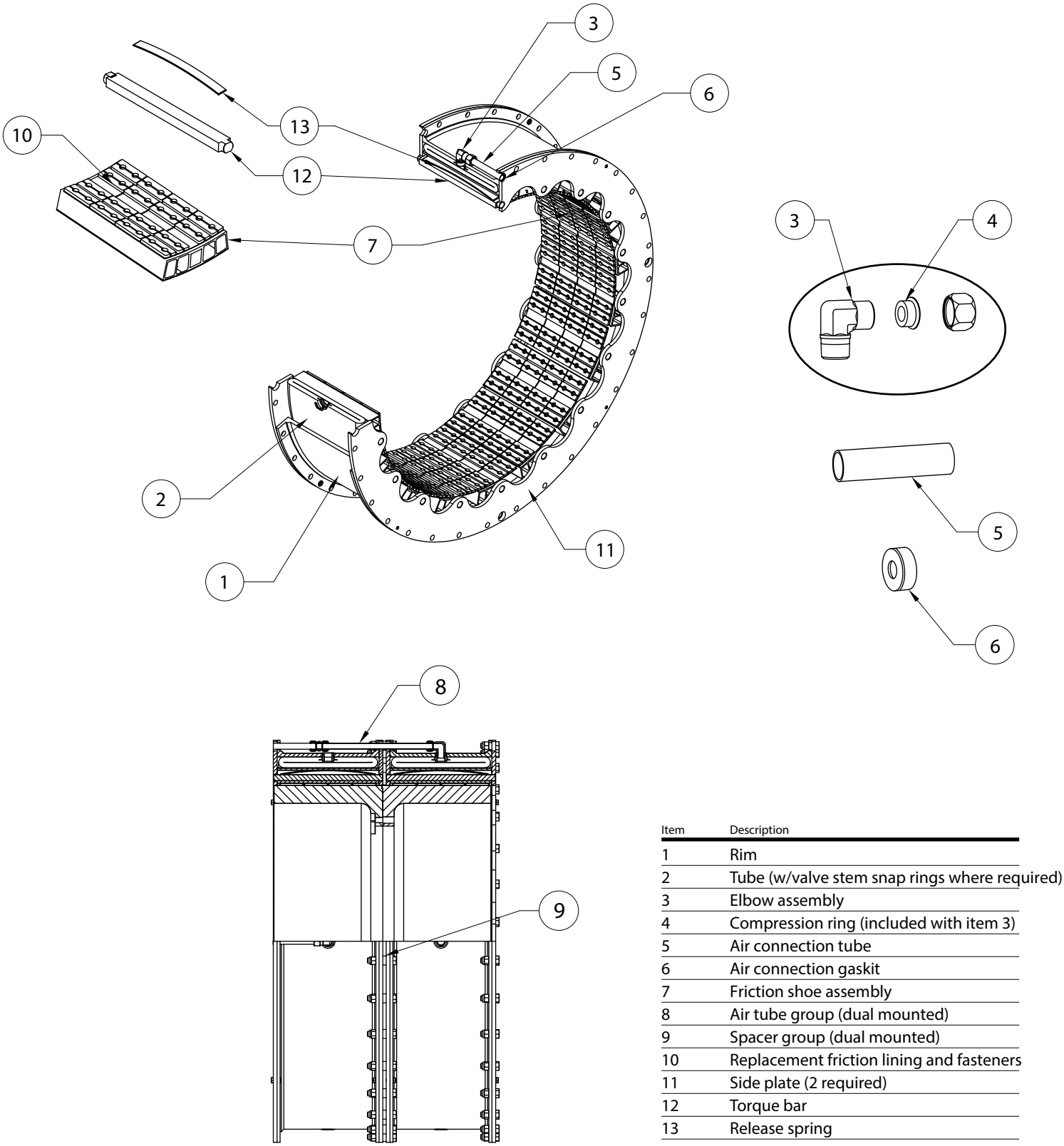
⚠ Caution

Use only genuine Airflex replacement parts.
The Danfoss 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 warranty.

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HEVC 5005



Item	Description
1	Rim
2	Tube (w/valve stem snap rings where required)
3	Elbow assembly
4	Compression ring (included with item 3)
5	Air connection tube
6	Air connection gaskit
7	Friction shoe assembly
8	Air tube group (dual mounted)
9	Spacer group (dual mounted)
10	Replacement friction lining and fasteners
11	Side plate (2 required)
12	Torque bar
13	Release spring

Figure 1

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, the Warning and the Caution procedures by which hazards are to be avoided.

1.1 Description

1.1.1 The Airflex® air-actuated HEVC clutch is specifically designed and manufactured for severe service encountered in grinding mill operations, where high starting loads and sustained slippage would normally lower clutch efficiency and reduce operating life. Constricting action and ventilated construction make high torque capacity and rapid heat dissipation possible.

1.1.2 All Airflex HEVC elements are supplied with long wearing, sintered friction material.

1.1.3 Airflex element assemblies are available for drum diameters from 28, 51, 60, 66 and 76 inches. Refer Table 1 for Nominal drum diameter and friction material width

1.1.4 All HEVC sizes are supplied as Dual units only.

Table 1

Nominal drum diameter and friction material width

Element size	Drum diameter inch (mm)	Friction material width inch (mm)
28HEVC1000	28.20 (716)	9.96 (253)
51HEVC1600	51.56 (1309)	16.11 (409)
60HEVC1600	60.56 (1538)	16.11 (409)
66HEVC1600	66.56 (1691)	16.11 (409)
76HEVC1600	76.56 (1945)	16.11 (409)
76HEVC2000	76.56 (1945)	20.16 (512)

1.2 How it works

1.2.1 Referring to Figures 1 and 2, the neoprene and cord actuating tube is contained within a steel rim which is drilled for mounting to the driving component. As air pressure is applied to the air actuating tube, the tube inflates, forcing the friction shoe assemblies uniformly against the drum, which is attached to the driven component. The friction shoe assemblies, which consist of friction blocks attached to aluminum backing plates, are guided by torque bars which are secured to side plates. The torque flow is from the driving shaft, through the element mounting component (typically an iron spider), through the rim side plate structure, through the torque bars to the backing plates and friction material, where the torque is transmitted through the friction couple to the components mounted on the driven shaft (clutch drum and drum mounting component). As actuating air is exhausted, release springs and centrifugal force assure positive disengagement.

1.2.1.1 In some cases, the spider and element assembly may be mounted to the driven shaft rather than the driving shaft. This “reverse mounted” arrangement is typically used when retrofitting a mill drive and it is more practical to drill the pinion shaft for the air supply rather than the motor shaft. In these cases, the operation and torque flow description is opposite to what is stated above.

1.2.1.2 For applications where the clutch is mounted on a motor shaft having plain bearings, an axial locking device is used to hold the motor on magnetic center during operation. Refer to the INSTALLATION section for axial locking device adjustment.

1.3 Clutch adjustment

1.3.1 Airflex HEVC clutches are completely self-adjusting and automatically compensate for lining and drum wear. Lubrication is not required. The torque developed is dependent upon rotating speed and applied air pressure. By limiting the applied pressure, the element will act as a torque limiting device and provide overload protection.

1.3.2 To achieve the desired mill acceleration time, a flow control valve is installed in the clutch air supply line and adjusted to restrict air flow to the clutch, while allowing free flow away from the clutch for rapid disengagement. By adjusting the flow, the rate of engagement may be varied. Note that the flow control valve ddoes not regulate air pressure the supply pressure must always be adequate to transmit the maximum required torque. Refer to the INSTALLATION section of the manual for a recommended air piping configuration and the OPERATION section for flow control valve adjustment.

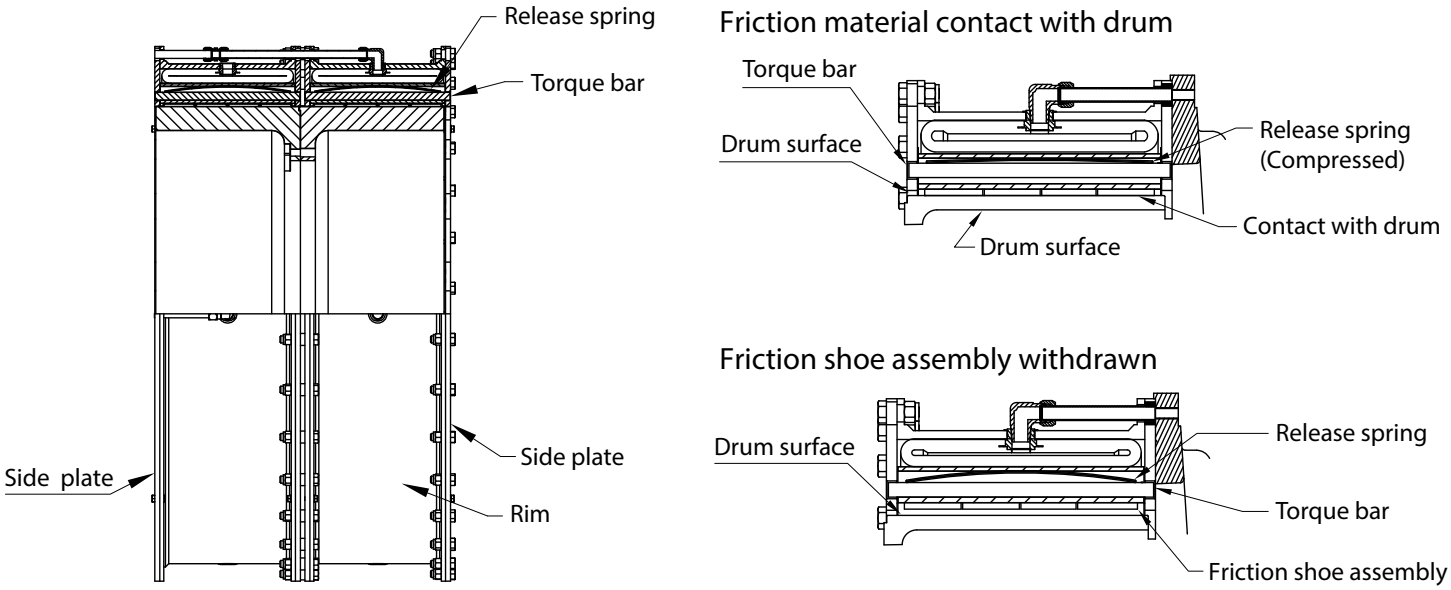


Figure 2

2.0 Installation

⚠ Warning

Only qualified personnel should install, adjust or repair these units. Faulty workmanship will result in exposure to hazardous conditions or personal injury.

⚠ Caution

Do not inflate the element without having a drum in place. Inflation of the element without a drum in place will result in permanent damage to the element components.

2.1 Mounting arrangements

2.1 Airflex HEVC grinding mill clutch applications are available in dual-wide mounting configuration. See Figure 3. The clutch configuration is determined by the motor horsepower and RPM, the allowable motor overload (percent rated horsepower) for mill starting, the inertia of the mill and the charge, and the physical space available for the clutch. All clutches can be supplied with our without an axial locking device.

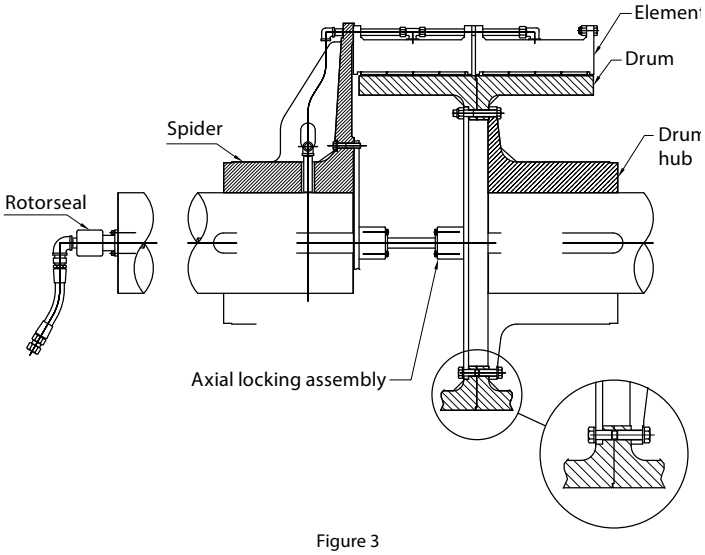


Figure 3

2.2 Mounting considerations

2.2.1 Shaft alignment must be within the tolerances indicated in the Alignment section of this manual.

⚠ Caution

Operation with shaft misalignment exceeding the limits indicated in this manual will result in accelerated wear of the HEVC components.

2.2.2 The element must be protected from contamination from oil, grease or excessive amounts of dust.

⚠ Caution

Oil or grease contamination will result in a reduction of developed torque. Excessive dust contamination may result in incomplete engagement. Either of these conditions will result in clutch slippage and overheating.

⚠ Caution

All rotating equipment must be guarded to comply with applicable safety standards .

2.2.3 All mounting fasteners must be of the proper size and grade, and torqued to the appropriate value. See Table 1.

⚠ Warning

Use only the proper grade and number of mounting fasteners. Using commercial grade fasteners (Grade 2) in place of Grade 8 fasteners (where called for) may result in failure under load, causing personal injury or equipment damage.

2.3 Mounting spider and drum hub

2.3.1 The spider and drum hub are bored for a press fit onto their respective shafts. The interference is approximately 0.0005 inch per inch (0.0005 mm/mm) of shaft diameter.

2.3.2 Ensure the shaft is clean and free of nicks or burrs and check the shaft and bore diameters for proper fit dimensions and are also clean and free of nicks and burrs. Tap the key into the keyway, making sure it bottoms, and apply a light coat of light weight oil to the shaft and key.

2.3.3 Heat the drum hub or spider uniformly to a maximum of 250°F (121°C) to expand the bores.

⚠ Caution

It is recommended the drum hub or spider be heated in oil or an oven; however, torches may be used. Use several with “rosebud” (broad-flame) tips and keep them moving to avoid "hot spots". Check bore temperature with a temperature reading device frequently to avoid overheating.

2.3.4 Slide the heated drum hub or spider onto the shaft. Hold in position and allow them to cool. It is helpful to put a mechanical stop device onto the component face to prevent “over-shooting” the proper axial location if there is no physical stop on the shaft such as a machined shoulder.

Table 2

Fastener Description and AssemblyTorque - ft.-lb. (Nm)

Description	Specification	DW28HEVC1000	DW51HEVC1600	DW60HEVC1600	DW66HEVC1600	DW76HEVC1600	DW76HEVC2000
ELEM/SPDR/RIM	Size	5/8-11NC-2	7/8-9NC-2	1-8NC-2	1 1/4-7NC-2	1 1/4-7NC-2	1 1/4-7NC-2
	Quantity	16	32	36	40	48	48
	Torque	170 (230) "L"	400 (542) "L"	500 (678) "L"	650 (881) "L"	650 (881) "L"	750 (1017) "L"
DRUM/HUB	Size	3/4-10NC-2	1-8NC-2	1 1/2-6NC-2	1 1/2-6NC-2	1 1/2-6NC-2	1 1/2-6NC-2
	Quantity	14	22	24	34	42	42
	Torque	280 (380) "L"	680 (922) "L"	1700 (2305) "L"	1500 (2034) "L"	1200 (1627) "L"	1500 (2034) "L"
SPDR to LCKG Assy.	Size	3/4-10NC-2	3/4-10NC-2	3/4-10NC-2	1 1/2-6NC-2	1 1/2-6NC-2	1 1/2-6NC-2
	Quantity	2	2	2	2	4	4
	Torque	130 (176) "LO"	130 (176) "LO"	130 (176) "LO"	325 (441) "LO"	325 (441) "LO"	325 (441) "LO"
HUB to LCKG Assy.	Size	3/4-10NC-2	1-8NC-2	1-8NC-2	1-8NC-2	1-8NC-2	1-8NC-2
	Quantity	2	2	2	2	2	2
	Torque	130 (176) "LO"	190 (258) "LO"	190 (258) "LO"	190 (258) "LO"	190 (258) "LO"	190 (258) "LO"

D : Dry
L : Lubricate with SAE 30OIL or Molybdenum disulphide grease.
LO : Assemble with loctite 242/243.

HEX Sizes (in.)

Size	Bolt	Nut	Size	Bolt	Nut	Size	Bolt	Nut
3/8NC	9/16	9/16	3/4NC	1-1/8	1-1/16	1-1/4NC	1-7/8	1-13/16
1/2NC	3/4	3/4	7/8NC	1-5/16	1-1/4	1-1/2NC	2-1/4	2-3/16
5/8NC	15/16	15/16	1NC	1-1/2	1-7/16			

2.4 Shaft alignment

Parallel Alignment Tolerance (Offset): Not to exceed 0.010 inch (0.254 mm) Total Indicator Reading (0.005 inch (0.127 mm) maximum off- set).

Angular Alignment Tolerance (Gap): Not to exceed 0.0005 inch per inch (0.0005 mm/ mm) diameter at which readings are taken ("D" on Figure 4).

Note: The alignment procedure described below has been used successfully on many HEVC grinding mill clutch applications. Other procedures, of course, may be used; however, the alignment tolerances are the same regardless of the technique used.

2.4.1 Foundations must be set so distance "X", shown on Figure 5 (or the appropriate drawing for non standard applications), is established. If the clutch is mounted on a shaft having plain bearings, make sure the shaft is centered within the bearings when establishing the "X" dimension. Refer to Table 3 for appropriate "X" dimensions.

Note: It is presumed that one of the shafts has been properly located and anchored. When setting and aligning the grinding mill drive components, always work from the pinion back to the motor.

Table 3
X Dimensions

Size	"X" In. (mm)
DW28HEVC1000	13.550 (344.17)
DW51HEVC1600	20.750 (527.05)
DW60HEVC1600	21.130 (536.70)
DW66HEVC1600	22.750 (577.85)
DW76HEVC1600	21.133 (536.78)
DW76HEVC2000	25.122 (638.09)

2.4.2 Fabricate a rigid bracket for supporting a dial indicator and attach to the spider. See Figure 4.

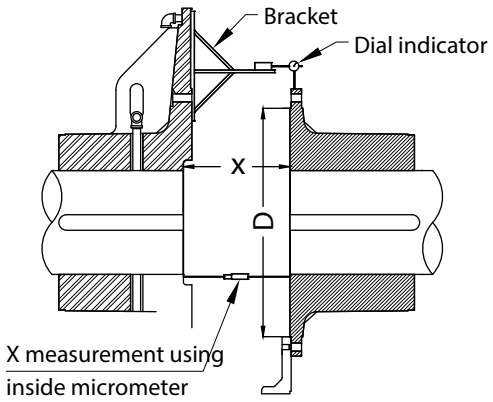
2.4.3 Thoroughly clean the flange O.D. and the face of the drum hub where alignment readings are to be taken.

2.4.4 Rotate the spider and take parallel alignment readings off the drum hub flange O.D. If both shafts can be rotated together, the alignment readings are less influenced by any surface irregularities.

Note: On reverse-mounted clutches where only one shaft can be rotated, the indicator is attached to the drum hub and readings are taken off of the spider O.D.

⚠ Caution

When recording parallel alignment readings, "sag" of the indicator/indicator bracket must be accounted for.



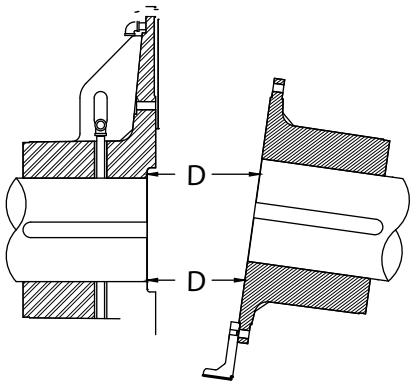


Figure 4

2.4.5 Angular alignment readings can be made by accurately measuring the gap between the spider and drum hub faces with an inside micrometer. If a dial indicator is used, make sure to monitor and correct for any axial movement of the shaft. To reduce the influence any surface irregularities may have on the angular alignment readings, index the spider 90 degrees after taking the initial set of readings. Take an additional set of readings and index the spider an other 90 degrees. Continue in this manner until four sets of readings have been taken For misalignment correction, use the average of the four readings at each position.

2.4.6 Shim and shift the base of the movable shaft to correct the misalignment. After tightening the base, recheck the alignment and correct if necessary. Make sure to check for a "soft foot" condition. Dowel or chock into position after satisfactory aligment has been achieved.

Note: On some applications, thermal growth of the mill or gear reducer (if present) may result in unacceptable shaft alignment in a running condition. It is always a good practice to make a "hot alignment" check and the shim if necessary.

2.5 Axial locking device adjustment

2.5.1 If the "X" dimension shown on Table 2 could not be achieved within +/- 0.250 inch (6.4mm), the axial locking device has a provision to accommodate this variation.

2.5.2 Position the motor shaft on its magnetic center and measure the gap between the faces of the drum hub and spider ("X" dimension on Table 2). The difference between this measured dimension and the value shown on Table 2 is the amount of correction to be made with adjustment of the axial locking device.

2.5.3 Referring to Figure 5, the overall length of the axial locking device can be adjusted by relocating spacers (11 / 17) from one side of a bearing to another.

2.5.3.1 Remove four hex head screws and lock washers (6,7) from the bearing housing (8) and adapter plate (1 or 9).

2.5.3.2 Remove the snap ring (2) from the bearing housing.

2.5.3.3 After ensuring the shaft (3) is clean and free of foreign matter, nicks or burrs in the area between the two bearing housings, slide the bearing housing assembly toward the opposite bearing housing assembly to expose the bearing/spacer assembly (10,11,17).

2.5.3.4 Remove the bearing locknut and lockwasher (13,14) from the shaft.

2.5.3.5 The assembled length of the axial locking device is established by the location of the bearings with respect to the shaft. The assembled length can therefore be adjusted by moving spacers from one side of the bearing to the other. Two thicknesses of spacers are included in each assembly 0.025 inch (0.6 mm) and 0.098 inch (2.5 mm). After making the appropriate assembled length adjustment, reassemble, making sure the thinner spacers are against the bearing.

2.5.3.6 Tighten the locknut sufficiently to take up all axial clearance in the bearing/spacer/snap ring assembly.

2.5.3.7 Slide the housing back over the bearing and install the snap ring.

2.5.3.8 Secure and tighten the bearing housing to the adapter plate using four hex head screws and lockwashers. Tighten the screws to 35 ft.-lbs. (47 Nm).

2.5.3.9 After completing assembly, lubricate both bearings with No. 2 EP grease.

2.6 Installation of element and drum (dual wide)

2.6.1 Separate the shafts as far as the bearing clearances will allow.

2.6.2 Attach the drum having the female register on the drum flange to the drum hub with short screws and lockwashers. There are tapped holes in the drum flange to accept the screws. Make sure the bore in the drum flange fully engages the pilot on the drum hub. See Figure 3.

2.6.3 Disassemble the dual element into two halves and, noting the orientation of the air connections, place the element onto the drum installed in 2.6.2.

2.6.4 Noting the orientation of the flange on the remaining drum with respect to tie air connections on the remaining element, slide the drum into the element.

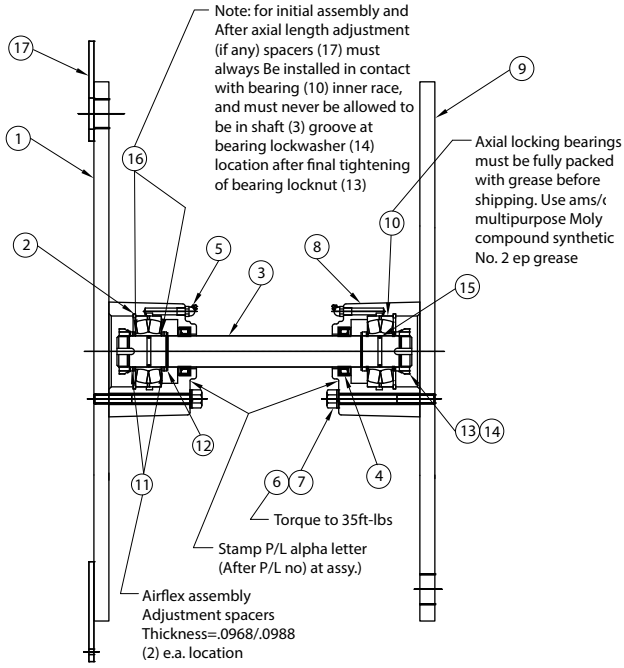


Figure 5

Item description axial locking assembly

Item	Description
1	Spider adapter plate
2	Internal snap ring
3	Shaft
4	Grease seal
5	Grease fitting
6	Hex head screw
7	Lockwasher
8	Bearing housing
9	Drum adapter plate

Item	Description
10	Bearing
11	Spacer
12	External snap ring
13	Bearing locknut
14	Bearing lockwahser
15	"O" Ring
16	Spacer
17	Spacer (Wired to spider adapter plate)

2.6.5 Attach the axial locking device (if required) to the flange of the remaining drum with the appropriate short screws and lockwashers. There are tapped holes in the drum to accept the screws.

2.6.6 Hoist the element/drum (axial locking device) into position, align the tapped holes in the drum having the male pilot with the tapped holes in the drum attached to the drum hub, and attach both drums to the drum hub with the appropriate fasteners. See Table 1. Make sure the male pilot fully engages the female register. If an axial locking device is used, take special care when hoisting the element between the shafts. The axial locking device mounting plate binds easily against the spider face.

2.6.7 Align the air connections and reassemble the element halves, making sure the spacers are in place between the elements. See Figure 7.

2.6.8 Reassemble the air connection tubes. If an elbow has been removed, use a good quality pipe sealant on the threads. See Figure 7.

Note: The elbow assemblies on the outboard element (farthest from the spider) use rubber compression sleeves. Make sure the sleeves are secure on the long air tubes.

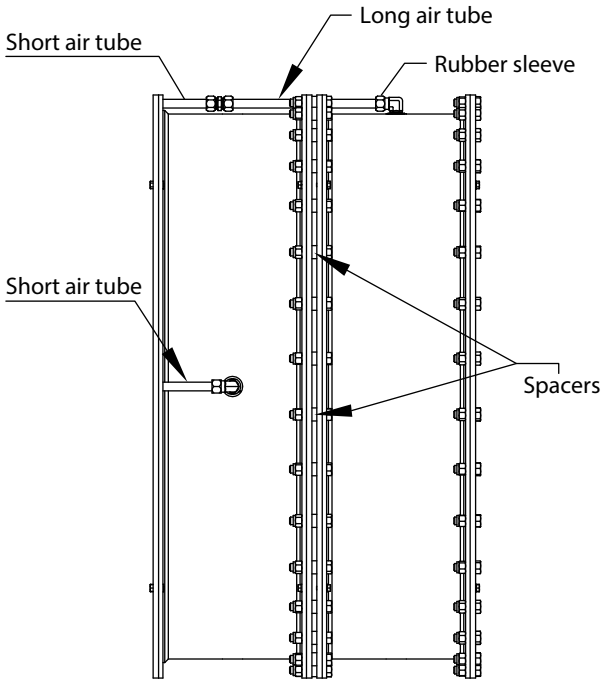


Figure 7

2.6.9 Install the air connection gaskets onto the air tubes. The metal backup washer is to be positioned toward the elbow (away from the spider). See Figure 6.

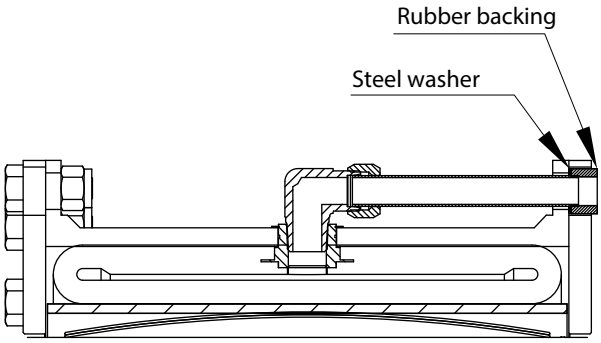


Figure 6

2.6.10 Align the element air connections with the corresponding passages in the spider and attach the element to the spider with the appropriate fasteners. See Table 1. Make sure the element fully engages the register in the spider.

2.6.11 Attach the axial locking device mounting plate (if required) to the spider with the appropriate screws and lockwashers. Rotate the motor shaft and push the spider toward the mill until the axial locking device mounting plate is flush against the spider face. Tighten the screws.

⚠ Caution

Do not attempt to pull the motor shaft back onto magnetic center by tightening the axial locking device mounting screws. To do so will damage the axial locking device.

2.7 Air control system

2.7.1 A typical air control system is shown on Figure 8. Since operating characteristics vary from one grinding mill to another, following are some general guidelines for installing the air controls.

2.7.1.1 The air receiver tank must be located as close to the clutch as possible (the tank should be located within 15 feet of the solenoid valve, and solenoid valve should be within five feet from the rotorseal) for consistent clutch response.

2.7.1.2 Use full size piping and valves consistent with the rotorseal size and keep the number of elbows to a minimum.

2.7.1.3 Use poppet-type solenoid valves. Spool valves are not recommended.

2.7.1.4 An air line lubricator is not required for the clutch element; however, if one is used, it must be a nonadjustable, mist-type.

2.7.1.5 Make sure the flow control valve is installed with free flow (indicated by an arrow on the valve body) away from the HEVC (free flow to exhaust).

2.7.1.6 The final connection to the rotorseal MUST be made with flexible hose and place no radial load upon the rotorseal. Also, if the rotorseal is mounted onto the end of a motor shaft, an insulating coupling must be installed between the piping and the rotorseal.

⚠ Caution

Do not use rigid pipe at the connection to the rotorseal. Rigid piping will result in excessive loads on the rotorseal bearings, shortening life.

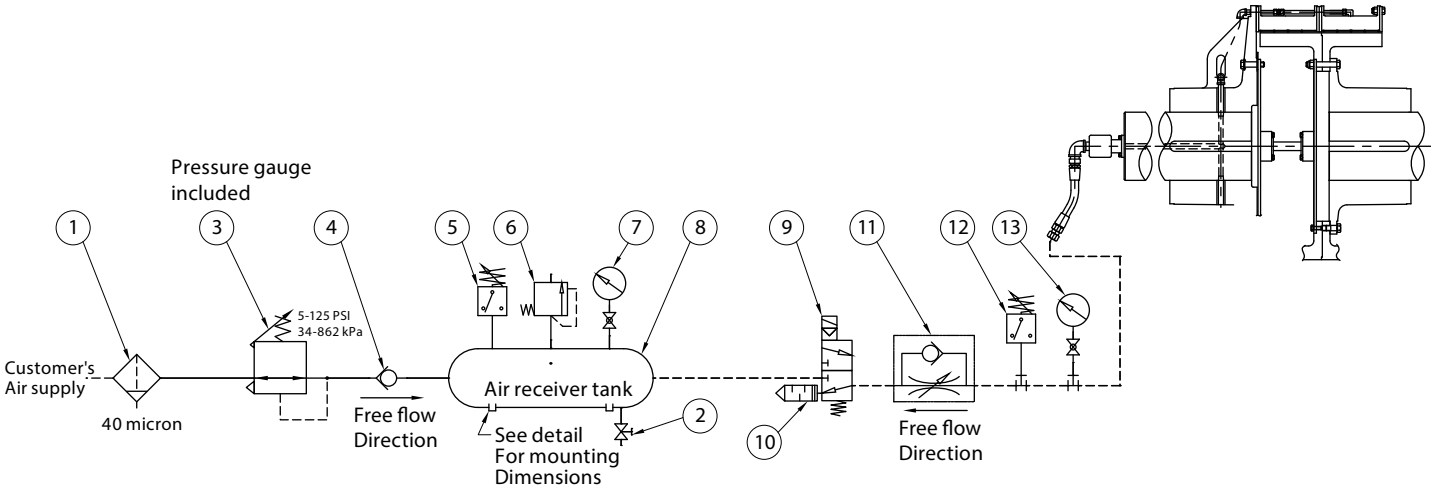


Figure 8

Dual wide Standard	Pipe size	Part number	Drawing number
28	1 1/4"	108705	LA-11705
51 to 66	1 1/2"	108708	LA-11708
76 (1600 & 2000)	2"	108709	LA-11709
Premium			
28	1 1/4"	108605	LA-11605
51 to 66	1 1/2"	108608	LA-11608
76 (1600 & 2000)	2"	108609	LA-11609

2.8 Electrical controls

2.8.1 Contact Danfoss Airflex engineering for electronic controls suitable for grinding mill applications. Standard controls provides run, inch and timed inch features only. Timed inch creates a delay between successive clutch engagements when spotting the mill to prevent clutch overheating and damage. Other control features, such as clutch slip detection, can be provided. These controls with the inclusion of an HMI, provide slip detection an clutch disengagement based on set parameters.

3.0 Operation

⚠ Warning

Exceeding the operating limits described in this section may result in personal injury or equipment damage.

3.1 Torque, RPM and pressure limits

3.1.1 The developed torque is directly proportional to the applied air pressure. If the developed torque seems inadequate, check for oil, grease or dust contamination.

⚠ Caution

Maximum applied air pressure is 120 psig (8.3 bar). Operation at pressures exceeding 120 psig may result in damage to the clutch element. Airflex grinding mill clutches typically require only 100 psig (6.8 bar) operating pressure.

⚠ Caution

The sintered friction material used in Airflex VC units may not develop rated torque initially, as a short “Wear-in” period is required. It is very important that the first few mill starts be monitored to prevent excessive heat generation from slippage.

3.1.2 Maximum safe operating speeds are shown on Table 4.

⚠ Danger

Do not exceed the operating speeds shown on Table 4. Operation at speeds greater than allowable will result in permanent damage to the clutch element, personal injury or death.

3.2 Control component adjustment

The following section gives "typical" component settings only. Since operating characteristics vary from one grinding mill to the next, absolute values cannot be given. The settings described below offer a good “starting point" to achieve satisfactory mill acceleration and motor overload - some ”fine tuning” will probably be required.

3.2.1 Set the pressure switch (5) located on the air receiver tank to open at 90 psig (6.1 bar) falling. Use normally open contacts and wire in series with the solenoid valve coil (9). This pressure switch is used to disengage the clutch if operating pressure falls below 90 psig (6.1 bar), or to prevent clutch engagement if operating pressure is below 90 psig (6.1) bar.

3.2.2 Set the pressure switch (12) located in the air supply line to the clutch to open at approximately 5 psig (0.3 bar). Use normally closed contacts and wire into the motor starter interlock circuit. The purpose of this pressure switch is to prevent starting the motor with the clutch engaged.

3.2.3 Set the pressure regulator (3) to 100 psig (6.8 bar). This is the nominal starting air pressure for the mill.

3.2.4 With the motor "off", manually trip the solenoid valve and note the time elapsed for the pressure gauge (7) to register full tank pressure.

3.2.5 Repeat the above procedure while adjusting the flow control valve (11) to supply a pressure rate of approximately 20 psig/sec. (1.4 bar/sec.). Due to the non-linearity of the pressure-time curve, it will be easier to use a reduced value to set the flow control valve. For example, if the tank pressure is 100 psig (6.8 bar), to obtain a flow rate of 20 psig/sec. (1.4 bar/sec.), time the pressure build up to 80 psig (5.4 bar) and adjust the flow control valve to deliver this pressure in 4 seconds, which, for all practical purposes, would equate to the desired 20 psig/sec. (1.4 bar/sec.).

Table 4
Maximum safe operating speeds

Size	Maximum RPM
DW28HEVC1000	1100
DW51HEVC1600	550
DW60HEVC1600	520
DW66HEVC1600	480
DW76HEVC1600	416
DW76HEVC2000	275

3.2.5.1 The flow rate is increased by turning the flow control valve adjusting screw clockwise or counterclockwise. Follow the manufacturers operation requirements. Contact Airflex engineering if needed.

3.2.6 Manually engage the clutch several times to verify the flow control valve setting. Also, confirm operation of the pressure switches at this time.

3.2.7 Check all other interlocks that affect the starting of the mill and remove any jumpers that may have been installed.

⚠ Caution

The flow rate described typically will result in a 4-7 second mill acceleration time (timed from the instant the clutch shoes make contact with the drum to the instant the clutch locks up); however, since operating characteristics vary from mill to mill, the mill acceleration at the above flow setting may be greater or less than the allowable 4-7 second range.

Note: For longer mill acceleration time beyond allowable 4-7 seconds range contact for Airflex engineering.

⚠

The sintered friction material used on Airflex HEVC clutches may not develop rated torque initially, as a short “wear-in” period is required. It is very important that the first few mill starts be monitored closely to prevent damage to the clutch components.

3.2.8 Start the motor and engage the clutch, noting the mill acceleration time. Abort the start if the clutch slips for more than seven seconds!

3.2.9 Disengage the clutch (if the start has not been aborted) and allow the drum(s) to cool to room temperature. Make the appropriate adjustment to the flow control valve if the mill acceleration fell outside of the 4-7 second range and retry. Repeat until the desired acceleration time has been achieved.

Note : If the motor overload is beyond allowable limits during the start (typically the result of too high operating pressure), reduce the operating pressure and increase the flow rate. If the motor is sized correctly for the mill load conditions, the overload on the motor is directly proportional to the applied air pressure - not the flow rate.

4.0 Maintenance

⚠ Warning

Only qualified personnel should maintain and repair these units. Faulty workmanship may result in personal injury or equipment damage.

⚠ Caution

When replacing clutch components, use only genuine, Airflex replacement parts. Use of replacement material which is not of Airflex origin will void all warranties.

4.1 Periodic inspection

4.1.1 The following items may be inspected without disassembly of the clutch.

4.1.1.1 Friction shoe assembly lining wear - Check the lining thickness and compare to the values shown on Table 5. If the linings have worn to minimum allowable thickness or less, they must be replaced as a complete set.

⚠ Caution

Operation with friction material worn to less than minimum allowable thickness will result in damage to the drum.

Table 5
Friction material thickness

Element size	Min. allowable lining thickness, inch (mm)	Original lining thickness, inch (mm)
DW28HEVC1000	.12 (3.05)	.28 (7.11)
DW51HEVC1600	.15 (3.68)	.34 (8.64)
DW60HEVC1600	.14 (3.68)	.34 (8.64)
DW66HEVC1600	.14 (3.68)	.34 (8.64)
DW76HEVC1600	.12 (3.05)	.34 (8.64)
DW76HEVC2000	.12 (3.05)	.34 (8.64)

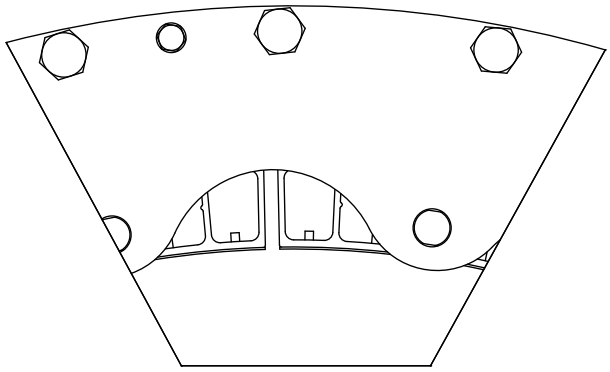


Figure 9

4.1.1.2 Contamination of shoes or drum - oil or grease contamination will reduce the developed torque of the clutch. Disassembly will be required to clean any oil or grease buildup. In extremely dusty environments, dust may accumulate in the backing plate cavities to the point where the friction shoes will not properly retract. Dust accumulations may be vacuumed out of the cavities.

⚠ Caution

Do not attempt to use a solvent to remove oil or grease without first removing the element. While squirting a solvent into an installed clutch may improve performance temporarily, a fire hazard exists from the heat generated during slippage.

⚠ Caution

Do not use compressed air to blow dust accumulations out of the backing plates. Although the friction material does not contain asbestos, the dust created as the friction material wears, along with the dust from the operating environment, may irritate the respiratory system.

4.1.1.3 Air control components - Check for proper adjustment of the air control components. Make sure the safety pressure switches are set correctly and are functioning properly. Repair any air leaks as discovered.

4.1.2 Partial or complete disassembly is required to inspect the following items:

4.1.2.1 Drum diameter wear - Check the O.D. of the drum and compare to the values shown on Table 6. Minor heat-checking may be removed by machining the drum O.D. If the drum has been subjected to excessive heat, the open end may flare out, giving the impression that the drum has not worn. It is therefore important to check the diameter at several locations across the face.

⚠ Caution

Operation of the clutch on a drum that is worn, or has been machined to less than minimum allowable diameter will result in damage to the element components.

4.1.2.2 Air actuating tube – Check that the tube has not been damaged by excessive heat. If any portion of the tube is hard or charred, the tube must be replaced. Check for any blisters, which would indicate ply separation. A tube in this condition must also be replaced.

⚠ Caution

When working with any friction material, regardless of material type, always wear approved safety equipment.

4.1.2.4 Uneven friction lining wear - Tapered wear across the friction surface typically indicates a worn drum and/or misalignment. If two or more adjacent shoes are worn on one end only, the air actuating tube has most likely developed a ply separation at that location.

4.1.2.5 Backing plate wear - Wear on the ends of the backing plates from bearing against the side plates is indicative of misalignment or thrusting. If wear is on one end only, and uniform for all backing plates, a worn drum may be causing the shoes to thrust as the element engages. If wear exists on both ends of all of the backing plates, excessive misalignment is probably the cause. Slight notching in the torque bar cavity is normal; however, if the notching occurs in a short amount of time, check shaft alignment. If both walls in the torque bar cavity are notched, there may be a significant vibration (torsional) problem.

4.1.2.6 Release springs and torque bars - Excessive wear at the ends of the torque bars where the release springs make contact indicates excessive parallel misalignment.

4.1.2.7 Side Plates - Any wear on the backing plates will also be reflected as elongation of the torque bar holes in the side plates.

Table 6
Drum wear limits

Element size	Max. allowable wear on drum diameter inch (mm)
28HEVC1000	0.19 (5)
51HEVC1600	0.25 (6)
60HEVC1600	0.25 (6)
66HEVC1600	0.25 (6)
76HEVC1600	0.25 (6)
76HEVC2000	0.25 (6)

Note: The number preceding the letters “HEVC” in the element size designates the original drum diameter in inches.

51HEVC1600 - Original drum diameter =

51.56 inches (1309 mm).

Minimum allowable drum diameter is:

51.56 inch (1309 mm) - 0.25 (6mm) =

51.31 inch (1303 mm).

4.1.2.8 Contamination of friction shoes – Mild oil or grease contamination may be removed with a solvent. Linings which have become saturated must be replaced. Also, linings that have been charred from excessive heat must be replaced.

⚠ Caution

When using any solvent, always follow the appropriate safety precautions.

4.1.2.9 Excessive dust accumulation - If dust becomes packed in the backing plate cavities, a pressurized enclosure should be considered. Excessive accumulations will prevent complete shoe retraction.

4.2 Removal of element assembly and drums (dual wide)

4.2.1 Match mark the element assemblies to each other and to the spider. Also, match mark the drums to each other and to the drum hub.

4.2.2 Disconnect the dual element from the spider and allow it to rest on the drums. Remove the air connection tubes.

4.2.3 Remove the fasteners and spacers attaching the element halves together.

4.2.4 Disconnect the axial locking device (if used) from the spider and separate the shafts as far as the bearings will allow.

4.2.5 Attach an overhead support to the spider-side element and apply enough tension to support the weight of the element half and one of the drums.

4.2.6 Remove the through bolts and nuts attaching the drums to the drum hub. Do not remove the Short screws and lockwashers which hold the female drum onto the drum hub. Carefully hoist the spider side element and drum out from between the shafts. If an axial locking device is used, take special care when hoisting the element/ drum from between the shafts, as the axial locking device mounting plate binds easily against the face of the spider.

4.2.7 Attach an overhead support to the remaining element and apply enough tension to support the weight of the element and drum.

4.2.8 Remove the short screws and lockwashers holding the drum onto the drum hub and carefully hoist the element and drum out from between the shafts.

⚠ Caution

Use extreme care when disconnecting the drums from the drum hub. Shear points exist at the mounting holes.

4.3 Removal of spider and drum hub

4.3.1 Removal may not be necessary. Removal may only be needed when access is needed to motor shaft, pinion shaft, or gearbox shaft.

4.3.2 Puller holes are provided for removal. It will require heating along with the puller. When heating, use torches with rosebud tips. Heat uniformly to prevent hot spots and do not exceed 275 degrees F.

4.4 Disassembly of the element

4.4.1 Lay the element flat on a clean work surface.

4.4.2 Remove one of the side plates and inspect the surface that the friction shoes contact for any unusual wear patterns, especially look at the end scallops on the side plates and check for excessive wear.

4.4.3 Remove the friction shoe assemblies, torque bars and release springs. If the torque bars and springs come out of the element with the friction shoe assemblies, carefully tap them out of the backing plate cavities. Note wear and replace as necessary.

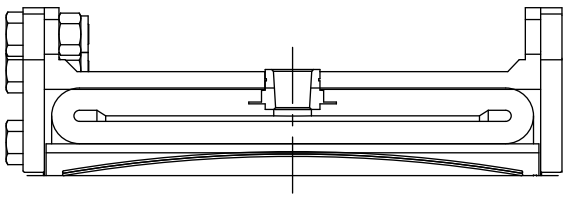
⚠ Caution

Whenever the element is removed and disassembled, it is always good practice to replace the release springs.

4.4.4 Remove the air connection elbows and spiral snap rings which secure the air actuating tube to the rim. Smaller size elements do not use snap rings. Carefully remove the air actuating tube from the rim and thoroughly inspect. Replace if necessary.

Note : The snap rings may no longer be required on certain size elements. Also, rims manufactured before 1984 were counterbored at the tube valve hole to accept the snap ring. Thi counterbore has been eliminated, and a second snap ring groov has been added to the tube valve. See Figure 10.

Snap ring and counterbore eliminated 28HEVC



Counterbore eliminated and second snap ring groove added 51HEVC, 60HEVC, 66HEVC

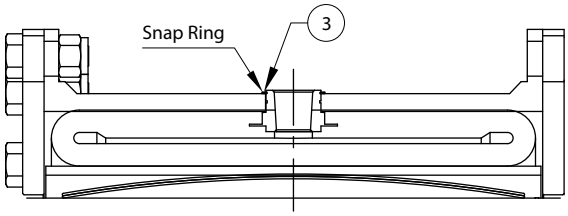


Figure 10

4.4.5 Remove the remaining side plate only if it is to be replaced.

4.5 Friction shoe assembly replacement

⚠ Caution
Use only genuine Airflex replacement parts. Use of replacement parts not of Airflex origin will void all warranties.

4.5.1 Make sure the torque bars and release springs have been removed from the backing plates.

4.5.2 HEVC clutches use rivets for mounting the friction segment to the baking plate. For removal of the friction segment, drill the rivets with a 15/64 inch (6 mm) drill and tap the rivet body out.

4.5.3 Attach the new lining to the backing plate with new drive pin rivets (See Figure 11). Work from the center of the friction segment out to the ends. The rivets are installed by driving the pin flush with the head.

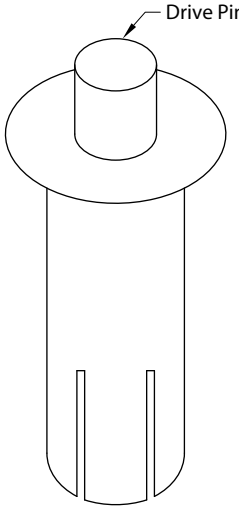


Figure 11

4.6 Assembly of the element

4.6.1 Make sure all of the components have been cleaned and any damaged or worn components have been repaired or replaced.

4.6.2 Assemble one of the side plates to the rim with cap screws and lockwashers. It is not necessary to install through bolts and locknuts at this time.

4.6.3 Lay the rim/side plate assembly on a clean, flat work surface, side plate down.

4.6.4 Carefully insert the air actuating tube into the rim. Push the valves on the tube through the corresponding holes in the rim and install the spiral snap rings (if applicable).

4.6.5 Place a torque bar in each mating hole in the side plate, slide a friction shoe assembly onto each torque bar and carefully tap a release spring (51HEVC1600, 60HEVC1600, 66HEVC1600 and 76HEVC1600 elements have two release springs in each cavity) into place. Make sure the spring is positioned on the side of the torque bar opposite the friction lining. Also, the spring must contact the torque bar at two points, not one. See Figure 10.

4.6.6 Lay the remaining side plate in position so the air connections and torque bar holes are properly aligned.

4.6.7 Carefully guide the torque bars into the corresponding holes in the side plate. It is often helpful to install four equally spaced screws and nuts through the rim and side plate to keep some tension on the side plate throughout this step.

4.6.8 Attach the side plate to the rim with cap screws and lockwashers, making sure all of the torque bars are seated in their side plate holes.

4.6.9 Note the orientation of the air connections and install the through bolts and locknuts where applicable.

4.6.10 Re-install the elbows using a good quality sealant on the pipe threads. Install the air connections on single narrow, dual narrow and single wide elements. Install only the short air connections (element closest to spider) on dual wide elements.

4.6.11 Re-install section per 2.0.

5.0 Spare parts storage

5.1 Element assemblies

5.1.1 Element assemblies must always be stored flat. Storage in the standing position may cause the rims to go out-of-round.

5.2 Drums

5.2.1 Drums must be stored open end down. Similar to element assemblies, storage of a drum in the standing position will adversely affect roundness.

5.3 Air actuating tubes

5.3.1 Air actuating tubes are shipped from Airflex plant folded to conserve shipping space. Upon receipt, remove the tube from its container and allow it to assume its natural shape. Store tube(s) in a cool, dry area, away from electrical equipment and ultraviolet light.

6.0 Ordering information/technical assistance

6.1 Equipment reference

6.1.1 If possible locate the Airex assembly drawing(s) and bill of material to insure the correct spare parts are used.

6.1.2 In any correspondence regarding Danfoss Airflex Equipment, refer to the information on the product nameplate LA-Drawing number, or bill of material and call or write.

The part lists on the following pages apply to standard grinding mill applications only.

High-torque applications and certain retrofit applications will have different component parts. Consult the factory if having difficulty identifying part numbers.

When repairing Airflex products, it is recommended to only use currently Danfoss Airflex genuine product and an authorized Danfoss Airflex repair and rebuild facility. A listing of these may be found at "www.danfoss.com"

7.1 Parts list of HEVC element assemblies (Dual wide element assemblies) figures 1.

Model		DW28HEVC1000		DW51HEVC1600		DW60HEVC1600		DW66HEVC1600		DW76HEVC1600		DW76HEVC2000	
Sub-assembly element part number		146591C		146592C		146593AL		146594P		146595P		146596P	
Item	Description	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.
1	Rim	405503-01	2	506674	2	510629	2	509548	2	515144	2	515377	2
2	Tube	403745	2	505580	2	511348	2	511350	2	515142	2	515375	2
3	Elbow assembly	000092X0007	4	000092X0010	4	000153X0791	4	000092X0010	4	000092X0010	4	000092X0010	4
4	Compression ring	000087X0014	4	000087X0020	4	000087X0020	4	000087X0020	4	000087X0020	4	000087X0020	4
5	Air connec tion tube	412178-05	4	412178-09	4	412178-18	4	412178-04	4	412178-04	4	412178-04	4
6	Air connec tion gasket	412324-03	4	412324-05	4	412324-06	4	412324-06	4	412324-06	4	412324-06	4
7	Friction shoe assembly	417513	20	515827	36	515828	40	515828	44	515829	50	515830	50
8	Air tube group (Dual mounted)	000074X0094	2	000074X0108	2	000074X0112	2	000074X0117	2	000074X0117	2	000074X0135	2
9	Spacer group (Dual mounted)	202776	16	202306	32	203390	36	-	-	-	-	-	-
10	Replacement friction lining	417512	16	515824	144	515825	160	515825	176	515826	200	515826	250
	& Rivets	000130X0081	480	000130X0081	1152	000130X0081	1280	000130X0081	1408	000130X0081	1600	000130X0081	2000
11	Side plate	412159	4	412165	4	412166	4	509527	4	515140	4	515384	4
12	Torque Bar	301831	20	308639	36	304214	40	304214	44	304214	50	308576	50
13	Release spring	301832	20	304215	72	304215	80	304215	88	304215	100	308577	50

7.2 Parts list of axial locking assembly

Model		DW28HEVC1000		DW51HEVC1600		DW60HEVC1600		DW66HEVC1600		DW76HEVC1600		DW76HEVC2000	
Axial locking assembly number		145839ES		145839ET		145839EU		145839EV		145839EW		145839EX	
Item	Description	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.	Part Number	Qty.
1	Spider adapter plate	414724-04	1.0	414724-02	1.0	414724-08	1.0	414724-10	1.0	414724-10	1.0	414724-10	1.0
2	Internal snap ring	000138X0028	2.0	000138X0028	2.0	000138X0028	2.0	000138X0028	2.0	000138X0028	2.0	000138X0028	2.0
3	Shaft	414726-07	1.0	414726-04	1.0	414726-13	1.0	414726-15	1.0	414726-15	1.0	414726-18	1.0
4	Grease seal	000113X0451	2.0	000113X0451	2.0	000113X0451	2.0	000113X0451	2.0	000113X0451	2.0	000113X0451	2.0
5	Grease fitting	000145X0003	2.0	000145X0003	2.0	000145X0003	2.0	000145X0003	2.0	000145X0003	2.0	000145X0003	2.0
6	Hex head screw	000001X0421	8.0	000001X0421	8.0	000001X0421	8.0	000001X0421	8.0	000001X0421	8.0	000001X0421	8.0
7	Lockwasher	000068X0014	8.0	000068X0014	8.0	000068X0014	8.0	000068X0014	8.0	000068X0014	8.0	000068X0014	8.0
8	Bearing housing	414256	2.0	414256	2.0	414256	2.0	414256	2.0	414256	2.0	414256	2.0
9	Drum adapter plate	414725-18	1.0	414725-19	1.0	414725-20	1.0	414725-21	1.0	414725-22	1.0	414725-22	1.0
10	Bearing	000136X0123	2.0	000136X0123	2.0	000136X0123	2.0	000136X0123	2.0	000136X0123	2.0	000136X0123	2.0
11	Spacer	000153X0874	8.0	000153X0874	8.0	000153X0874	8.0	000153X0874	8.0	000153X0874	8.0	000153X0874	8.0
12	External snap ring	000139X0037	2.0	000139X0037	2.0	000139X0037	2.0	000139X0037	2.0	000139X0037	2.0	000139X0037	2.0
13	Bearing locknut	000114X0007	2.0	000114X0007	2.0	000114X0007	2.0	000114X0007	2.0	000114X0007	2.0	000114X0007	2.0
14	Bearing lockwahser	000115X0007	2.0	000115X0007	2.0	000115X0007	2.0	000115X0007	2.0	000115X0007	2.0	000115X0007	2.0
15	"O" ring	000073X0051	2.0	000073X0051	2.0	000073X0051	2.0	000073X0051	2.0	000073X0051	2.0	000073X0051	2.0
17	Spacer	000153X0951	16.0	000153X0951	16.0	000153X0951	16.0	000153X0951	16.0	000153X0951	16.0	000153X0951	16.0
18	Spacer (Wire to spider adaptor plate)							306987	2.0	306987	2.0	306987	2.0

7.3 Drums for dual wide HEVC

Model	DW28HEVC1000	DW51HEVC1600	DW60HEVC1600	DW66HEVC1600	DW76HEVC1600	DW76HEVC2000
Description	Part Number	Part Number	Part Number	Part Number	Part Number	Part Number
Male	417509	515716	515719	515722	515725	515728
Female	417510	515717	515720	515723	515726	515729

7.4 Upgrade kit VC to HEVC

Model		DW28HEVC1000	DW51HEVC1600	DW60HEVC1600	DW66HEVC1600	DW76HEVC1600	DW76HEVC2000
Kit part number		108203F	108203A	108203B	108203C	108203D	108203E
Item	Description	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
1	HH SCR,GR8 (Drum to Hub)	14	22	24	34	42	42
2	HH SCR,GR2	2	2	2	2	2	2
3	Friction shoe assembly	20	36	40	44	50	50
4	DR ADPT PL for AX/LCKG A	1	1	1	1	1	1
5	Internal flange drum with male register	1	1	1	1	1	1
6	Internal flange drum with female register	1	1	1	1	1	1
7	I.O.M. manual	1	1	1	1	1	1
8	HHSCR, GR8 (SPDR to Elem)	16	32	36	40	48	48
9	Lock washer (Drum to Hub)	14	22	24	34	42	42
10	Lock washer (SPDR to Elem)	16	32	36	40	48	48
11	Torque Bar Kit	1	1	1	1	1	1
12	Release Spring Kit	1	1	1	1	1	1
13	Locknut (Drum to Hub)	14	22	24	34	42	42
14	Locknut (SPDR to Elem)	16	32	36	40	48	48

Note: VC to HEVC upgrade needs technical considerations like shaft gap adjustment, verifying shaft/hub stresses etc.
Contact Airflex engineering for upgrade.

7.5 Rebuild kit HEVC

Model		DW28HEVC1000	DW51HEVC1600	DW60HEVC1600	DW66HEVC1600	DW76HEVC1600	DW76HEVC2000
Kit part number		107479DF	107479DA	107479DB	107479DC	107479DD	107479DE
Item	Description	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
1	Friction shoe assembly	20	36	40	44	50	50
2	Torque bar	20	36	40	44	50	50
3	Release springs	20	72	80	88	100	50
4	I.O.M. manual	1	1	1	1	1	1

7.6 Friction segment and rivet kit

Model		DW28HEVC1000	DW51HEVC1600	DW60HEVC1600	DW66HEVC1600	DW76HEVC1600	DW76HEVC2000
Kit part number		146610AE	146610AL	146610AM	146610AN	146610AP	146610AQ
Item	Description	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
1	Friction segment	60	144	160	176	200	250
2	Rivet	480	1152	1280	1408	1600	2000

7.7 Friction Shoe Assembly (FSA) kit

Model		DW28HEVC1000	DW51HEVC1600	DW60HEVC1600	DW66HEVC1600	DW76HEVC1600	DW76HEVC2000
Kit part number		108233F	108233A	108233B	108233C	108233D	108233E
Item	Description	Quantity	Quantity	Quantity	Quantity	Quantity	Quantity
1	Friction shoe assembly	20	36	40	44	50	50

8.0 Revision

Original Publication Date : February 2016

Revision date	Change	Page
May 2017	Corrected Table 1 friction material width values and DW28HEVC drum diameter	5
	Updated Table 2 fastener assembly torque values	7
	Updated Table 3 "X" gap values for DW76HEVC1600 and DW76HEVC2000	8
	Updated maximum air pressure values to 120psi (8.3 bar) Section 3.1.1	12
	Updated Table 4 maximum rpm values for DW76HEVC1600 as 416rpm	12
	Added note to Section 3.2.7 about allowable mill accelaration time	13
	Removed wear indicating groove in Figure 9	13
	Removed note in Section 4.1.1.1 related to wear indicating groove	13
	Updated Table 5 friction material thickness values for DW51HEVC, DW60HEVC and DW66HEVC	13
	Updated Table 6 Max. allowable drum wear limits for all sizes and calculations below table.	14
	Updated Section 7.1 DW76HEVC2000 Rim (Item#1) part number to 515377.	18
	Updated Section 7.4 HEVC upgrade kit part numbers and item list. Added note to Section 7.4	20
	Updated Section 7.5 HEVC rebuild kit part numbers.	20
	Added Section 7.6 Friction segment and Rivet rit	20
	Added Section 7.7 Friction shoe assembly (FSA) kit	20

Notes

Notes

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