Temporary Maintenance Instruction
TMI109-540 Rev.A

Main Rotor Duplex 109-0110-35
Inspection and installation procedure

A109A / A109AII / A109C / A109K2 /
A109K2 10001 / A109E / A109LOH
A109LUH / A109LUHSAAF / A109LUHAG
A109LUHAP / A109LUHNZ / A109S
AW109SP / AW109SP-REGA / A109S
with Trekker kit / A119 / A119MKII
Helicopters

The technical content of this document is approved under the authority of DOA nr. EASA.21J.005.

The present TMI will be evaluated for its introduction in the standard set of Technical Publication.
If no further notice is received, the present document expires on: November 2nd, 2024.

2023-11-02

Introduction

This TMI aims to detail the existing inspection and improve the installation procedure of duplex bearing ball P/N 109-0110-35 inside the swashplate of A109/A119 series, within the manual MM/AMP procedures.

This TMI is composed by the annexes that follow:

- Annex 1 – Inspection of duplex bearing ball P/N 109-0110-35
- Annex 2 – Installation of duplex bearing ball P/N 109-0110-35

The content of this TMI will be endorsed within the applicable Maintenance Manuals at the earliest opportunity.

Annex 1

Inspection of duplex bearing ball

Table of contents

List of tables

List of figures

References

Table 1 References

Data Module/Section	Title
09-A-00-50-00-00A-013A-D	Material data information publication – Numeric index
0B-A-62-32-00-00A-530A-B	Swashplate assembly – Disassemble procedure.
0B-A-62-32-00-00A-710A-B	Swashplate assembly – Assemble procedure
0B-A-62-32-00-00A-283A-A	Swashplate assembly – Duplex bearing - Special regular inspection

Preliminary requirements

Required conditions

Table 2 Required conditions

Condition	Data Module/Section
The helicopter must be safe for maintenance	0B-A-00-20-00-00A-120A-A

Support equipment

Table 3 Support equipment

Nomenclature	Identification No.	Qty
None		

Supplies

Table 4 Supplies

Nomenclature	Identification No.	Qty
Abrasive pads	C015	AR
Cleaning solvent	C287	AR

Spares

Table 5 Spares

Nomenclature	Identification No.	Qty
Slider bearing	109-0110-81-1	2 EA
Pivot sleeve	109-0110-07-3	1 EA
Pivot sleeve	109-0110-04-1	1 EA
Duplex bearing	109-0110-35-3	1 EA

Safety conditions

None

Procedure

1. Perform the special inspection of the duplex bearing. Refer to 0B-A-62-32-00-00A-283A-A
2. The swashplate assembly must be disassembled. Refer to 0B-A-62-32-00-00A-530A-B
3. Examine the two slider bearings (1, Fig 1) for:
   - 3.1. General condition and worn areas of Teflon layer in the area "A".
   - 3.2. Replace the Slider bearing (109-0110-81-1) if you find a dangerous worn areas or eroded Teflon.
4. Examine the pivot sleeve (2, Fig 2) for:
   - 4.1. Crumbing of anodized layer and out-of-round condition in the ball external surface, area "B". Remove light scratches from the pivot sleeve (2) using Abrasive pads (C015).
   - 4.2. Replace the Pivot sleeve (109-0110-07-3) or Pivot sleeve (109-0110-04-1) if you find:

- Presence of crumbing and shiny areas from which the anodized layer has been fully removed
- Out-of-round condition of 0.025 mm (0.001 in)
- Presence of scoring on the pivot sleeve ball.

4.3. Scratches, scoring, wear in the area "C" where rings turn.

4.4. Spalling in the area "D". Be careful to the slot ends. A local removal of anodized layer in this area is permitted and does not require the pivot sleeve replacement.

5. Examine the duplex bearing (3, Fig 1) for smoothness, brinelling, chipping, spalling and overheating. Perform this operation as follows:

5.1. Clean the duplex bearing ball with Cleaning solvent (C287).

Note

The removal of the grease is functional to have a better visual inspection and to have a roughness check more sensible.

5.2. During the clean perform a visual check. In case of any contamination, duplex bearing is a scrap.

5.3. Perform a visual inspection for the external surface (inner and outer races) and the sealings to detect any corrosion, scratch, deformation with a light source and 10x magnifier (Fig 3).

6. Examine the bearing balls and races for flaking and other damage. Fretting in the area (E, Fig 2). Perform this operation as follows:

6.1. Perform a visual inspection with 10x magnifier and a light source to examine each bearing ball and inner and outer races (Fig 4). It should be performed rotating slightly the races with respect to the balls, to see any traces of damages both in the spheres and in the races.

6.2. Turn the duplex bearing ball pressing with your hand on the inner diameter of the duplex bearing ball put in vertical and slightly slanting position in order to evaluate any roughness during rotation. Perform the inspection two or three times for each rotation verse.

Note

Make sure to press the ring in the direction of correct balls work (blue resultant arrow). This can be done combining two forces (horizontal and vertical) as shown in figure 5

7. Replace the Duplex bearing (109-0110-35-3) even if you find only one of the these damages.

Requirements after job completion

1. Assemble the swashplate assembly. Refer to 0B-A-62-32-00-00A-710A-B.

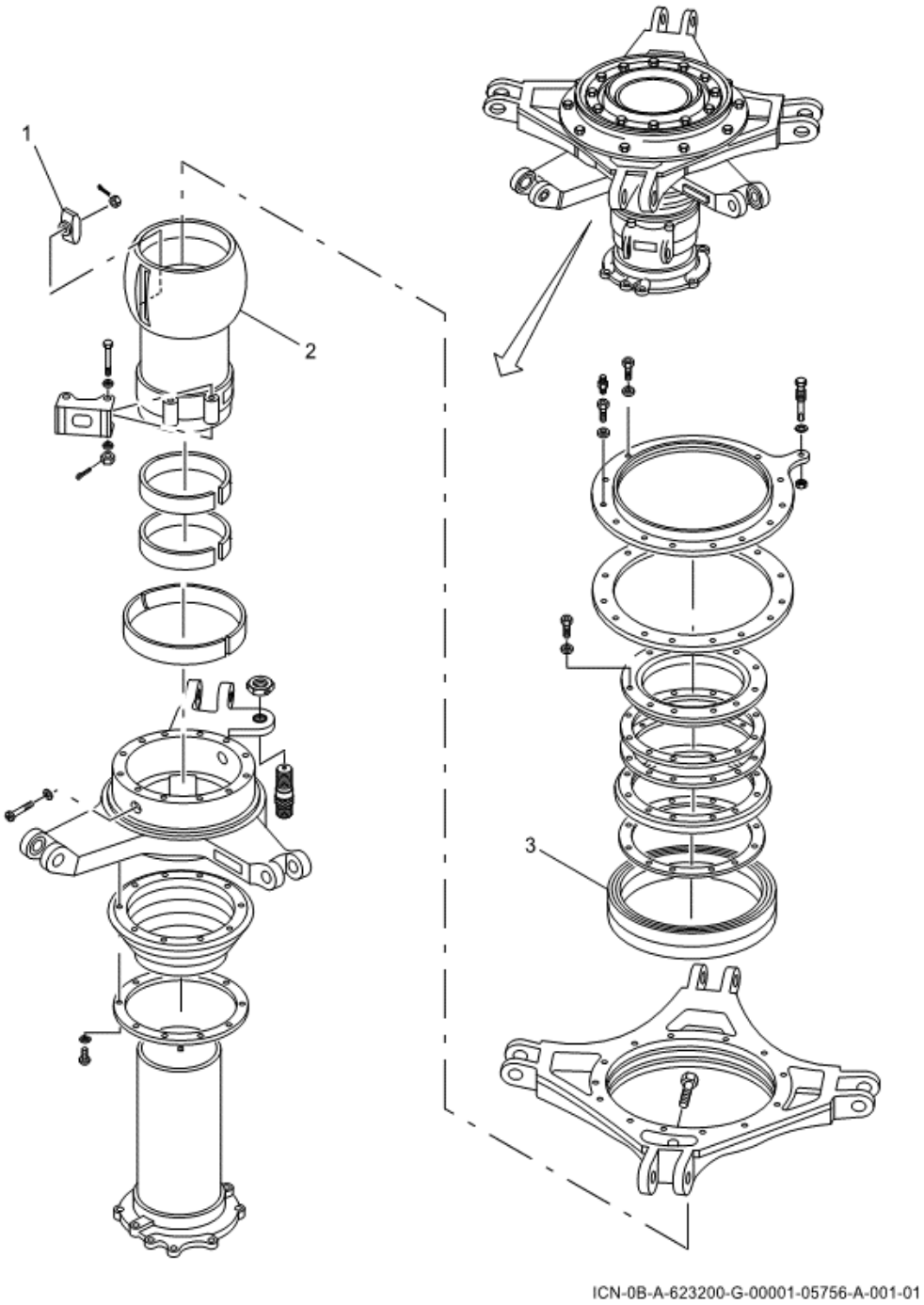

Figure 1 *– Swashplate assembly - Special regular inspection*

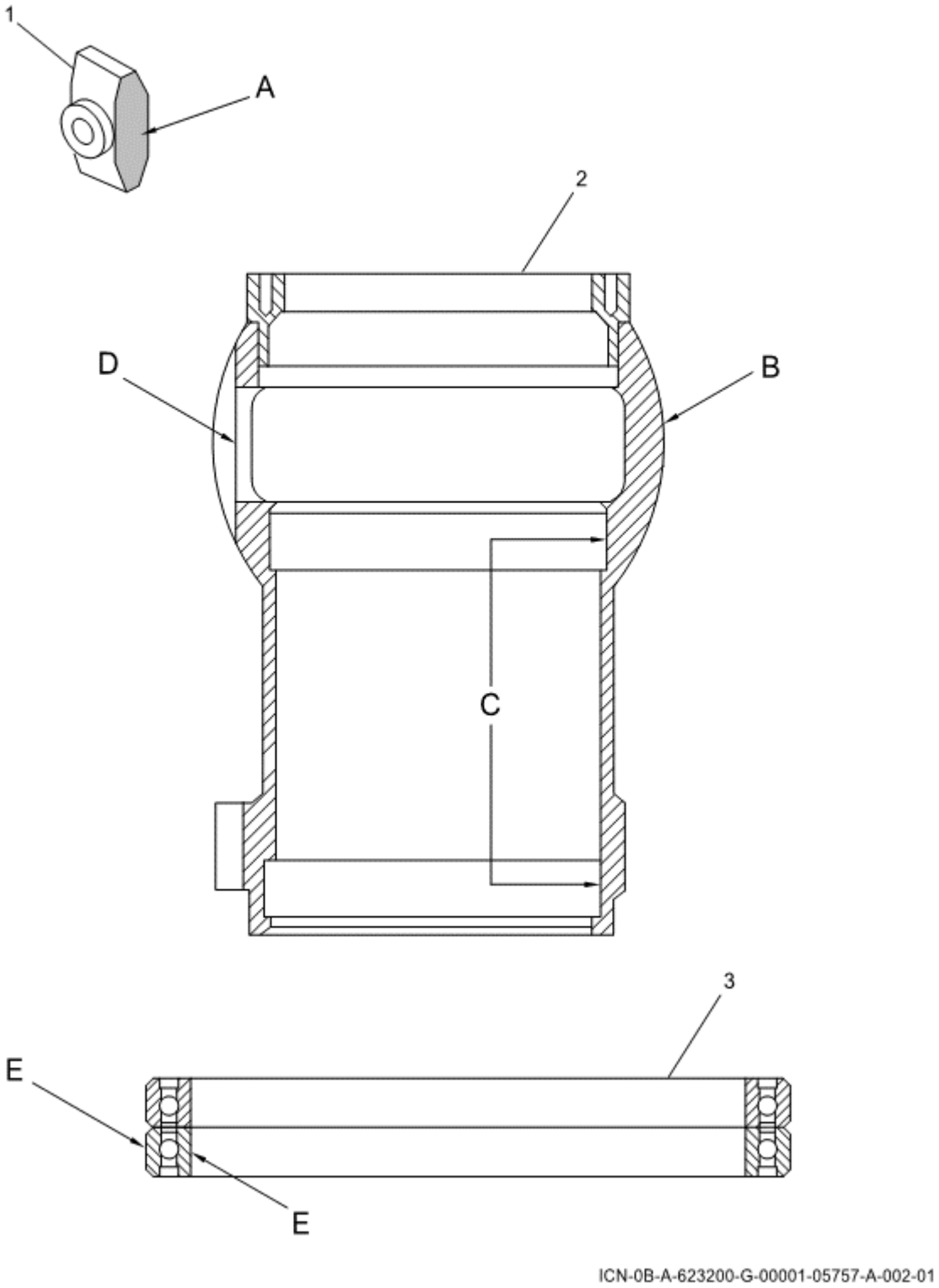

Figure 2 *– Swashplate assy, duplex bearing ball, special regular inspection*

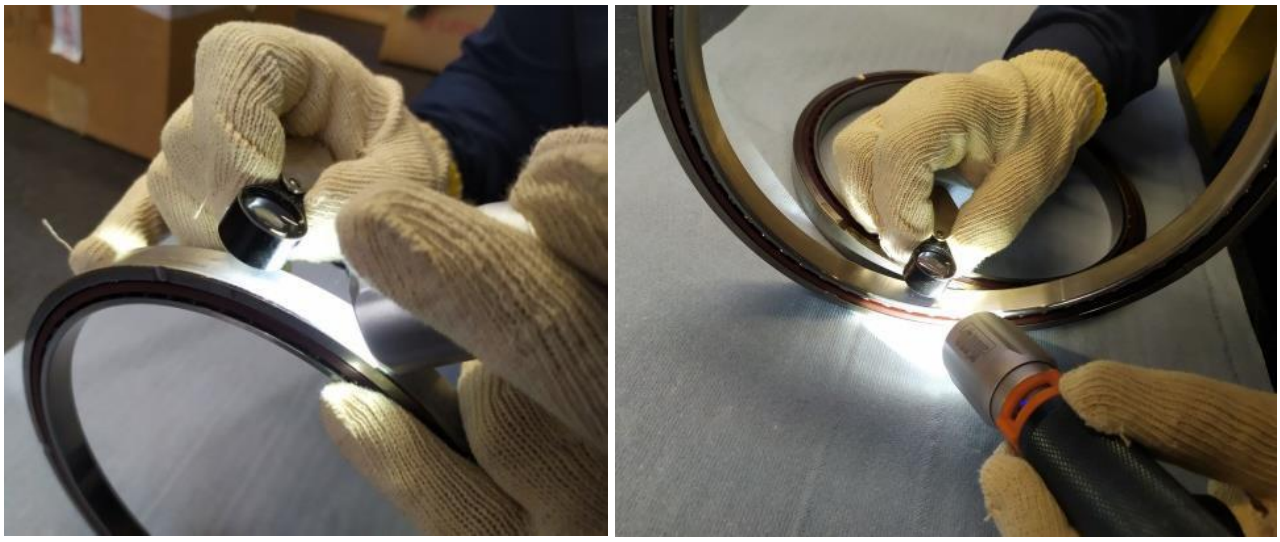

Figure 3 *- Outer (to the left) and Inner ring (to the right) inspection of duplex bearing ball.*

Figure 4 *– To the left, detail of the duplex bearing ball; to the right, inspection of inner and outer races.*

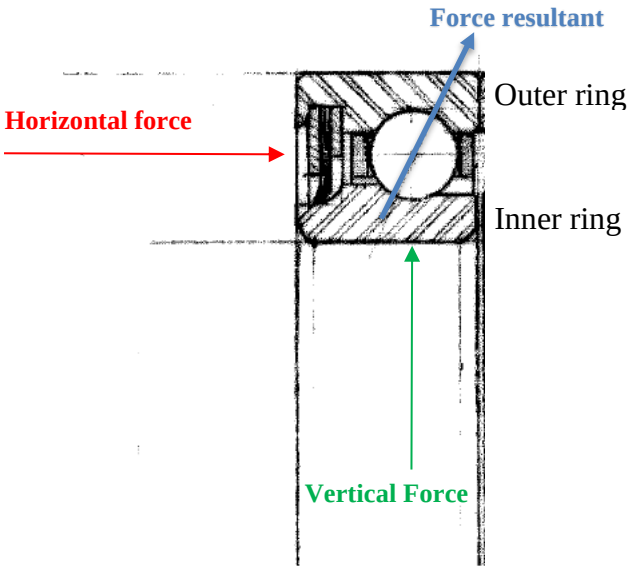

Figure 5 *- Detail of half duplex bearing ball and forces to apply*.

Annex 2

Installation of duplex bearing ball

Table of contents

List of tables

List of figures

References

Table 1 References

Data Module/Section	Title
09-A-00-50-00-00A-013A-D	Material data information publication – Numeric index
0B-A-00-60-00-00A-010A-A	Critical parts – General data
0B-A-12-20-14-00A-242A-A	Swashplate duplex bearing – Grease
0B-A-62-32-00-00A-720A-A	Swashplate assembly – Install procedure
0B-A-GF-14-00-00A-066A-A	Ring, swashplate duplex bearing installation (GF-14-00) – Support equipment and tools data
0B-A-GF-93-00-00A-066A-A	Fixture, swashplate support (GF-93-00) – Support equipment and tools data

Preliminary requirements

Required conditions

Table 2 Required conditions

Required condition	Data Module/Section
None	

Support equipment

Table 3 Support equipment

Nomenclature	Identification No.	Qty
Fixture, swashplate support	GF-93-00	1 EA
Ring, swashplate duplex bearing installation	GF-14-00	1 EA
Feeler gauge	Local supply	1 EA
Spring scale	Local supply	1 EA
Positioning tool	109G6220G03-101	1 EA
Oven	Local supply	1 EA
Brush	Local supply	1 EA
Gauge	Local supply	1 EA

Supplies

Table 4 Supplies

Nomenclature	Identification No.	Qty
Safety wire	C013	AR
Safety wire	C014	AR
Sealing compound	C036	AR
Grease	C009	AR
Sealing compound	C501	AR
Corrosion inhibiting compound	C505	AR
Corrosion preventive compound	C509	AR
Corrosion inhibiting compound	C587	AR

Spares

Table 5 Spares

Nomenclature	Identification No.	Qty
Cotter pin	MS24665-153	2 EA
Cotter pin	MS24665-155	2 EA
Cotter pin	MS24665-151	2 EA
Cotter pin	MS24665-1013	2 EA
O-ring	MS29561-010	2 EA
O-ring	M83248/1-010	2 EA
Shim	A864A0833E016M	1 EA
Shim	109G6230A01-107	1 EA
Shim	109-0134-12-101	1 EA
Shim	109G6230A01-105	1 EA
Shim	109-0110-34-105	2 EA
Shim	109G6230A01-103	2 EA
Shim	109-0110-34-1	1 EA
Shim	109G6230A01-101	1 EA
Washer	NAS1149C0432R	2 EA
Washer	NAS1149C0463R	2 EA

Safety conditions

WARNINGS

- **The materials that follow are dangerous. Before you do this procedure, make sure that you know all the safety precautions and first aid instructions for these materials:**

- Grease (C009)
- Sealing compound (C036)
- Sealing compound (C501)
- Corrosion inhibiting compound (C505)
- Corrosion preventive compound (C509),
- Corrosion inhibiting compound (C587).

- **This installation includes Vital Points (VP). During the procedure, you must obey the Local Regulations applicable to the Vital Points.**

CAUTION

- **This component includes critical parts. Examine the component for signs of structural damage, before you install it on the helicopter. Refer to 0B-A-00-60-00-00A-010A-A(*).**
  (*) DM applicable to A109S helicopter, please refer to the correct one applicable to your helicopter.

- **Make sure that you do not mix greases of different specifications. Also make sure that you do not mix greases of different brands although the specifications are the same. Refer to the helicopter log book to prevent mixture of unwanted greases.**

Procedure

1. Fill the duplex bearing (16, Fig 1) with Grease (C009) to 1/3 of its capacity.
2. Apply the Corrosion inhibiting compound (C505) or Corrosion inhibiting compound (C587) on the shank and under head of bolt (18).
3. Install the bolt (18) and protect its head with the Corrosion preventive compound (C509).
4. Apply a layer of Grease (C009) on the duplex bearing seat of the outer ring (17).
5. Put the bearings back to back and align the "V" mark on the outside diameter.

CAUTION

Do not heat the outer ring (17) more than permitted temperature of 60 °C (140 °F).

6. Heat the outer ring (17) in an oven to a temperature between 50 and 60 °C (122 and 140 °F) for 15 - 30 minutes.
7. Put the swashplate rotating assembly in the tool 109G6220G03-101, lower side – “base assy” P/N 109G6220G03-109 (Fig 4, right side), attached, to allow the correct positioning of the part during the installation of the duplex bearing ball.
8. Put the duplex bearing ball in the tool 109G6220G03-101 upper side – “Pusher Assy” P/N 109G6220G03-103, attached, to allow the correct positioning of the part installed on the rotating swashplate (Fig 5).
9. Heat the swashplate rotating assy and the positioning tool in an oven at temperature of 50÷60°C for 15÷30 minutes.
10. In the meanwhile, apply Grease (C009) to the external surfaces of the duplex bearing ball and the positioning tool, using a brush (Fig 6).

11. Press the duplex bearing ball in the seat of the rotating swashplate with the apex of “V” mark upward, coupling the two parts of the positioning tool 109G6220G03-101 (Fig 7). Put it in contact against the shoulder of the rotating swashplate.
12. Verify no clearance with feeler gauge, between duplex bearing ball and the rotating swashplate on the shoulder.
13. Remove the tool and proceed with following steps.
14. Install the Teflon rings (33) into the pivot sleeve (34).
15. Seal the two holes of the pivot sleeve (34) located on the Teflon rings seats with the Sealing compound (C501).
16. Install the sleeve (32) into the inner ring (28).
17. Put the pivot sleeve (34) from top into the inner ring (28).
18. Align the two holes in the inner ring (28) with the slots in the pivot sleeve (34). Make sure that the pivot sleeve bracket seat is cantered in the smallest angular sector of the inner ring arms.
19. Install the related new O-ring (M83248/1-010) (37) on the bolts (30).
20. Apply the Corrosion inhibiting compound (C505) or Corrosion inhibiting compound (C587) on the shank and under head of the two bolts (30).
21. Put the two slider bearings (38) in the slots of the pivot sleeve (34) and put the bolts (30) into the inner ring (28) to keep them in place.

Note

Put the rubber or cotton wadding pads to prevent damage to the slots of the pivot sleeve (34).

22. Lock the bolts (30) with nuts (35) and torque to 5,7 - 7,9 N m (50.5 - 69.9 lbf in).
23. Fit the two new Cotter pin (MS24665-1013) (36).
24. Protect the head of the bolts (30), nuts (35), protruding thread and cotter pins (36) with the Corrosion preventive compound (C509).
25. Slide the boot (26) onto the pivot sleeve (34) and put it in position on its seat on the inner ring (28).
26. Put the ring (25) on the boot (26).
27. Apply the Corrosion inhibiting compound (C505) or Corrosion inhibiting compound (C587) on the shank and under head of the ten screws (23).
28. Attach the boot (26) and the ring (25) to the inner ring (28) with the ten screws (23) and washers (24).

29. Torque the ten screws (23) to 0,38 - 0,42 N m (3.4 - 3.7 lbf in) and safety with Safety wire (C014) in pairs as required.
30. Protect the head of screws (23) and washers (24) with the Corrosion preventive compound (C509).
31. Safety the lower end of the boot (26) to the pivot sleeve (34) with two-three wraps of Safety wire (C014).
32. Safety the support (22) to the Fixture, swashplate support (GF-93-00) and clamp the fixture in a bench vice.
33. Slide the pivot sleeve / inner ring group on the support (22).

CAUTION

Do not heat the outer ring / duplex bearing assembly more than the permitted temperature of 60 °C (140 °F).

34. Heat the outer ring / duplex bearing assembly in an oven to a temperature between 50 and 60 °C (122 and 140 °F) for 15 - 30 minutes.
35. Apply a layer of Grease (C009) on the duplex bearing seat of the inner ring (28).
36. Install the outer ring / duplex bearing assembly on the inner ring (28). Put it in contact against the shoulder of the inner ring with the Ring, swashplate duplex bearing installation (GF-14-00).
37. Make sure that the duplex bearing (16) is correctly seated against the shoulder of the inner ring (28) with a Feeler gauge (Local supply).
38. Apply the Corrosion inhibiting compound (C505) or Corrosion inhibiting compound (C587) on the shank and under head of the two bolts (39).

    Note

    For correct installation of the cotter pins (21) do the selection of the Washer (NAS1149C0463R) (40).

39. Install the fitting (41) on the pivot sleeve (34) and attach it with the two bolts (39), washers (40) and nuts (43).
40. Torque nuts (43) to 2,8 - 3,9 N m (24.8 - 34.5 lbf in) and install the two new Cotter pin (MS24665-151) or Cotter pin (MS24665-155) (21).
41. Protect the head of the bolts (39), washers (40), nuts (43), protruding thread and cotter pins (21) with the Corrosion preventive compound (C509).
42. Calculate the thickness of the Shim (109G6230A01-101) (15) as follows (see Detail A of Fig 2): {S15 = C - D - (0,15 to 0,25 mm)} in which

    - C = Dimension of lockring shoulder;
    - D = Dimension between duplex bearing surface and swashplate inner ring surface.

43. Peel the shim (15, Fig 1) to the necessary thickness.
44. Put the shim (15), lockring (14), the two half Shim (109G6230A01-103) (13) and the ring (10) in position.
45. Apply the Corrosion inhibiting compound (C505) or Corrosion inhibiting compound (C587) on the shank and under head of the twelve bolts (11).
46. Temporarily install the bolts (11) and washers (12).
47. Remove the rubber or the cotton wadding pads before installed.
48. Torque the twelve bolts (11) to 9,5 - 12,0 N m (84.1 - 106.2 lbf in).
49. Calculate the thickness of the Shim (109G6230A01-105) (9) as follows (see Detail B of Fig 2): {S9 = A - B - (0,15 to 0,25 mm)} in which
    - A = Dimension of ring shoulder;
    - B = Dimension between duplex bearing surface and swashplate inner ring surface.
50. Peel the shim (9, Fig 1) to the necessary thickness.
51. Install the shim (9) and the ring (1) on the outer ring (17) with the pencil holder in the position shown in Fig 1 (Detail A).
52. Apply the Corrosion inhibiting compound (C505) or Corrosion inhibiting compound (C587) on the shank and under head of the twelve bolts (6) and of the two special bolts (3).
53. Install the two washers (2) and the special bolts (3) in the position shown in Fig 1 (Detail A).
54. Lock the swashplate outer ring (17) and ring (1) with the twelve bolts (6) and the related washers (5).
55. Torque the bolts (6) and (3) to 9,5 - 12,0 N m (84.1 - 106.2 lbf in).
56. Safety the two special bolts (3) to adjacent bolts (6) with Safety wire (C014). Safety the remaining ten bolts (6) in pairs with Safety wire (C013).
57. Protect the head of the bolts (6), special bolts (3) and related washers (5) and (2) with the Corrosion preventive compound (C509).
58. Apply a drop of Sealing compound (C036) on the threads of the two grease fittings (4).
59. Install the two grease fittings (4) on the two special bolts (3). Torque the two grease fittings to 2,8 - 3,2 N m (24.8 - 28.3 lbf in).
60. Apply a bead of Sealing compound (C501) on the outer touch surfaces of the ring (1) and outer ring (17).
61. Examine and adjust the swashplate friction as follows:

    Note

    After the adjustment, do the friction check again to make sure that you get the correct value

    61.1 Put the swashplate in a level position.

61.2 Insert one bolt of the swashplate outer ring arm and attach the Spring scale (Local supply).

61.3 Pull the spring scale vertically with steady pressure to cause the swashplate rings to tilt on the pivot sleeve and make sure that the friction is between 10 and 11 kg.

61.4 Do the operation again for the remaining arms of the swashplate outer ring and make sure that the value in all positions is not more than 0,64 kg.

61.5 If the friction in not in the limits, remove the twelve bolts (11), the washers (12), the ring (10) and the shim (13).

Note

Increase the shim (13) thickness to decrease the friction and viceversa.

61.6 Change the thickness of the shim (13) and do the check again.

62. When you get the correct friction, make sure that the torque of bolts (11) is correct (see Step 43) and safety the bolts (11) in pairs with Safety wire (C013).
63. Protect the twelve bolts (11) and washers (12) with the Corrosion preventive compound (C509).
64. Temporarily install the pencil (7) and Shim (A864A0833E016M) or Shim (109G6230A01-107) (7A) on the arm of the ring (1).
65. Make sure that the distance “A” (Detail A of Fig 3) between the pencil (7, Fig 1) and the three arms of the inner ring (28) is between 2,5 and 3,0 mm.
66. If not in the limits, change the thickness of the shim (7A) and do the check again.
67. Remove the pencil (7) and apply a drop of Sealing compound (C036) on the thread in the contact area with the ring (1).
68. Install the pencil (7) with the shim (7A) on the arm of the ring (1). Torque the pencil to 5,6 - 7,8 N m (49.6 - 69.0 lbf in).
69. Install the nut (8) and torque to 11,3 - 15,7 N m (100.0 - 138.9 lbf in).
70. Make sure that the distance measured at Step 60 is still in the limits with the Feeler gauge (Local supply).
71. Safety the nut (8) with the Safety wire (C014) as necessary.
72. Apply a drop of Sealing compound (C036) on the thread of the transducer (29).
73. Install the transducer on the arm of the inner ring (28). Make sure that the distance “B” (Detail B of Fig 3) between the pencil and the transducer end is 1,0 to 1,3 mm and attach it with the supplied nut.

74. Torque the transducer nut to 11,3 - 15,7 N m (100.0 - 138.9 lbf in).
75. Make sure that the distance measured at Step 68 is still in the limits with the Feeler gauge (Local supply).
76. Safety the transducer nut with Safety wire (C013) as necessary.
77. Grease the swashplate duplex bearing. Refer to 0B-A-12-20-14-00A-242A-A.
78. Remove the swashplate assembly from the swashplate support fixture

Requirements after job completion

1. Install the swashplate assembly. Refer to 0B-A-62-32-00-00A-720A-A.

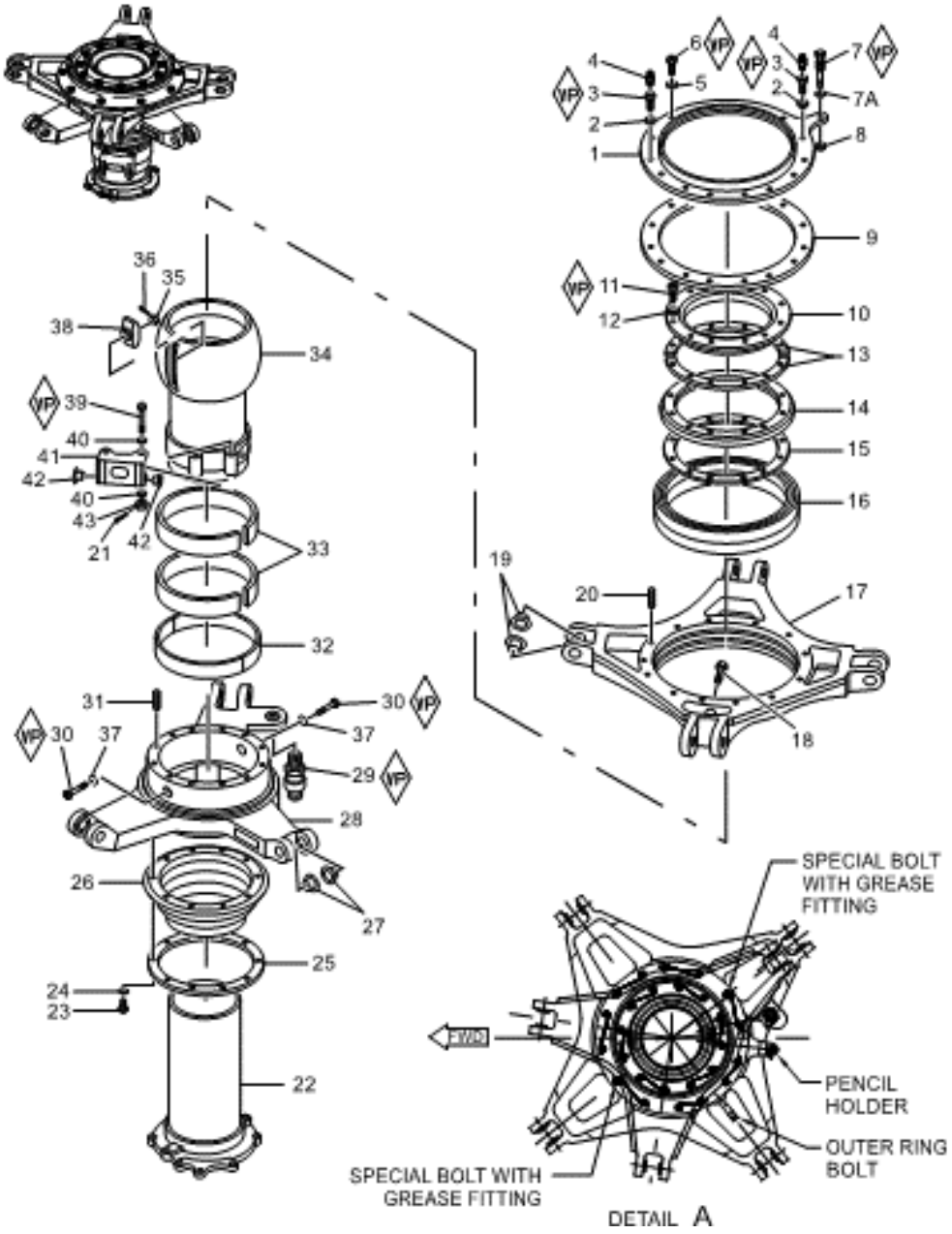

Figure 1 *- Swashplate and support*

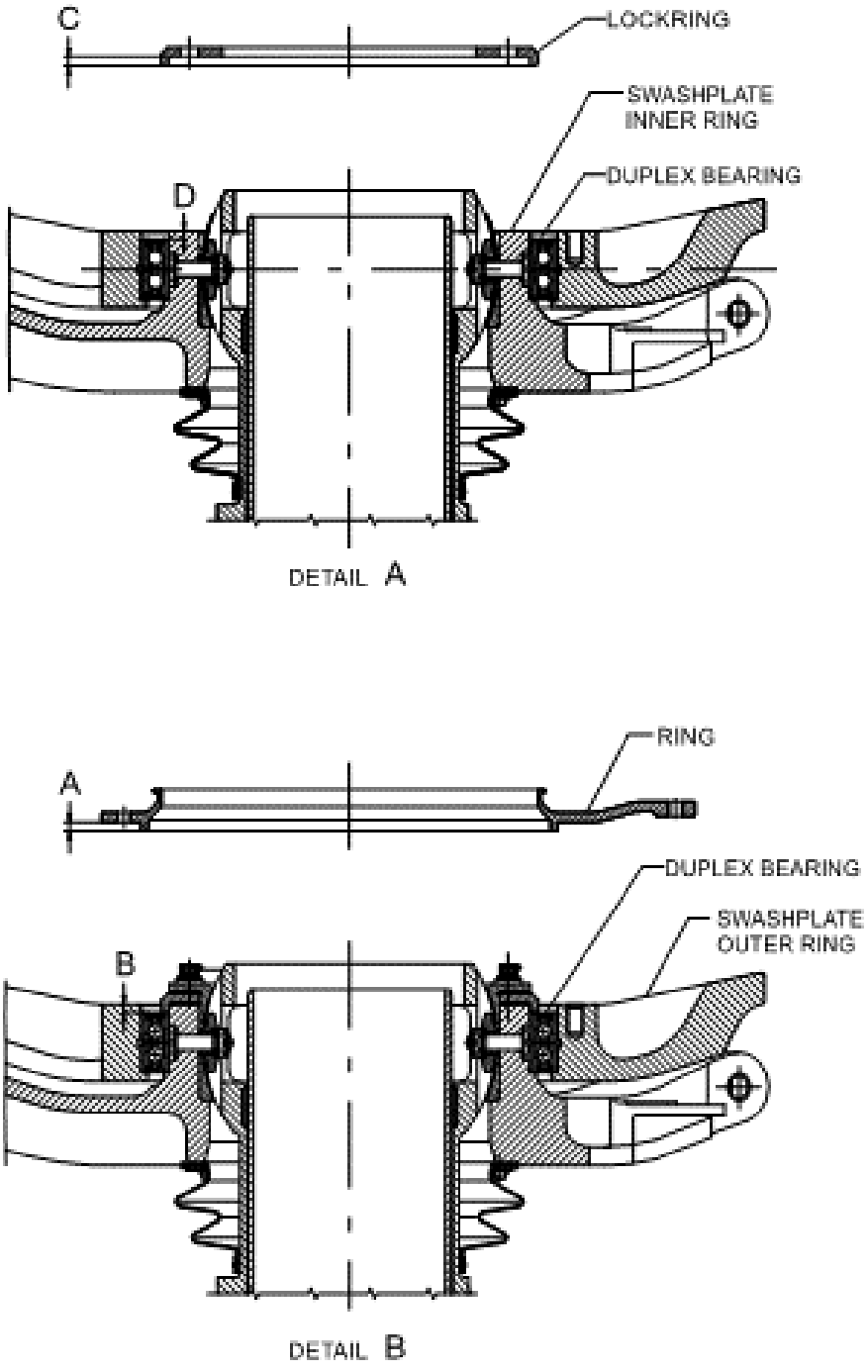

Figure 2 *– Swashplate and support – Shim thickness determination*

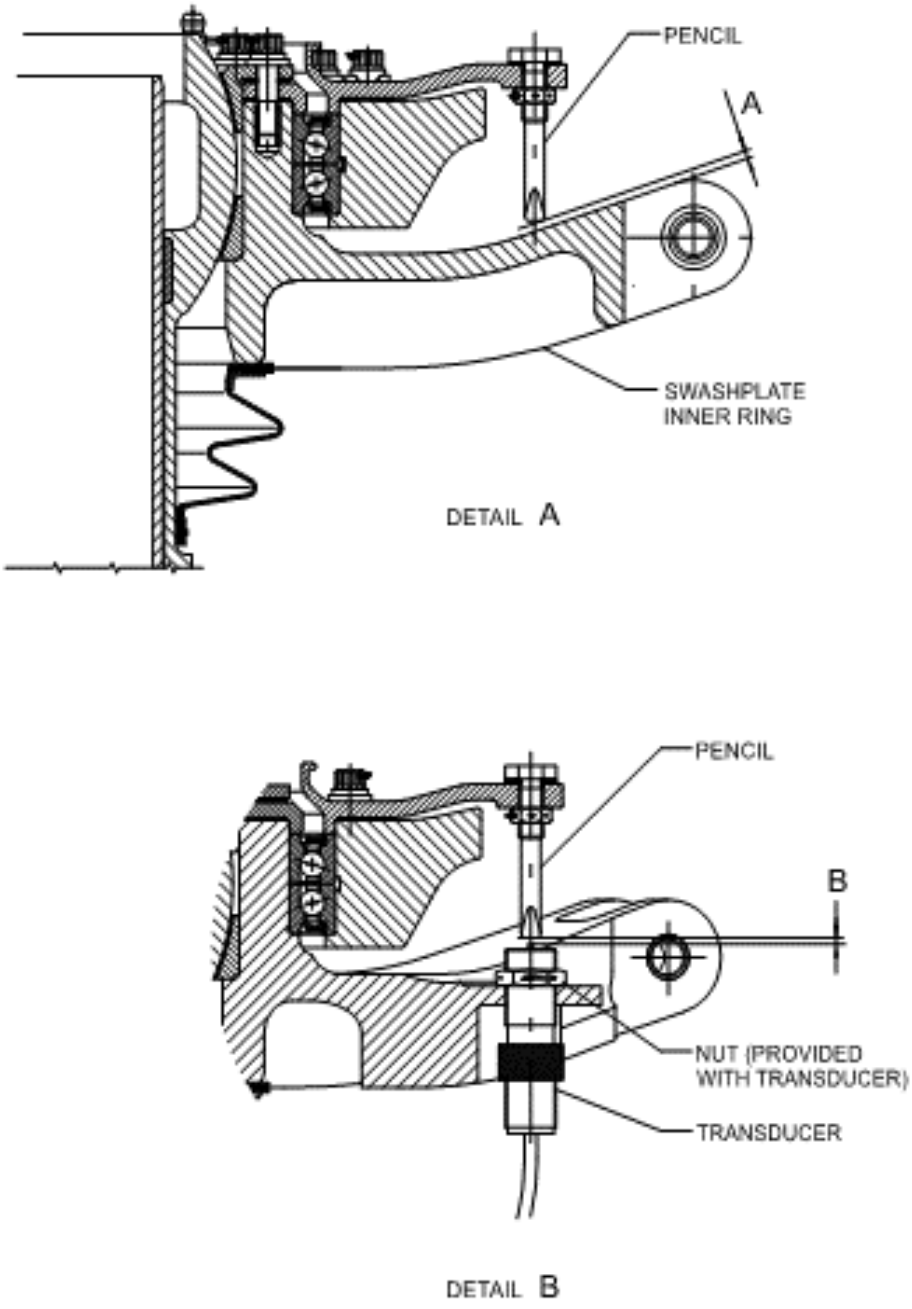

Figure 3 *- Shawshplate and support – Pencil adjustment*

Figure 4 *–"Pusher assy P/N 109G6220G03-103" (to the left) and "base assy P/N 109G6220G03-109" (to the right)*

Figure 5 *– Duplex bearing ball installed on positioning tool 109G6220G03*

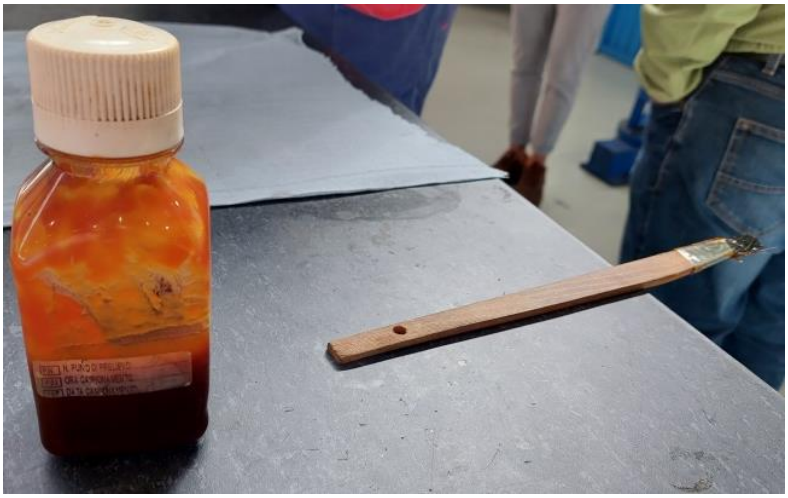

Figure 6 *– Grease and its brush*

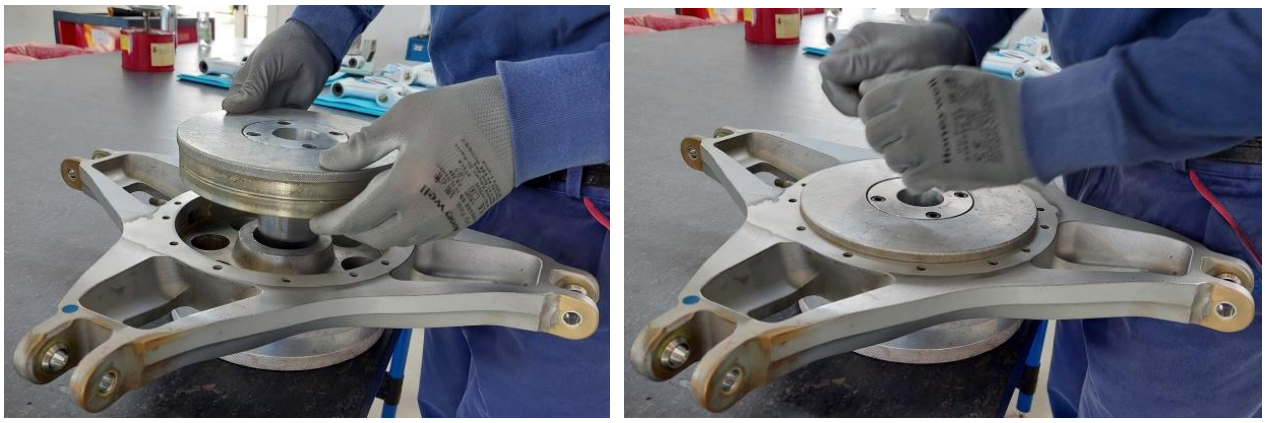

Figure 7 *– Duplex bearing ball installation on the rotating swashplate*