Driveline MULTIPLE DISC BRAKE

Service Instructions

TABLE 1

Model Number	*Lining Kit Number	Bearing Kit Number	O-ring Kit Number	Spring Kit Number	Red Springs Quantity	Yellow Springs Quantity	Rotor Stacking Arrangement
02-560-104	12-501-486	12-501-487	12-501-488	12-501-489	0	18	Figure 1
02-560-106	12-501-486	12-501-487	12-501-488	12-501-489	0	24	Figure 1
02-560-108	12-501-486	12-501-487	12-501-488	12-501-489	0	18	Figure 1
02-560-110	12-501-486	12-501-487	12-501-488	12-501-489	0	24	Figure 1
02-560-114	12-501-486	not available	not available	12-501-489	0	24	Figure 1
02-560-116	12-501-497	12-501-498	12-501-499	12-501-500	12	0	Figure 1a
02-560-118	12-501-486	12-501-487	12-501-488	12-501-489	0	24	Figure 1
02-560-124	12-501-497	12-501-521	12-501-522	12-501-500	12	0	Figure 1a

* See lining wear information, Figure 2 on page 3.

TABLE 2 (items included in kits)

Lining Kit	Bearing Kit	O-ring Kit	Spring Kit
Case Seal (26) Stator Discs (20) Rotor Discs (19)	Case Seal (26) Bearings (8 & 13) Shims (9 & 12) Oil Seals (3, 4, 29, & 30)	Case Seal (26) Back-up Rings (21 & 24) O-rings (22 & 25) Oil Seals (3, 4, 29, & 30)	Case Seal (26) Springs (17)

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NOTE

This literature services various models in this brake series. The components shown in Figures 1 and 2 may appear different than what is found in your brake.

DISASSEMBLY

(Refer to Figures 1 and 2)

1. Remove plugs (33 & 35) and drain fluid from brake assembly.
2. Remove retainers (1 & 32) and retaining rings (2 & 31) from shaft (11). **NOTE: Not all models use retainers (1 & 32) or retaining rings (2 & 31).**
3. Position brake assembly so pressure plate (27) is facing up. A suitable holding fixture is useful to keep brake in position. Remove six cap screws (28) and carefully separate pressure plate (27) from cover plate (5).

⚠ CAUTION

Pressure plate (27) is under spring tension of approximately 3175 kgf (7000 lb). The six cap screws should be loosened evenly to relieve this force. If a hydraulic press is available, 3629 kgf (8000 lb) maximum, the pressure plate can be held in position while removing the cap screws.

4. Separate shaft assembly (14) from cover plate (5) and pressure plate (27). Inspect case bearings (8 & 13) and bearing cups (7 & 15) for damage and replace as necessary. Cone bearings (8 & 13) and outer spline (10) need not be removed from shaft (10) unless bearing kit is being installed. See instructions below. Bearing cups (7 & 15) need not be removed from pressure plate (27) or cover plate (5) unless bearing kit is being installed.
5. Remove case seal (26) from cover plate (5).
6. Remove stack assembly, consisting of stator discs (20), rotor discs (19), and return plate (18) from cover plate (5).
7. Remove dowel pins (6) from cover plate (5).
8. Remove springs (17) and spring guide (16) from cover plate (5). **NOTE: Record the spring pattern for reassembly purposes.**
9. Remove piston (23) from pressure plate (27).
10. Remove o-rings (22 & 25) and back-up rings (21 & 24) from piston (23). **NOTE: Be careful not to scratch or damage piston.**
11. Oil seals (3, 4, 29, & 30) only need removal for installation of o-ring kit and bearing kit. Disregard this step if o-ring kit or bearing kit is not being installed. Carefully press out oil seals (3 & 4) from cover plate (5). Carefully press out oil seals (29 & 30) from pressure plate (27).
12. Steps 13 through 17 are for installation of bearing kit. Disregard these steps if bearing kit is not being installed.
13. Place shaft assembly (14) on an arbor or hydraulic press with a slot or hole in the base to firmly support outer spline (10).
14. Press on the end of shaft (11) to force bearing (8) and shim(s) (9) from shaft (11). While holding bearing (8) and shim(s) (9) together, use a micro-meter and measure the combined thickness. Record this measurement for reassembly purposes.
15. Turn shaft (11) over and repeat step 14 to remove bearing (13) and shim(s) (12). Outer spline (10) need not be removed from shaft (11). While holding bearing (13) and shim(s) (12) together, use a micrometer and measure the combined thickness. Record this measurement for reassembly purposes.
16. Carefully remove bearing cup (7) from cover plate (5) by gently tapping on the bearing cup (7). A press may also aid in the removal of bearing cup (7). **NOTE: Be careful not to damage cover plate (5).**
17. Repeat step 16 to remove bearing cup (15) from pressure plate (27).

ASSEMBLY

(Refer to Figures 1 and 2)

LUBRICATE ALL RUBBER COMPONENTS FROM REPAIR KITS WITH CLEAN TYPE FLUID USED IN THE SYSTEM. IF BEARING (4) AND OIL SEAL (5) ARE NOT BEING REPLACED DISREGARD STEPS 2 THROUGH 4.

1. Clean all parts thoroughly before assembling.
2. Steps 2 through 6 are for installation of bearing kit. Disregard these steps if bearing kit is not being installed. To prevent damage to new bearings (8 & 13) during assembly, a fabricated bearing installation tool as shown on page 4, Figure 3, will be necessary.
3. Using a micrometer measure the thickness of new bearing (8). Use existing and new shim(s) (9) to achieve the thickness recorded during disassembly. Install shim(s) (9) and new bearing (8) on shaft (11). Using an arbor or hydraulic press and bearing installation tool, see page 4, press new bearing (8) and shim(s) (9) onto shaft (11).
4. Turn shaft (11) over and repeat step 3 to install new bearing (13) and shim(s) (12).
5. Carefully install new bearing cup (7) in cover plate (5). Be sure bearing cup (7) is fully seated in cover plate (5).
6. Carefully install new bearing cup (15) in pressure plate (27). Be sure bearing cup (15) is fully seated in pressure plate (27).
7. Install plug (33) in cover plate (5) and torque 20.3-27.1 N·m (15-20 lb·ft).
8. Install back-up rings (21 & 24) and o-rings (22 & 25) on piston (23). Back-up rings are on the spring side of piston (23). Be sure o-rings are flat and all twists are removed. **NOTE: Be careful not to scratch or damage piston (23).**
9. Lubricate piston (23) with clean type fluid used in the system. Carefully press piston (23) into pressure plate (27).
10. Position cover plate (5) so it faces upward and reinstall shaft assembly (14) in cover plate (5).
11. Install dowel pins (6), spring guide (16), and springs (17) in cover plate (5). Be sure to install springs (17) according to pattern recorded during disassembly. Contact ZF Off-Highway Solutions Minnesota Inc. if you have questions regarding spring pattern.
12. Install return plate (18), rotor discs (19), and stator discs (20) over dowel pins (6) and outer spline (10). See TABLE 1 for reference to rotor stacking arrangement.
13. Install new case seal (26) on cover plate (5).
14. Assemble pressure plate (27) to cover plate (5) using six cap screws (28). Torque cap screws (28) 115.3-122.0 N·m (85-90 lb·ft).

NOTE

If available, a hydraulic press can be used to clamp pressure plate while installing and tightening cap screws.

15. Step 15 is for installation of o-ring kit or bearing kit. Disregard this step if o-ring kit or bearing kit is not being installed. Press new oil seal (4) over shaft (11) and into cover plate (5) until it contacts step in cover plate. Note direction of oil seal (4). Press new oil seal (3) over shaft (11) and into cover plate (5) until it is flush with outer surface of cover plate. Note direction of oil seal (3). Press new oil seal (29) over shaft (11) and into pressure plate (27) until it contacts step in pressure plate. Note direction of oil seal (29). Press new oil seal (30) over shaft (11) and into pressure plate (27) to the dimension, 2.54 mm (0.10 inch), shown in Figure 2. Note direction of oil seal (30).
16. Install retaining rings (2 & 31) and retainers (1 & 32) on shaft (11). **NOTE: Not all models use retainers (1 & 32) or retaining rings (2 & 31).**
17. Add proper oil and volume to brake through fill/oil level port. Install plug (35) and torque 47.5-54.2 N·m (35-40 lb·ft).
18. Firmly secure the brake in a vise with shaft (11) in a horizontal position. Pressurize the brake to release. Rotate and move shaft (11) axially several times. Mount a dial indicator with the probe against one end of the shaft. Move shaft (11) back and forth axially by pushing by hand or using a soft hammer. The dial indicator reading should be 0.003-0.010 inch. If excess end play is indicated, disassemble the brake and adjust shim(s) (9 & 12) thickness as necessary. Example: If excess play of 0.010 inch is indicated, install one 0.005 inch thick shim (9) under bearing (8) and one 0.005 inch thick shim (12) under bearing (13). If 0.005 inch excess play is indicated, install one 0.005 inch shim.

See TABLE 2 for items included in kits.
* Not used in all models

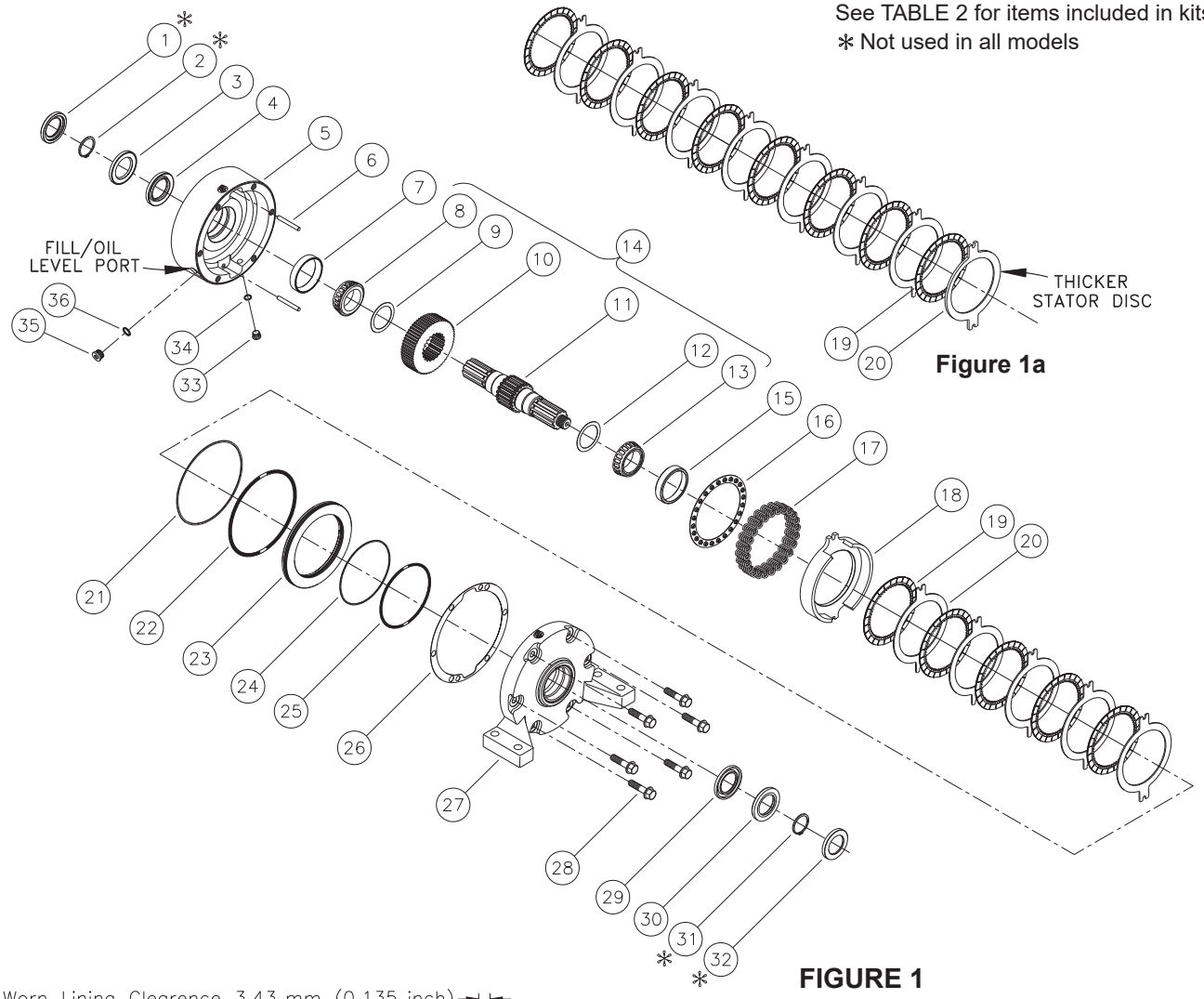


Figure 1a

FIGURE 1

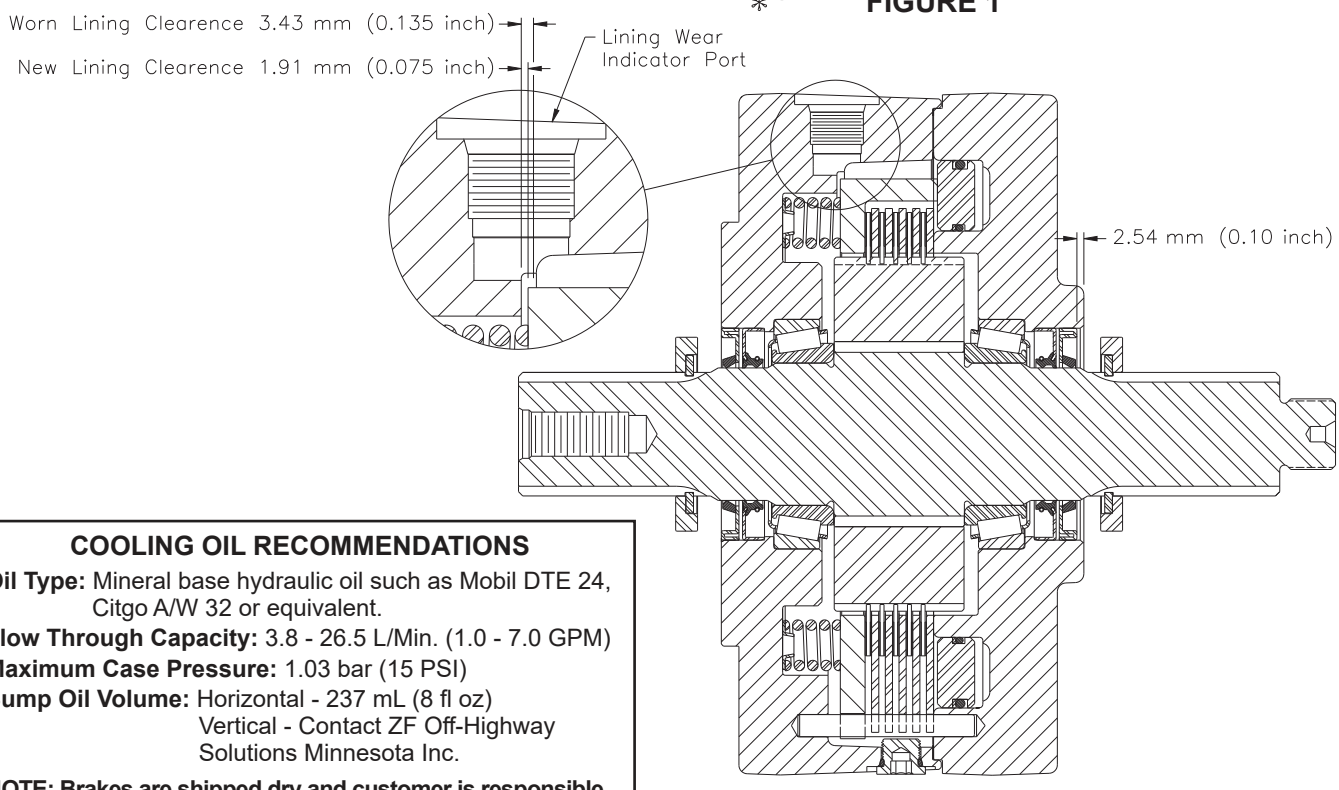


FIGURE 2

COOLING OIL RECOMMENDATIONS

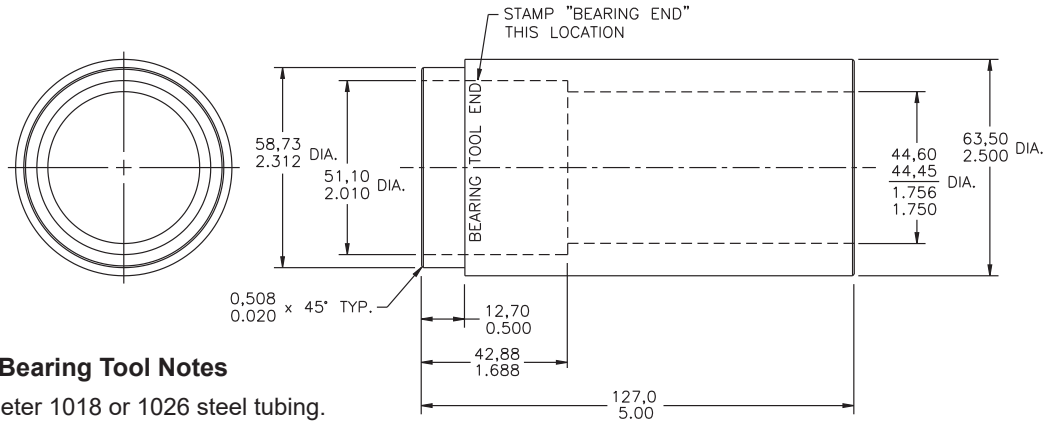
Oil Type: Mineral base hydraulic oil such as Mobil DTE 24, Citgo A/W 32 or equivalent.

Flow Through Capacity: 3.8 - 26.5 L/Min. (1.0 - 7.0 GPM)

Maximum Case Pressure: 1.03 bar (15 PSI)

Sump Oil Volume: Horizontal - 237 mL (8 fl oz)
Vertical - Contact ZF Off-Highway Solutions Minnesota Inc.

NOTE: Brakes are shipped dry and customer is responsible for adding proper type and volume of cooling oil.



Bearing Tool Notes

1. Material: 2 1/2 in diameter 1018 or 1026 steel tubing.
2. Tolerances: ± $\frac{0,127}{0.005}$ unless noted.
3. Optional Heat Treat: $\frac{0,762}{0.030}$ deep, quench and temper to Rc 58/62.

FIGURE 3

BLEEDING

1. Install brake in system and connect pressure lines.
2. Bleed pressure release section of brake by pressurizing side inlet port and allowing air to escape from top port. Pressure should not exceed 6.89 bar (100 PSI) during bleeding.
3. Apply sufficient pressure to release brake and check for proper operation in system.

SERVICE DIAGNOSIS

PROBLEM	CAUSE	EXPLANATION	ACTION
Brake slips	A. Excessive pressure in hydraulic system	If there is back pressure in the actuation line of the brake, holding torque will be reduced.	Check filters, hose size, restrictions in other hydraulic components.
	B. Disc plates worn	The thickness of the disc stack sets the torque level. A thin stack reduces torque.	Check disc thickness and contact ZF Off-Highway Solutions Minnesota Inc.
	C. Springs have broken or have taken a permanent set	Broken or set springs can cause reduced torque, a rare occurrence.	Check release pressure and contact ZF Off-Highway Solutions Minnesota Inc. May need servicing with new spring kit.
Brake drags or runs hot	A. Low actuation pressure	The brake should be pressurized to a minimum of 1.38 bar (20 PSI) over the full release pressure under normal operating conditions. Lower pressures will cause the brake to drag thus generating heat.	Attach a pressure gauge to the bleed port and check pressure with system on.
	B. Bearing failure	If bearing should fail, a large amount of drag can be generated.	Replace the bearing. Refer to kits on page 1.
Brake will not release	A. Stuck or clogged valve	Brakes are designed to come on when system pressure drops below stated release pressure. If pressure cannot get to the brake, the brake will not release.	Attach a pressure gauge to the bleed port. Check for adequate pressure. Replace defective line or component.
	B. Bad o-rings	If release piston will not hold pressure, the brake will not release.	Replace o-rings. Refer to kits on page 1.
	C. Discs frozen	These brakes are designed for only limited dynamic braking. A severe emergency stop or prolonged reduced release pressure operation may result in this type of damage.	Replace disc stack. Refer to kits on page 1.