Temporary Maintenance Instruction
TMI109-405 Rev. A

Tail Gearbox –
Special Inspection

A109E / A109K2 / A109C / A109A/AII /
A109S/AW109SP 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: August 9th, 2022.

2021-08-09

Introduction

Purpose of this TMI is to provide the procedure for the Special Inspection of Tail Gearbox P/N 109-0440-01-119/-121/-123 and relevant acceptability limits.

For A109K2, A109C and A109A/AII the inspection interval scheduled every 1200 FH of the component.
For A109E and A109S/AW109SP the inspection interval is 1600 FH.

The content of this TMI will be endorsed within the relevant A109E-MM, A109K2-MM, A109C-MM, A109A/AII-MM and A109S/AW109SP-AMP at the earliest opportunity.

Rev. A of this TMI is published in order to extend the expiration date.

Tail Gearbox – Special Inspection

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Table 1 References

Data Module	Title
Section 12-10 (MM[1] or AMP[2])	Servicing
Section 65-20, 65-21 or 65-39 (MM[1] or AMP[2])	90-Degree Gearbox
Section 65-20 or 65-21 (OM Series[1] or CR&OP[2])	90-Degree Gearbox

[1] Applicable to A109E, A109K2, A109C and A109A/AII Helicopters.

[2] Applicable to A109S/AW109SP Helicopters.

Preliminary requirements

Required conditions

Table 2 Required conditions

Condition	Data Module / Technical Publication
The Tail Gearbox must be removed from the helicopter	65-21 / A109E-MM 65-20 / A109K2-MM, A109C-MM 65-39 / A109A/AII-MM 0B-A-65-21-01-00A-520A-A / A109S/AW109SP-AMP

Table 2 Required conditions

Condition	Data Module / Technical Publication
The oil must be drained from the 90-degree gearbox	12-10 / A109E-MM, A109K2-MM, A109C-MM, A109A/AII-MM 0B-A-65-21-01-00A-200A-C / A109S/AW109SP-AMP

Support equipment

Table 3 Support equipment

Nomenclature	Identification No.	Alternative Identification No.	Qty
1. Puller	109-3400-64-1	MS3-00812	1
2. Tool set	109-3400-42-101	CS7-00360	1
3. Tool set	TBD	109044009-101A029C MS3-03543	1
4. Tool set	TBD	109044009-101A029A 109044009-101A023F	1
5. Magnifying glass, 10-power	Local Supply	-	1

Supplies

Table 4 Supplies

Nomenclature	Identification No.	Qty
1. Cleaning compound (*)	Ardrox AV 980	A.R.
2. Epoxy polyamide primer (*)	MIL-PRF-23377	A.R.
3. Aliphatic naphtha (*)	TT-N-95B	A.R.
4. Cleaning solvent (*)	MIL-PRF-680 Type II	A.R.
5. Grease	MIL-PRF-81322 / Aeroshell	A.R.
6. Sealing compound (*)	199-05-004, Type II Class B2 / MIL-S-8802 Class B2 / Proseal 890 B2	A.R.
7. Lubricating oil (*)	MIL-PRF-7808	A.R.
8. Corrosion preventive compound (*)	MIL-PRF-16173, Grade 3	A.R.
9. Corrosion preventive compound (*)	MIL-C-15074	A.R.
10. Polyurethane enamel (*)	MIL-PRF-85285, Type I / Sherwin-Williams Jet Glo Express, Dupont AF3500, PPG Aerospace CA 9800 Series	A.R.
11. Lubrication oil (*)	MIL-PRF-23699 / Turbo Oil 2380	A.R.
12. Lubrication oil (*)	DOD-PRF-85734 / Aeroshell Turbine Oil 555	A.R.

Spares

Table 5 Spares

Nomenclature	Identification No.	Qty
1. WASHER (14, Figure 1)	NAS1149F0532P	6
2. WASHER (13, Figure 1)	NAS1197-516L	6
3. NUT (15, Figure 1)	MS21042L5	6
4. WASHER (3, Figure 1)	NAS1197-416L	6
5. WASHER (2, Figure 1)	NAS1149F0432P, NAS1149C0432R (Alternative, only for 109-0440-01-123)	6
6. NUT (1, Figure 1)	MS21042L4, MS21043-4 (Alternative, only for 109-0440-01-123)	6
7. O-RING (6, Figure 1)	AS3209-258	1
8. O-RING (9, Figure 1)	AS3209-011	1
9. PTFE SEAL (20, (Figure 1)	109-0445L02-101 (Only for 109-0440-01-123)	1
10. RETAINING RING (21, Figure 1)	M2742630157B (Only for 109-0440-01-123)	1

Safety conditions

WARNING:

THE CONSUMABLE MATERIALS IDENTIFIED BY "(*)" ARE DANGEROUS MATERIALS.

BEFORE USE, MAKE SURE TO KNOW:

- THE SAFETY PRECAUTIONS AND FIRST AID INSTRUCTIONS PRINTED ON THE LABEL ON THE CONTAINER THE MATERIAL WAS SUPPLIED IN.
- THE SAFETY PRECAUTIONS AND FIRST AID INSTRUCTIONS ON THE MATERIAL SAFETY DATA SHEET.
- THE LOCAL SAFETY REGULATIONS.

ALSO MAKE SURE THAT THE APPLICABLE FIRST AID MATERIALS ARE AVAILABLE.

Procedure

NOTE: This procedure can be performed only by AgustaWestland, by an authorized repair station or by trained customers.

Disassembly

NOTE: During the removal and disassembly of sealed components, cut and remove the bead of sealant with a plastic spatula.

NOTE: During subassembly removal, plug openings in cases.

NOTE: When a set of pullers is used for component removal and disassembly, the pullers must all be tightened simultaneously in order to avoid damaging splines and gear teeth. Lever must not be used.

1. Remove bead of sealant from the cases, nuts and nylon set-crews joints.

NOTE: In order to facilitate following operation is possible to use the tool (Support equipment Ref. 3).

2. Remove and discard mounting sleeve attaching hardware (13, 14 and 15, Figure 1) and slide off the mounting sleeve (12) from studs.
3. Remove the chip detector (10) from related support. Discard the O-ring (9).
4. Install the 90-degrees gearbox on tool set (Support equipment Ref. 2) and perform backlash check in accordance with Overhaul Manual Series or CR&OP (Section 65-20 or 65-21) and record reading.
5. Remove the 90-degrees gearbox from tool set (Support equipment Ref. 2).
6. Remove the three nylon set-screws (5) from the cover plate.
7. Remove and discard the hardware (1, 2 and 3) securing cover plate and output drive shaft assembly (7) to case assembly (11) and insert pullers (Support equipment Ref. 1) in appropriate holes in cover. For Tail Gearbox P/N 109-0440-01-123 is necessary also to remove the bracket (4).

NOTE: For Tail Gearbox P/N 109-0440-01-123 make sure to not damage PTFE seal (20).

8. Operate pullers (Support equipment Ref. 1) and remove cover plate and output drive shaft assembly (7) complete with duplex bearing (16) from case assembly (11).
9. Remove and discard O-ring (6) from output drive shaft assembly (7).

NOTE: If the cleaning is not performed immediately following disassembly, treat the components with corrosion preventive compound (Supply Ref. 9) and with oil (Supply Ref. 12).

Cleaning

WARNING:

ALWAYS CARRY OUT CLEANING OPERATIONS IN A WELL VENTILATED AREA, FAR FROM NAKED FLAMES OE EXCESSIVE HEAT SOURCES.

CAUTION:

WEAR GLOVES WHEN CARRYING OUT CLEANING ACTIVITIES TO AVOID STARTING THE CORROSION ON THE AFFECTED COMPONENTS.

1. Remove any traces of sealant and adhesive using a plastic spatula and clean using a cloth soaked in aliphatic naphtha (Supply Ref. 3).
2. Clean components using cleaning solvent (Supply Ref. 4) and soft bristle brush.
3. Dry components with filtered compressed air. Do not allow bearings to spin during drying.

NOTE: If the inspection/check is not undertaken immediately after the cleaning, treat the components with corrosion preventive compound (Supply Ref. 9) and with oil (Supply Ref. 12).

Inspection

NOTE: Use ten-power magnification lens (Support equipment Ref. 5), as necessary, during visual inspection.

NOTE: Do not spin unlubricated bearings.

1. Visually inspect all the components for excessive or abnormal wear, presence of metal particles and obvious damage.
2. Visually inspect case assembly (11) and cover plate for corrosion and damages.
3. Inspect pinion teeth and surrounding areas (A, Figure 2) for unusual prints (see Figure 4), deep scratches, flaking, pitting, scoring, chipping, spalling, overheating color and cracks. The presence of such damage is cause for pinion replacement. It is admitted a light bright line on the bottom of the tooth; this line is acceptable provided that the manufacturing signs are visible with a 10-power magnification lens.
4. Inspect the roller bearing (18, Figure 1) for freedom of rotation and roughness.
5. Inspect the duplex bearing (19) for freedom of rotation and roughness.
6. Inspect teeth and surrounding areas (B, Figure 2) on Gleason gear for unusual prints (see Figure 4), deep scratches, flaking, scoring, pitting, chipping, spalling, overheating color and cracks. The presence of any type of damage is cause for rejection. It is admitted a light bright line on the bottom of the tooth; this line is acceptable provided that the manufacturing signs are visible with a 10-power magnification lens.
7. Inspect the shaft near to the seal contact surface (C) for wear, grooving and scoring. Grooving greater or equal to 0,05 mm in depth is cause for shaft replacement.
8. Inspect seat (D) of roller bearing for wear, stepping, nicks, pitting, chipping, overheating color, brinelling, seizing and heavy circumference mark or wide slight mark. The presence of any of the above defects is cause for shaft rejection.
9. Visually inspect the roller bearing (17, Figure 1) for wear, damage and for freedom of rotation and roughness.
10. With the shaft assy on a bench, manually rotate the shaft in order to inspect the duplex bearing (16) for freedom of rotation and roughness.
11. Inspect the two bearings (8) for freedom of rotation and roughness.

NOTE: In case of a negative result during at least one of the previous inspections, send the 90-degree gearbox to the Manufacturer or to an authorized repair station for a specific repair.

Assembly

CAUTION

(ONLY FOR TAIL GEARBOX P/N 109-0440-01-123) DO NOT LUBRICATE PTFE SEAL P/N 109-0445L02-101 (20, FIGURE 1).

NOTE: Before reassembly lubricate all inner parts, surfaces, O-rings and the edge of seals with lubricating oil (Supply Ref. 11) or (Supply Ref. 7) depending by operating environment temperature. The use of oils conforming to MIL-L-23699 is limited with ambient temperatures above -40°C.

NOTE: Replace all the attaching hardware, O-rings and standard seals with new items. Check all the components for cleanliness and evidence of damage.

1. Install a new O-ring (6, Figure 1) on cover plate and output drive shaft assembly (7).

NOTE: (Only for Tail Gearbox P/N 109-0440-01-123) The sealing lip of the PTFE seal P/N 109-0445L02-101 (20) and the relative rotating shaft race must be free of any oil contamination during the installation.

2. Locally heat the case to 60 - 70°C and install cover plate and output drive shaft assembly (7) with related new packing taking care not to damage packing, roller bearing and gear teeth.

NOTE: Washer fitted against magnesium surfaces must be of aluminum.

3. After case has cooled secure cover plate and output drive shaft assembly on case with new nuts (1) and new washers (2 and 3). For Tail Gearbox P/N 109-0440-01-123 is necessary also to install the bracket (4) as shown in Figure 1. Torque nuts to 5.7 - 7.9 Nm (50 - 69 lb.in).
4. Check the Tail Gearbox for correct assembly and freedom of rotation of the parts.
5. Install the 90-degrees gearbox on tool set (Support equipment Ref. 2) and perform backlash check in accordance with Overhaul Manual Series or CR&OP (Section 65-20 or 65-21) and record reading.

NOTE: Compare backlash values with reading performed before disassembling. If there are some differences please check again the assemble.

6. Remove the 90-degrees gearbox from tool set (Support equipment Ref. 2).
7. Install the chip detector (10) with a new O-ring (9) on its seat.

Final Assembly and Oil Leakage Test

1. Clean sleeve mating surface of case with cleaning compound (Supply Ref. 1) and apply corrosion preventive compound (Supply Ref. 8) to mating surfaces of case (11, Figure1) and mounting sleeve (12).

NOTE: Washer fitted against magnesium surfaces must be of aluminum.

2. Position draining hole down and install mounting sleeve (12) with new nuts (15) and new washers (13 and 14). Torque nuts to 11,3 - 15,8 Nm (100 - 140 lb.in).
3. Insert a small quantity of grease (Supply Ref. 5) in holes housing of set screws (5), than install the set screws allowing to protrude 1 mm approx. Apply a bead of sealant (Supply Ref. 6) on periphery of set-screws at contact area with cover plate.
4. Apply sealing compound (Supply Ref. 6) on the mating surfaces of the 90-degrees gearbox as shown in Figure 3.

5. Touch-up external surfaces of Tail Gearbox assy with one coat of epoxy polyamide primer (Supply Ref. 2) and two coats of polyurethane coating (Supply Ref. 10), color No. 16440 Fed. Std. 595.
6. Perform oil leakage test in accordance with the applicable steps of Overhaul Manual Series or CR&OP (Section 65-21 or 65-20).
7. If there is a leakage from the seal of the input shaft, send the Tail Gearbox to the Manufacturer or to an authorized repair station for a depot level repair.
8. If there is a leakage from the seal of the output shaft, replace the seal in accordance with the applicable Overhaul Manual. If the seal is a PTFE type (20) proceed as follow:
   a. Remove and discard the retaining ring (21).
   b. Remove the seal (20) using tool (Support equipment Ref. 4) and discard the seal.

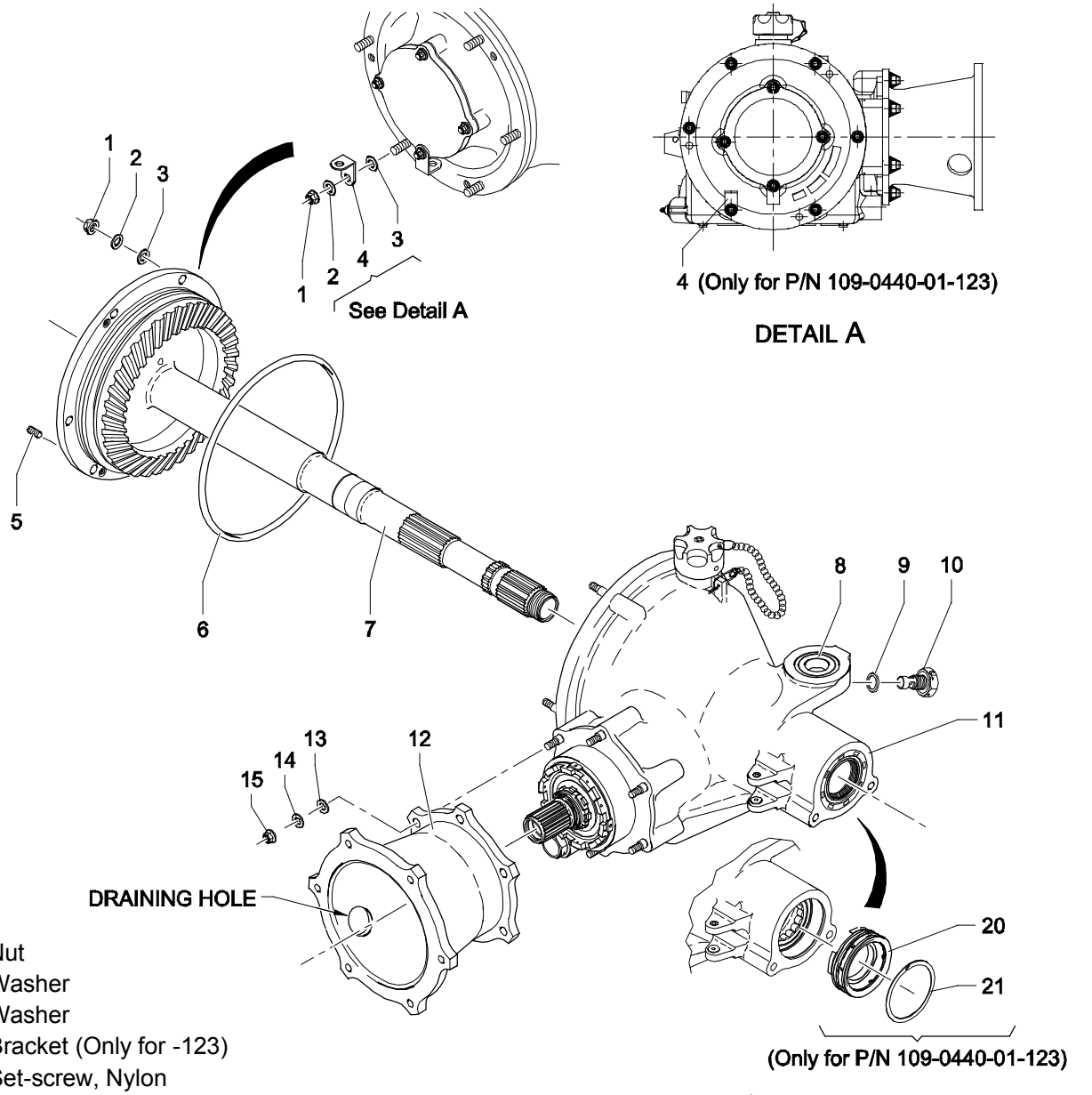
NOTE: The sealing lip and outer diameter shaft, shall be without any contaminations during the installation. It is forbidden to apply sealing compound (Supply Ref. 6) on seal outer diameter.

NOTE: During the installation make sure that the positioning of the seal oil slots are aligned with the oil holes on the case.

   c. Install a new PTFE seal (20) (Spares Ref. 9) using tool (Support equipment Ref. 4).
   d. Install a new retaining ring (21) (Spares Ref. 10).
   e. Apply sealing compound (Supply Ref. 6) between the housing and the external end of the rotating seal (20) (see Figure 3).
   f. Perform again the oil leakage test.

Requirements after job completion

1. Make sure that the work area is clean.



1. Nut
2. Washer
3. Washer
4. Bracket (Only for -123)
5. Set-screw, Nylon
6. O-ring
7. Cover plate and output drive shaft assembly
8. Bearing
9. O-ring
10. Chip detector
11. Case assembly
12. Mounting sleeve
13. Washer
14. Washer
15. Nut
16. Duplex bearing (Ref.)
17. Roller bearing (Ref.)
18. Duplex bearing (Ref.)
19. Roller bearing (Ref.)
20. PTFE Seal (Only for -123)
21. Retaining ring (Only for -123)

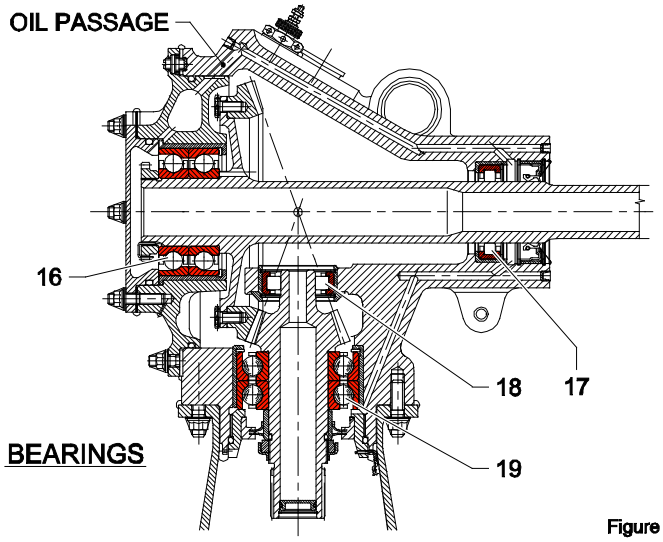
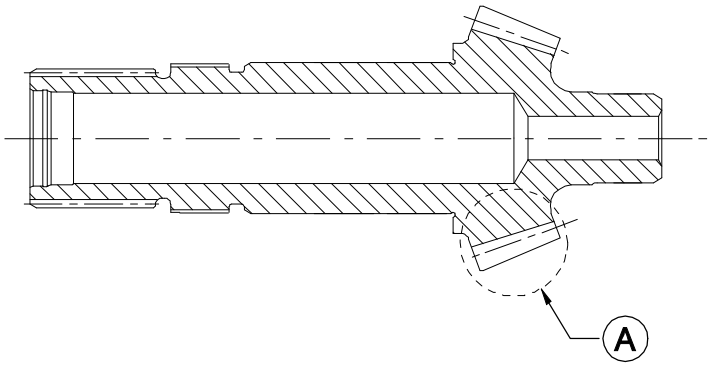
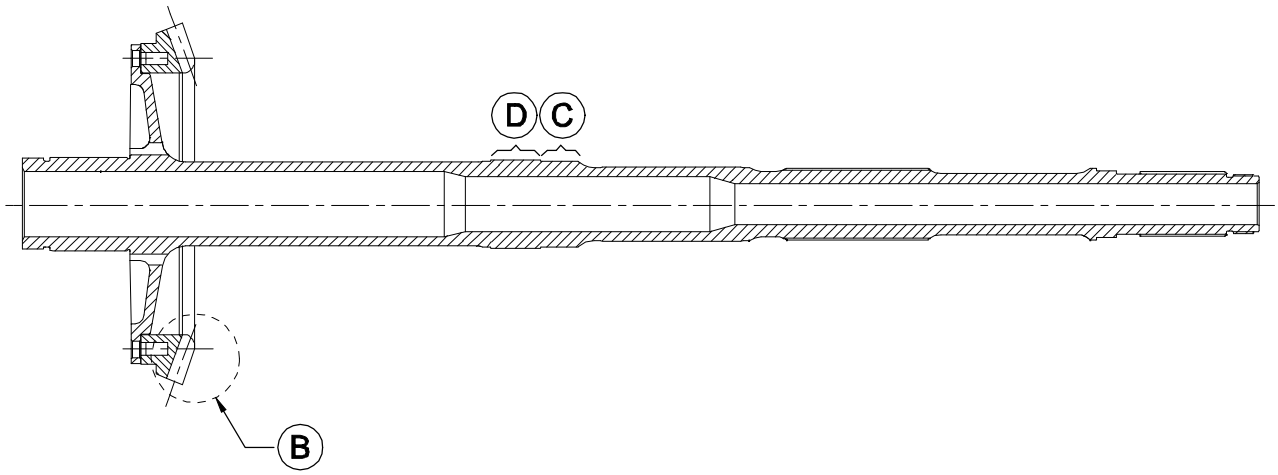


Figure 1

Figure 1 – 90-degrees gearbox assembly.



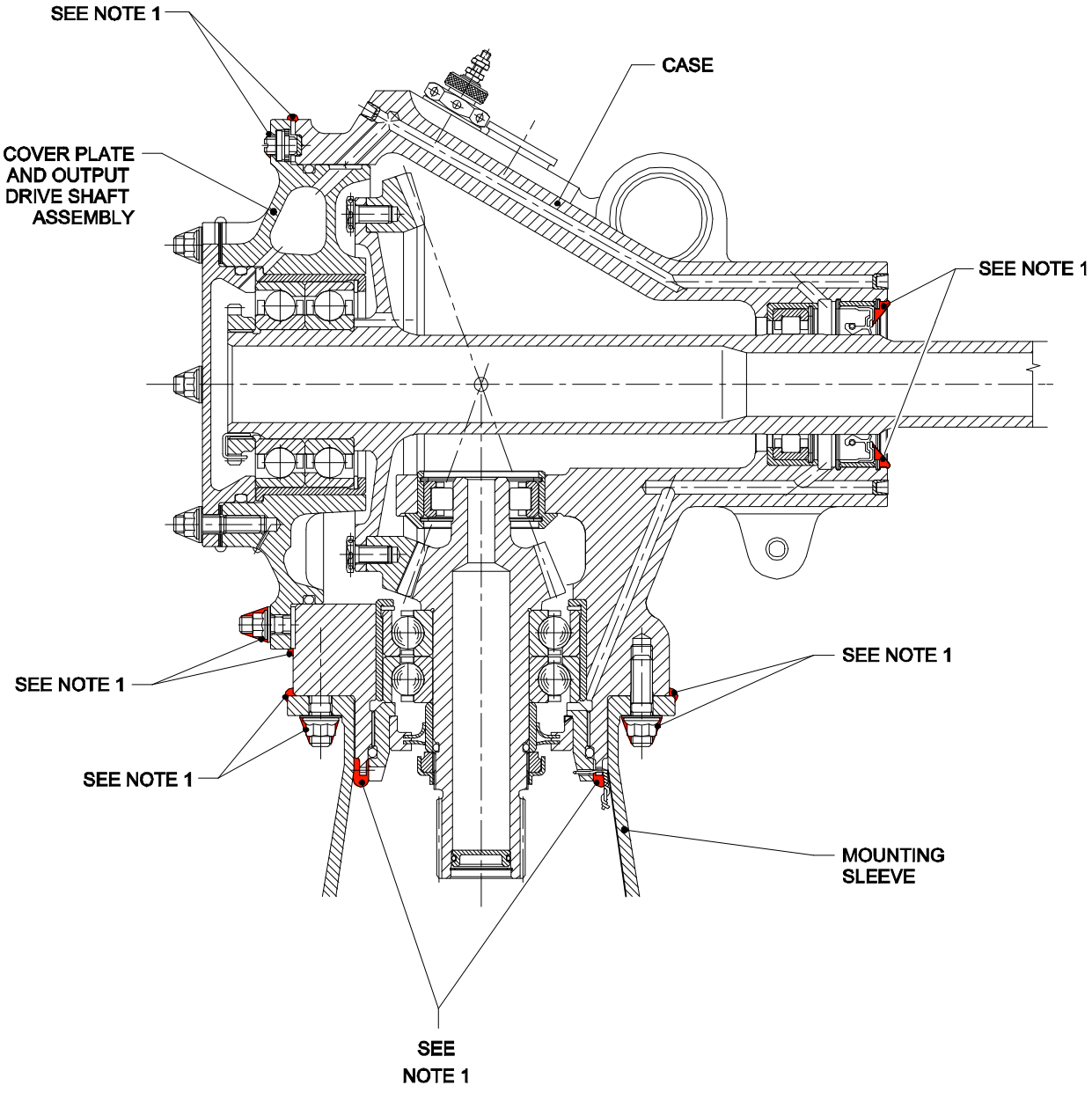
IMPUT PINION



OUTPUT DRIVE SHAFT

Figure 2

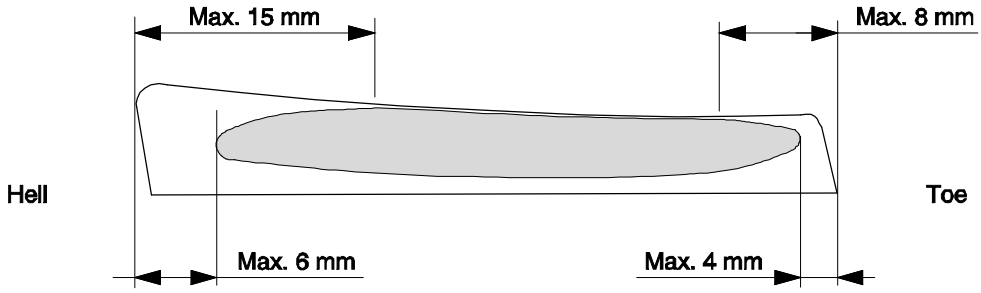
Figure 2 - 90-degrees gearbox – Inspection areas.



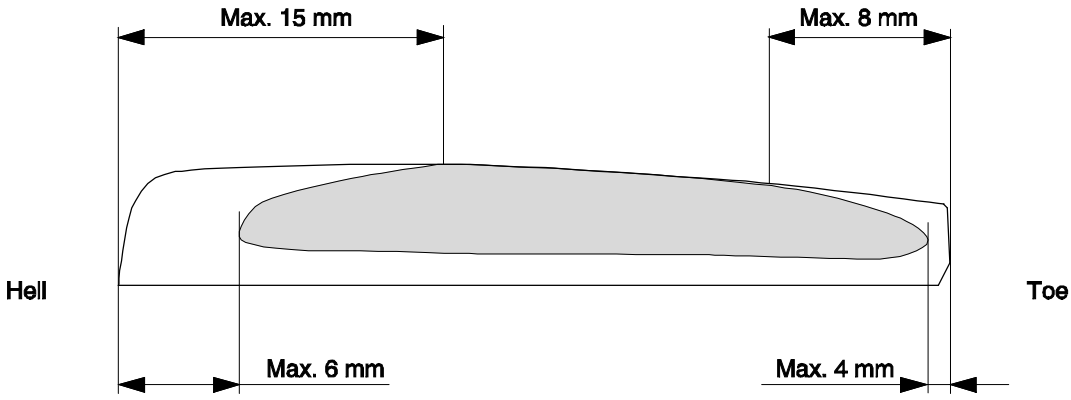
NOTE 1 : Apply sealing compound (Supply Ref. 6) to outer edge of mating surfaces.

Figure 3

Figure 3 - 90-degrees gearbox - Sealing.



GLEASON GEAR



GLEASON PINION

Figure 4

Figure 4 - 90-degrees gearbox – Allowed Gleason gear/pinion patterns.