

BRP-Rotax
Maintenance Manual

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5) Table of amendments

***Approval**
The technical content of this document is approved under
the authority of
DOA Nr. EASA.21J.048.

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0	00-00-00	all	05 01 2007	DOA*			
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0	72-00-00	all	05 01 2007	DOA*			
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3	73-00-00	1,6-7,15-19,23,27,29-30,45-46,51,54	10 01 2010	DOA*			
3	74-00-00	6,25,27,29,31,33,62	10 01 2010	DOA*			
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3	76-00-00	59	10 01 2010	DOA*			
3	78-00-00	1,3-5,19,23	10 01 2010	DOA*			
3	79-00-00	6,8,10,19-21,27	10 01 2010	DOA*			
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5	80-00-00	13,14	03 01 2017	DOA*			

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5.1) Summary of amendments

Summary of the relevant amendments in this context, but without requirement on completeness.

Ser. No.	Section	Pages	Date of correction	Comment
4	00-00-00	11-16,20,21,36-38, 43	02 01 2015	effective pages selected, consumable materials changed/deleted/added.
4	71-00-00	13,17	02 01 2015	information about the ignition timing changed.
4	72-00-00	8,18-20,22,36,38, 49,50,53,67-69,81, 82,92,93,97,101, 103,107,111,114 115,117	02 01 2015	correction of text, LOCTITE from 221 to 603 changed, Dowel pin from 8x20 to 6x20 changed, Reference to inspection tool changed, Fig 72-75 changed, NOTICE at cylinder head fitting, Change of tightening angle from 180° to 120°, piston/cylinder/intermediate gear of electric starter /sprag clutch: wear limits changed.
4	73-00-00	17,22,23,27,30,31, 38,43-63,66	02 01 2015	information to Fig 73-15/2, float brackets-spacing: change of text, Fig73-28 changed, fuel pump (912+914): change of text+graphics, NOTICE+ +NOTES added.
4	74-00-00	3,6,12,22,29,33,40- 42,44,46,47,51,54, 55, 61-63	02 01 2015	Fig 74-1+20+22+25+28+29+33 changed, wording from "resistance spark plug.." to "spark plug.." changed, wear limits+form sheet changed.
4	75-00-00	4,17,18	02 01 2015	cylinder head temperature sensor: additional text.
4	76-00-00	42,59	02 01 2015	form sheets changed.
4	78-00-00	3,10,11,20,23	02 01 2015	exhaust system (912): change of text, Fig 78-3+ 13 changed, wear limit (TC03) corrected.
4	79-00-00	1,9,11-14,18-20 26-32	02 01 2015	LOC.515 changed to LOC.5910, tightening torque at oil pump cover changed (from 133 to 90 in.lb -oiled thread), Fig 79-19 changed.
4	80-00-00	5,6,12- 14	02 01 2015	graphic+wear limits changed.
5	00-00-00	11-16,38,42-48	03 01 2017	changed text and CAUTION to MICRONORM, effective pages selected, tool changed
5	71-00-00	13,14	03 01 2017	correction of text
5	72-00-00	35,36,49,51,83	03 01 2017	correction of text
5	73-00-00	20,60-62	03 01 2017	correction of text and graphics
5	74-00-00	5,29,31,33,56,61	03 01 2017	change of text and graphics
5	76-00-00	47,49,59	03 01 2017	change of text and form sheet
5	80-00-00	13,14	03 01 2017	change of text and graphics
6	00-00-00	11-13,20-22	07 01 2018	change of text
6	72-00-00	6,39,49,50,112	07 01 2018	new gear cover assy. with oil spray nozzle

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2) Systems description

2.1) Propeller gearbox

See Fig. 72 -1

Transmission gear ratio crankshaft: propeller shaft **2.43 : 1** ^{2), 3), 4)} ; **2.27 : 1** ¹⁾

The propeller shaft is driven by the crankshaft via a straight toothed spur gear (1).

The propeller gearbox incorporates a torsional shock absorbing device. This consists of a torsional shock absorber with dogs (2) and axial springloading by means of disc springs (3).

The design also includes a friction damped free rotation at the dogs to ensure smooth engine idling. Due to this free rotation, a distinct torsional impact arises at engine start and stop and in the event of sudden load changes, but due to the integrated overload clutch it will remain harmless.

◆ NOTE: This overload clutch (4) will also prevent any undue load on the crankshaft in the event of the propeller having ground contact.

◆ NOTE: The overload clutch is fitted **in serial production** on both certified aircraft and uncertified aircraft engines of configuration 3.

2.1.1) Gearbox version

See Fig. 72 -1

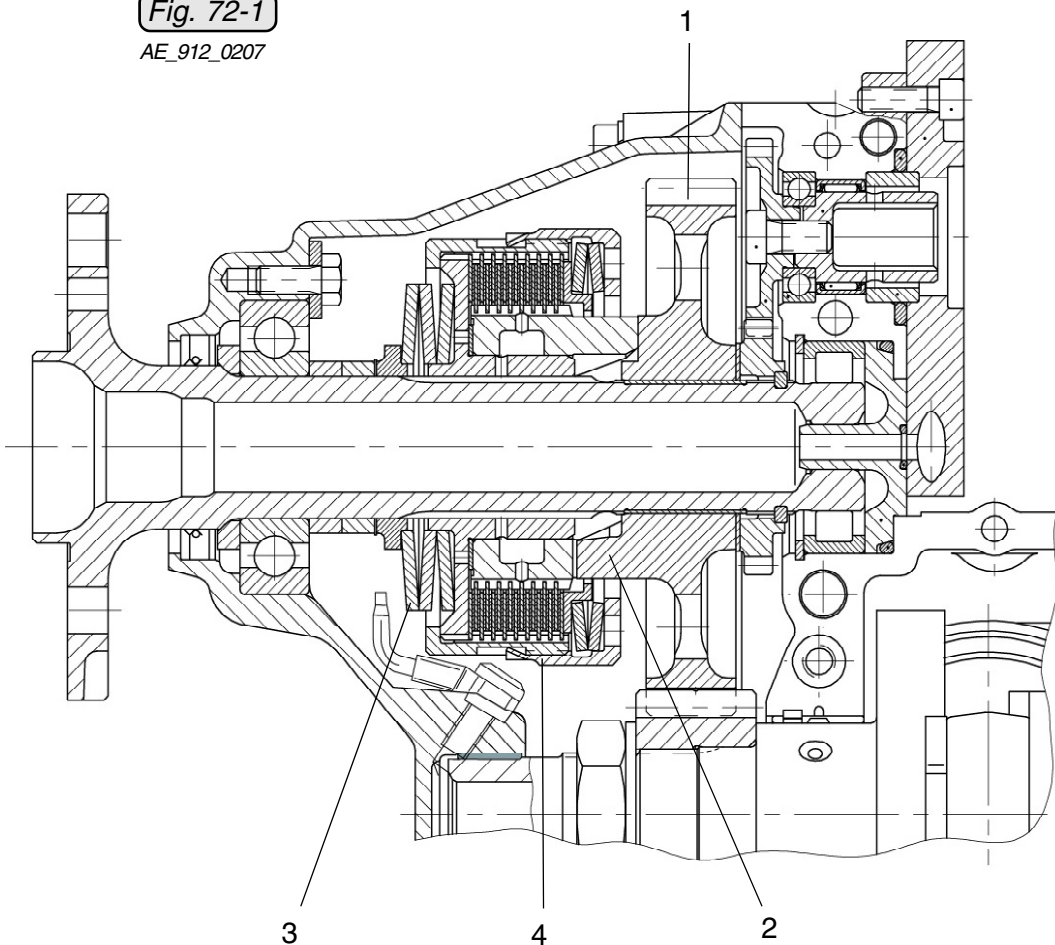
There are 3 gearbox configurations for the 912/914 Series. See 71-00-00 sec. 2.2

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1) 912 A, F, UL
2) 912 S, ULS, ULSFR
3) 914 F, UL
4) 912 A, F, UL - optional

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Fig. 72-1

AE_912_0207



Configuration 3
with overload clutch

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3.9.3) Removal of roller bearing for - Series 4

See Fig. 72-24.

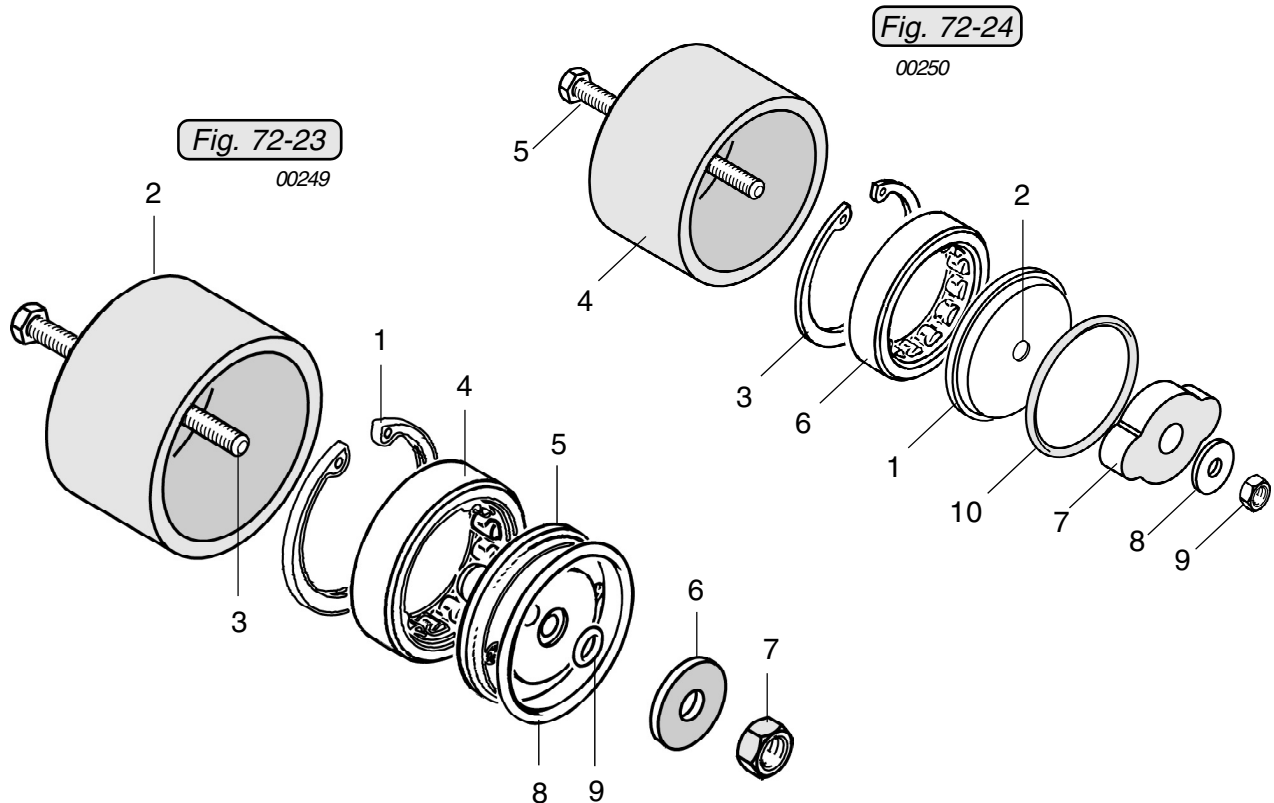
After the propeller gearbox is removed, the crankcase side propeller shaft bearing can be replaced if necessary.

For the extracting procedure it is necessary to drill a bore (2) of at least 6.2 mm dia., (1/4") into the center of the oil inlet cover (1).

■ CAUTION : The oil inlet cover is thus rendered useless and must be replaced before installation!

■ CAUTION : Grease the grooves of the drill slightly to ensure that the majority of the metal chips adhere to the drill. Remove metal chips carefully after drilling.

The roller bearing is pulled out together with the oil inlet cover. Remove the retaining ring (3) with circlip pliers. On the gearbox side, fit puller cap (4), part no. 876489, and push hex. screw (5) through the cap, roller bearing (6) and the hole drilled in the oil inlet cover (1). Fit the pullout plate (7) with the nut (9) and washer (8) on the back end. By turning the hex. screw clockwise, the roller bearing is pulled out together with the oil inlet cover. Remove the O-ring (10).



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3.9.4) Propeller gearbox disassembly

See Figs. 72-25, 72-26 and 72-27.

- **CAUTION** : Only push the dog gear down until it is possible to remove the two ring halves, otherwise the gearbox housing could be destroyed. The gear cover should be rotated back and forth during this step!

Place the complete gearbox in a suitable fixture (1) and press down the gear wheel with the mounting yoke (2), part no. 876885, until the ring halves (3) can be removed, see 00-00-00 section 10.4

Now relieve the pressure on the gear by turning spindle (4) back and remove the mounting yoke and the gearbox from the fixture. Remove the drive gear (5), the thrust washer and the dog gear. Force bearing bushing (6) apart with circlip pliers and withdraw from the propeller shaft.

- **CAUTION**: Do not overstress bearing bushing (6), as otherwise it will become unusable.

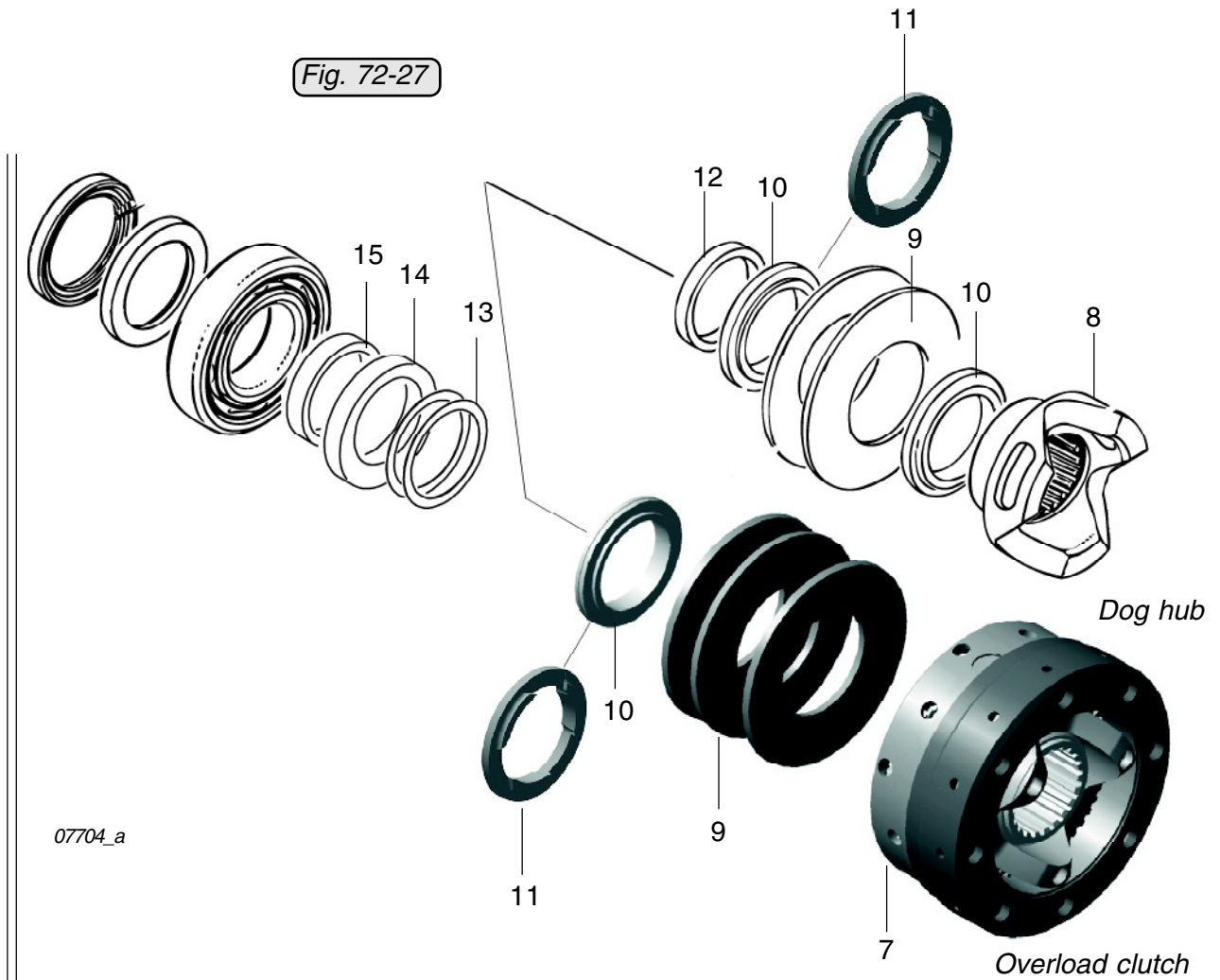
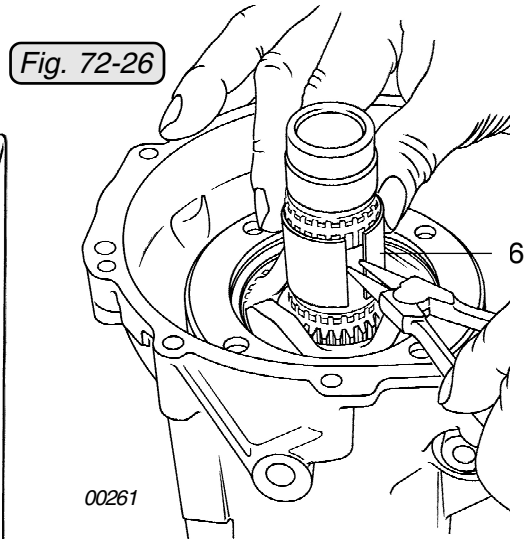
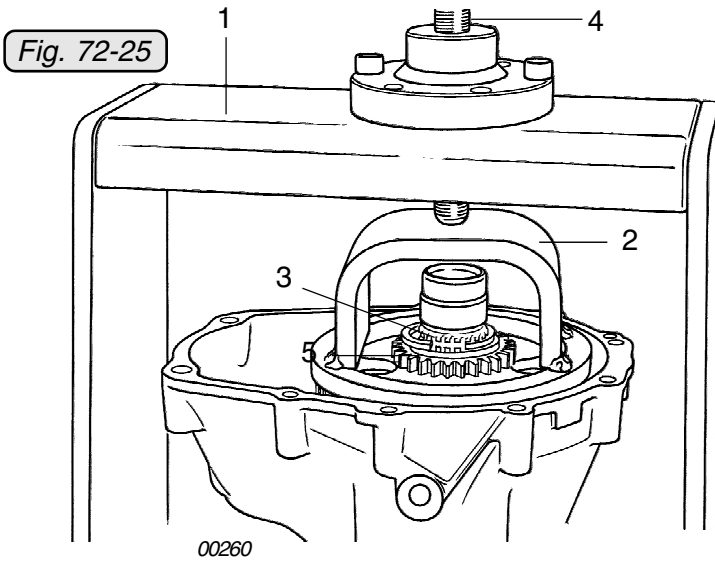
Remove the complete overload clutch (7) or dog hub (8), disc springs (9) 80x35x3, step collar (10) 6 mm (0.236 in.) or step collar (11) (for gearbox with oil spray nozzle), distance sleeve (12), compensating shim (13), eccentric (14) (for fuel pump on the ROTAX 912 Series, of no significance on the 914 Series) and 8 mm (0.31in.) distance sleeve (15).

- **CAUTION**: The overload clutch is fitted **in serial production on** all certified aircraft engines and on all noncertified aircraft engines of configuration 3. All other engine versions are equipped with a dog hub, but available with an optional overload clutch or can be retrofitted to accommodate one.

- ◆ **NOTE**: Propeller gearbox with oil spray nozzle has a step collar with execution in bore.

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3.9.5) Propeller shaft removal

See Figs. 72-28 and 72-29.

Place gearbox housing on a suitable surface and press out the propeller shaft with a hand press. Alternatively, the extractor (1), part no. 877615, can be used to press out the propeller shaft.

Fit the extractor onto the gearbox housing (3) with 6 x M6 screws (2) and place press-out insert (4), part no. 877605 (for engine configuration 2), or press-out insert (5), part no. 877600, (for configurations 3 and 4) on the end (6) of the propeller shaft (7).

Insert pull-in spindle (8) into the support (9) of the extractor (1) and screw hex. nut (10) M24x1.5 onto the spindle (8) from the inside. Keep nut in position with a wrench. By turning the spindle clockwise, the propeller shaft is pressed out of the gearbox housing.

■ **CAUTION :** The protection piece (press-out insert (4) - part no. 877605 or press-out insert - part no. 877600) must be used without fail, as otherwise the machined inner diameter of propeller shaft would be damaged. If the propeller shaft is removed, the ball bearing (11) must be replaced!

To remove the ball bearing (11), unscrew the 4 hex. screws (12) M7x16 with the washers (13) from the gearbox housing (3).

■ **CAUTION :** During this procedure, the shaft seal (14) will be damaged and must be replaced.

Heat the gearbox housing to 80 to 100 °C (176 to 212 °F) and knock the ball bearing (11) out, together with the oil seal (14) and the radius ring (15), using a suitable punch and from the outside towards the inside.

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3.9.8) Propeller governor drive installation

See Figs. 72-32, 72-33 and 72-34.

■ **CAUTION** : The oil inlet flange must be properly aligned and the O-ring must not be squeezed.

Install needle sleeve and ball bearing as described in 72-00-00 sec. 3.9.9.

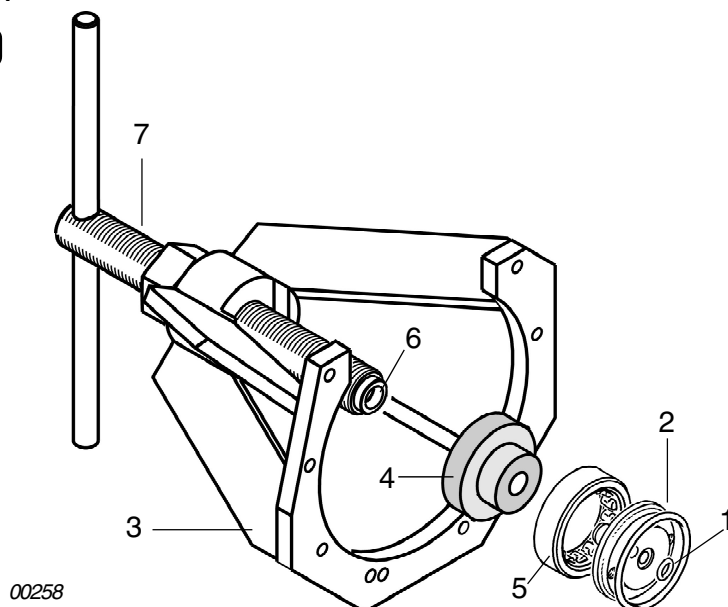
Grease new O-ring (1) and insert it together with the oil inlet flange (2) into the crankcase. Take care that both M6 threads are horizontal and the oil gallery is in a position to let the oil pass. For better positioning, temporarily attach governor flange with 2 allen screws M6x20 (12) and oil inlet flange with 2 allen screws M6x16 (13). Do not torque screw, only tighten enough to keep flange aligned.

Screw extractor (3), part no. 877615, onto the crankcase, place press-in insert (4), part no. 877590, into roller bearing (5), place on the centering (6) and press it fully home into the crankcase with the spindle (7). Fit circlip in groove with its sharp edge towards the outside.

Align drive gear lip (8) Fig. 72-32 into drive sleeve notch (9) Fig. 72-32 with holder, part no. 242660. Apply LOCTITE 648 to the allen screw M8x16 and tighten. Torque to 25 Nm (19 ft. lb).

Fit the governor flange (8) again. Fit distance sleeve (9) and new O-ring (10) 32x4 into the crankcase. Place one O-ring (11) 7x2 into the oil inlet flange and one into the governor flange and keep them in position with some grease. Fit the governor flange and attach it to the crankcase with 4 allen screws (12) M6x20 and to the oil inlet flange with 2 allen screws (13) M6x16.

Fig. 72-33



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- CAUTION : Longer screws will damage the oil inlet flange.
- ◆ NOTE: Tightening torque 10 Nm (90 in.lb). The allen screws (12) and (13) are secured with LOCTITE 243.

Fit the governor (14) and the new gasket (15). Make sure that the tothing is engaged and the toothed shaft of the governor move easily into the drive sleeve (5). Do not use any tools (such as a hammer) for insertion.

Depending on governor type different screws and nuts are needed. See SB-912-052 and SB-914-035, "Installation / Use of governors", latest issue.

Fit the pressure oil line (18) to the governor flange and the oil pump housing and secure with a clamp. The screw plugs (19) and (20) normally remain closed. A pressure gauge for governor pressure inspection can be connected at position (19) if necessary. The maximum governor pressure is between 21.5 bar (312 p.s.i) and 24.5 bar (355 p.s.i), depending on governor type. The governor starts regulating at 3400 to 4150 rpm.

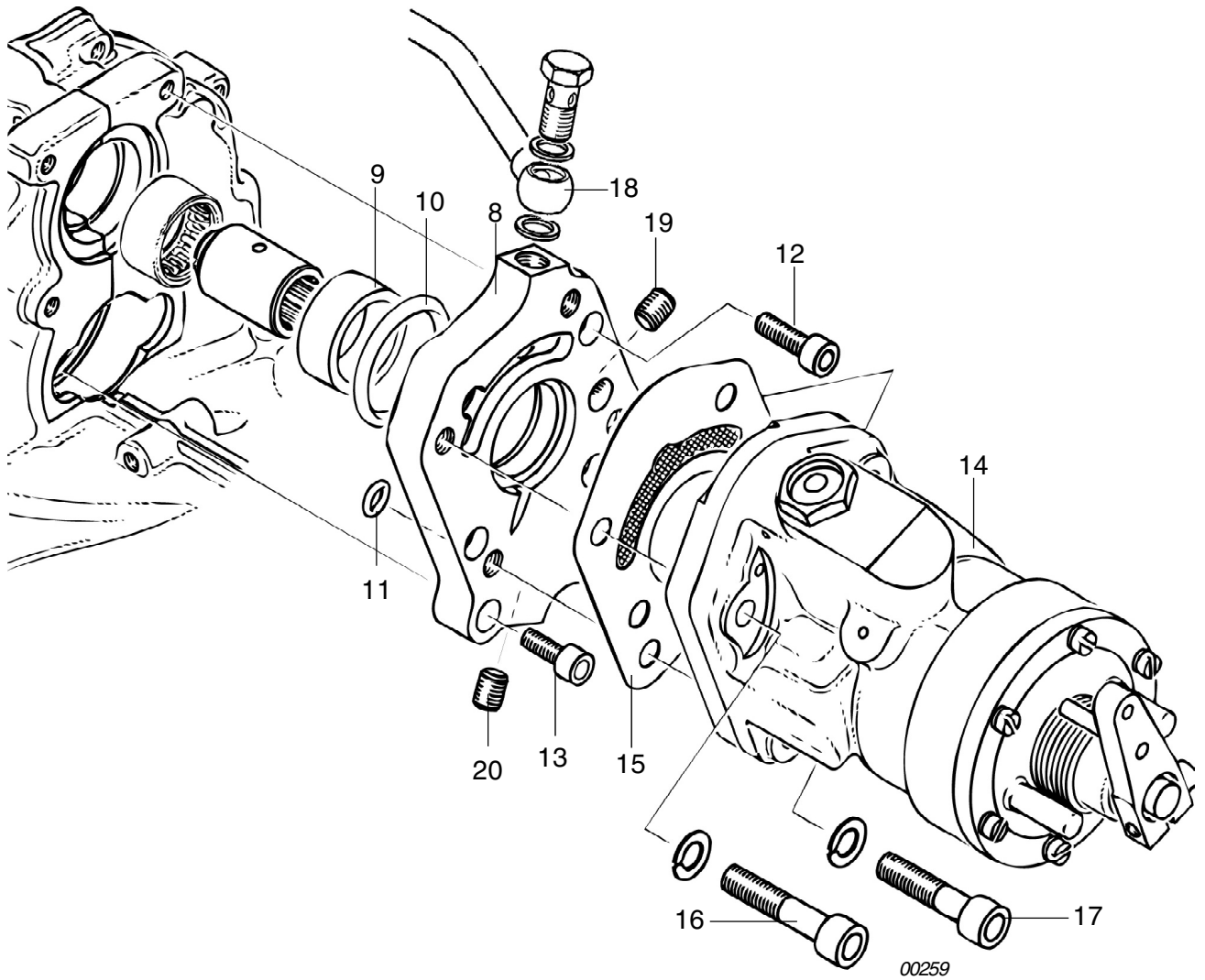
Malfunction of the propeller governing may be caused by the following:

- incorrect adjustment of governor actuation
- malfunction of propeller governor
- insufficient oil pressure, oil pressure fluctuations
- propeller pitch control.

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Fig. 72-34



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3.9.9) Vacuum pump drive installation

See Figs. 72-34, 72-35 and 72-36.

Lubricate new needle sleeve (3). Position puller cap (10), part no. 876489, on crankcase side, place press-in insert, part no. 877579, (11) onto the needle sleeve and fix with the hex. nut (12). Turning the hex. screw (13) clockwise presses the needle sleeve in completely.

The ball bearing is pressed in with the same procedure, but the puller cap (10), part no. 876489, is fitted on the pump flange side and the press-in insert (14), part no. 877595, is used.

Then the new oil seal (9) is pressed in using insertion jig, part no. 877276, and greased. Apply LOCTITE 243 to the sunk screw (7) M5x12 and the washer (8) for ball bearing fixation and tighten.

■ **CAUTION :** The length of allen screw (6) M8x14 must never be altered, as otherwise the screw will collide with the drive shaft of the vacuum pump.

Fit vacuum pump gear (4) and fix drive sleeve (5) with holder, part no. 242660. Apply LOCTITE 648 to allen screw (6) M8x14 and turn it in.

Fig. 72-35

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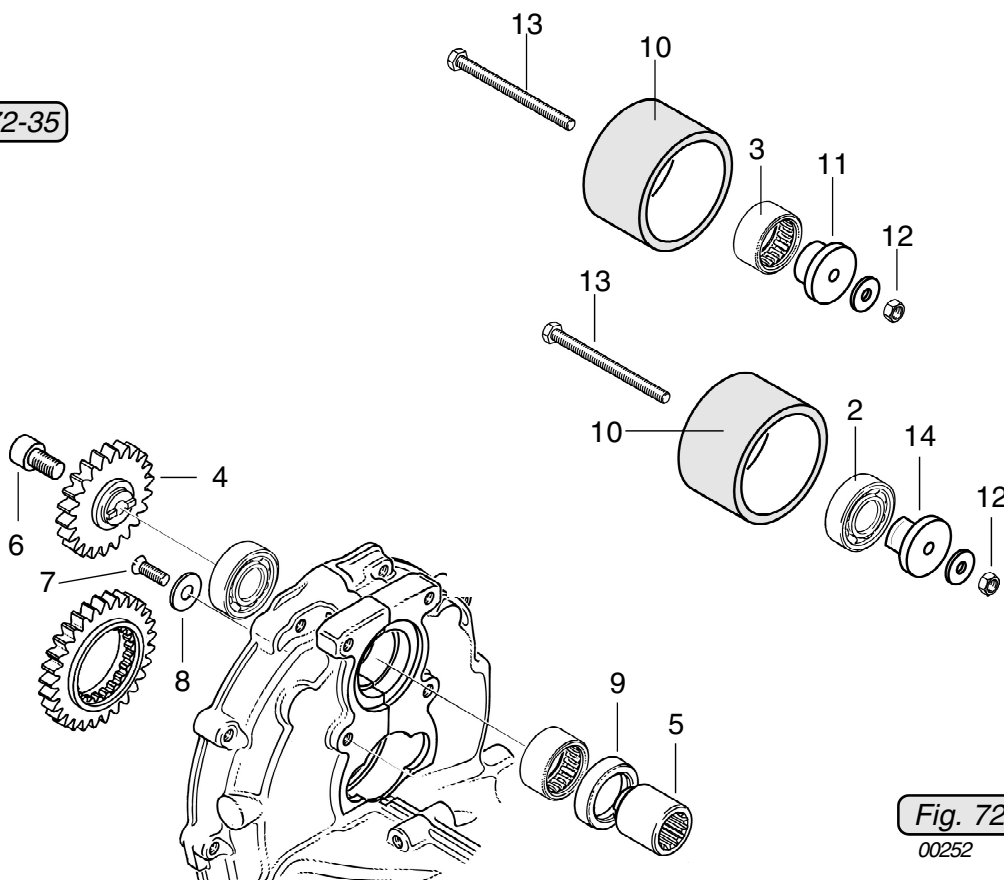


Fig. 72-36

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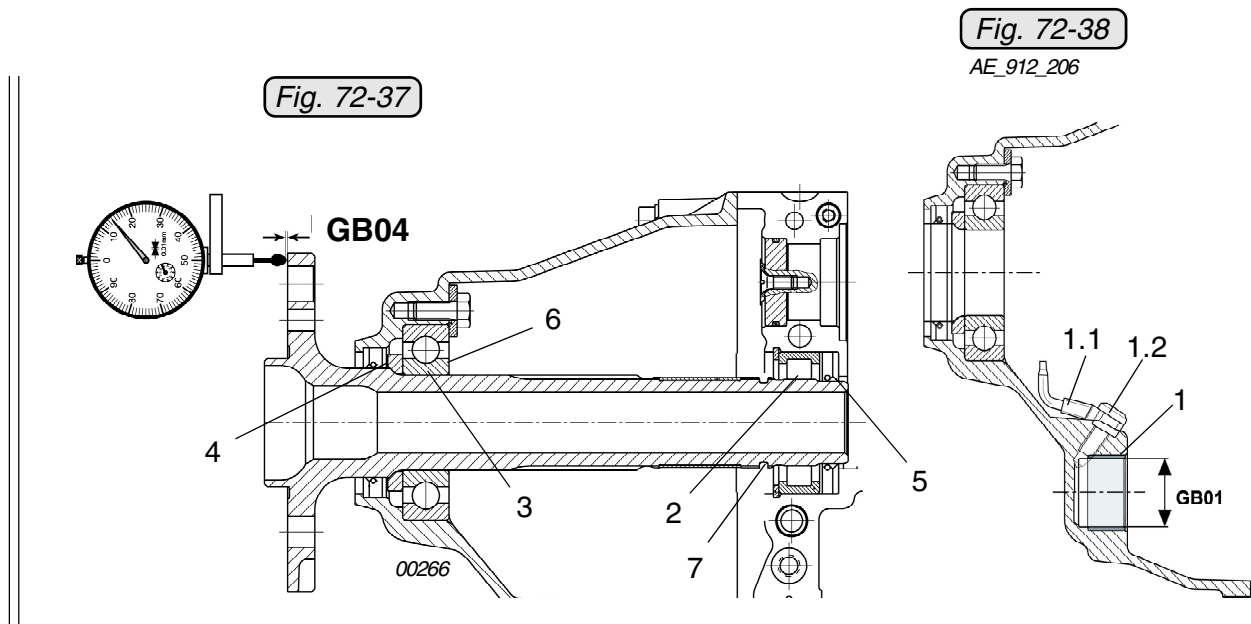
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3.9.10) Gearbox components inspection

See Figs. 72-37, 72-38, 72-39, 72-40, 72-41 and 72-42.

Clean disassembled gearbox with suitable cleaning agents and check the following parts:

- Check that the bearing bushing (1) for crankshaft support bearing in the gear cover fits tightly and measure dimension (GB01). See 72-00-00 sec. 4.
- Measure both bearing seats (2) and (3) on the propeller shaft. See dimension (GB02) and dimension (GB03). Check oil seal running surface (4) and (5). Roll propeller shaft and check for run out. Check the run out of the propeller flange, see dimension (GB04). See 72-00-00 sec. 4.



- Check oil spray nozzle (1.1) for blockage and if it is bended. In case of disassembly loosen the banjo bolt (1.2) with Torx T40.

■ **CAUTION:** The entire propeller shaft with attachment bores must be free of corrosion, and there must be no fretting corrosion at bearing points ((2) and (3)).

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Treatment of corrosion damage and surface damage to the propeller flange

The flange of the propeller shaft is subject to corrosion. After wrapping the propeller shaft (2) in plastic tape or covering it with plastic tubing, the propeller flange can be treated with an abrasive.

■ **CAUTION:** Before applying the protective coating, carefully cover the flange face (3), the attachment bores and the propeller shaft in this area (2).

To prevent corrosion damage, the back of the propeller flange should be coated with a corrosioninhibiting agent.

Where there is greater corrosion damage and the material has been affected, the propeller shaft must be replaced.

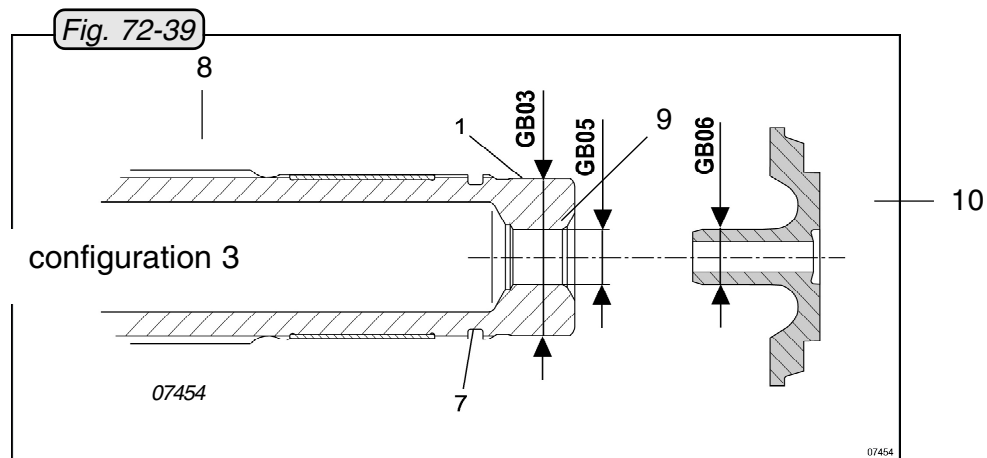
When carrying out any of these steps, the manufacturers instructions must be observed.

— The ball bearing (6) must be an interference fit on its outer race in the gearbox housing and on its inner race on the propeller shaft. Check groove (7) for the retaining rings and the gear-tooth system (8) for wear or damage.

On configuration 3, the inner diameter (9) of the propeller shaft must be checked in the area of the oil inlet flange (10), dimension (GB05/GB06). See 72-00-00 sec. 4.

◆ **NOTE:** The dimension GB05 or GB06 by itself is not as important as the radial clearance between GB05/GB06.

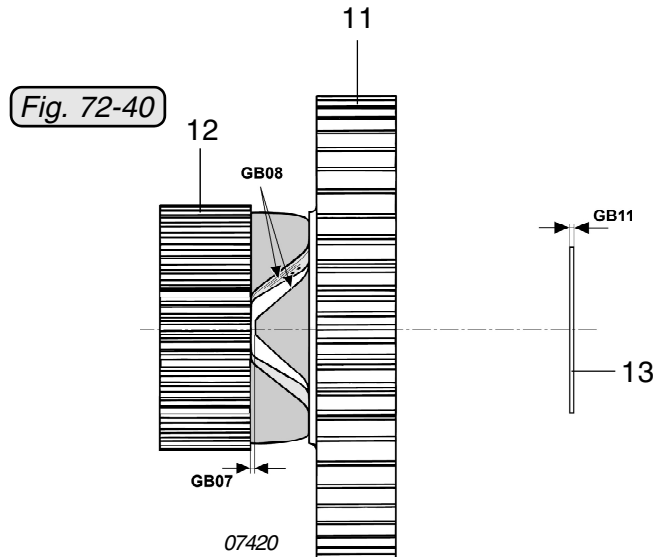
Inspect the propeller shaft for cracks. See 00-00-00 sec.10.4. Register the results of the magnetic particle inspection in the respective form sheet. See 72-00-00 sec. 5.



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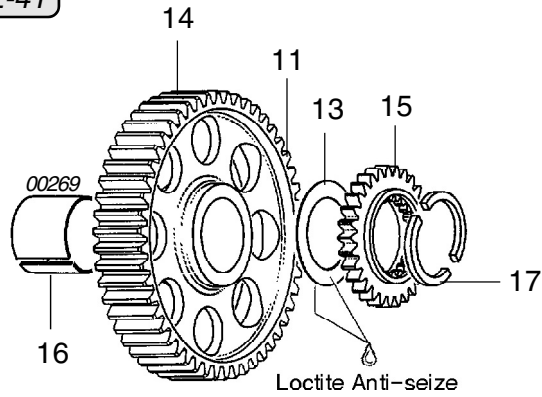
- Carry out a visual inspection of the dog gear (11) and the dog hub (12) to establish whether pitting is visible on the gear-tooth system and/or the sliding ramps (GB08) of the dogs. Ensure that the ramp tops of the dog gear are clearing the ramp valleys of the dog hub. Check the gap between the ramp top and the ramp valley, see dimension (GB07). See 72-00-00 sec. 4. Light to medium traces of wear and pitting on the dogs are permissible.



- Check the gear-tooth system (14) of the gear set.
- Check the eccentric for the fuel pump and the fuel pump tappet for wear, see 72-00-00 sec. 3.9.4 and 73-00-00 sec. 3.4.8
- Check the step collar for wear in the area of the disc spring support, see 72-00-00 sec. 3.9.4.
- Measure the thickness of the plastic thrust washer (13) between the dog gear (11) and the drive gear (15), see dimension (GB11). See 72-00-00 sec. 4.
- Check the hardened steel dog gear bush (16) for wear.
- Use always new ring halves (17) for assembly. See 72-00-00 sec. 3.9.15.

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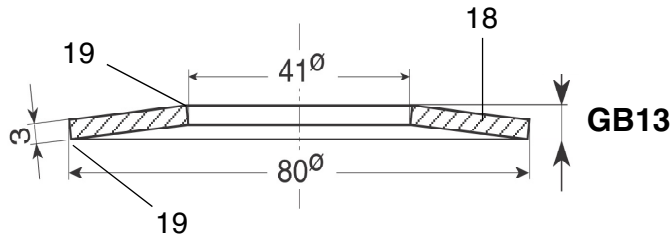
Fig. 72-41



— If there is visible wear to the disc springs (18) in the contact area (19), they must be replaced. Check dimension (GB13) of the uncompressed disc spring. See 72-00-00 sec. 4.

Fig. 72-42

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3.9.13) Propeller gearbox reassembly

See Figs. 72-51, 72-52 and 72-53.

- ◆ NOTE: At the modification of the gearbox (e.g. reduction ratio, retro-fit of overload clutch) the part number on the gearbox housing must be corrected. See Fig. 72-51/1.

Install the oil spray nozzle (1.1) with the banjo bolt M8x1 (1.2) into the gearbox housing. Torque to 20 Nm (170 in lbs).

Heat gearbox housing (1) with hot air (or in an oven) to approx 100 °C (212 °F). Press shaft seal (2) into the gearbox housing from the inside, using insertion jig, part no. 876518, and grease sealing lips (3). Add radius ring (4) 36/50/ 5.5 with rounded side towards shaft seal. The weight of the ball bearing (5) must cause it to fall into the bearing point of the heated gearbox housing. Apply small amount of LOCTITE 243 into tapped holes and install 4 hex. screws with hardened washers. Torque to 15 Nm (130 in lbs).

- ◆ NOTE: “Closed” plastic cage of bearing must be placed towards the propeller flange.

Slide the propeller shaft into the gearbox housing and place on a suitable flat surface (8). Apply LOCTITE Anti-Seize to the bearing seat (10) of the propeller shaft (9). Fit a sleeve (12 which is approx. 30 mm (1.18 in.) longer than the propeller shaft. The inner diameter should be selected so that the sleeve presses against the inner ring (11). Press on the gearbox housing, turning it slightly (left-right).

- CAUTION : Do not tap!

It is an advantage if the gearbox housing is still warm at this stage.

Place distance sleeve (13) 35.2/42/8 and eccentric (14) for the fuel pump onto the propshaft.

Place these components on horizontally and in this order: step collar (15) with the $\varnothing 40.8$ mm (1.60“) towards the disc spring, then two disc springs (16) facing each other and the third disc spring (17) with its back to the second disc spring. Make sure that the disc springs lie against the centering rib (18) of the clutch hub. Apply LOCTITE Anti-Seize to the tooth profile of the slipper clutch (19) and place it onto the propeller shaft.

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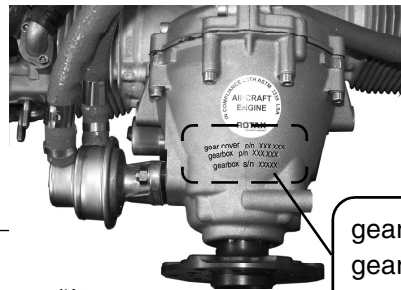
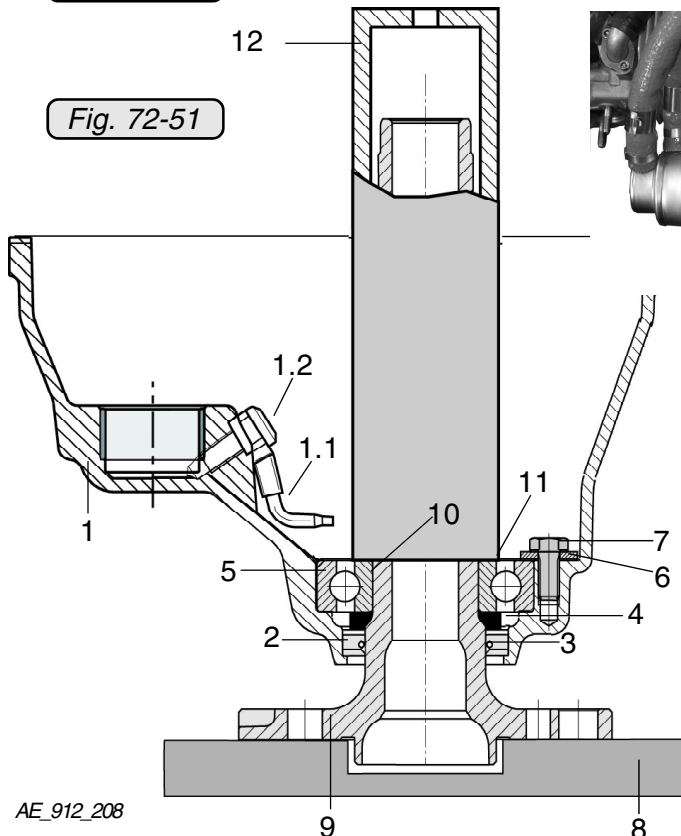
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Carefully fit pre-oiled bearing bushing (20) onto the propeller shaft using circlip pliers. Push on dog gear (21), apply LOCTITE Anti-Seize to both sides of the plastic thrust washer (22) 33.2/51/1.2 and place it on together with drive gear (23).

- CAUTION : The contact surface of the plastic thrust washer must be level (flat). Risk of breakage!
- ◆ NOTE: Gearboxes without an overload clutch have no third disc spring (17), centering rib or slipper clutch. Instead, they are fitted with a second step collar (15) and spacer 35.2/42/6, 35.2/42/8 (13), see Figs. 72-52 and 72-53.
- CAUTION : If the disc springs are not well centered, the dog gear cannot be depressed sufficiently to allow insertion of ring halves. Do not increase the pressure, but remove the clutch again and center the disc springs more accurately.
- ◆ NOTE: Coat contact surfaces of disc springs and dogs as well as the tooth profile of propeller shaft with LOCTITE Anti-Seize.

Fig. 72-51/1

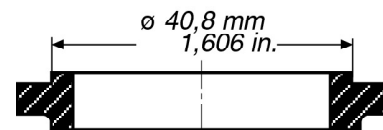
Fig. 72-51



gear cover p/n XXXXXX
gearbox p/n XXXXXX
gearbox s/n XXXXX

part no. (6 digit)

Fig. 72-52



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■ **CAUTION :** Danger of material damage! Always install a new thrust washer.

3.9.14) Disc spring pre-tension adjustment (with overload clutch)

See Figs. 72-53 and 72-25 (see Section 72-00-00 / 3.9.4).

When the propeller shaft assembly is uncompressed, the contact surface (24) for the ring halves must lie in the groove of the propeller shaft 1 mm (0.039 in.) over the upper edge (25). The difference must be compensated for by placing shims (26) between eccentric (14) and step collar (15).

◆ **NOTE:** To facilitate adjustment, they can first be pushed apart until the top edge (25) of the contact surface (24) for the ring halves slips into the groove in the propeller shaft and a 1 mm (0.039 in.) compensating shim (26) can be inserted between step collar (15) and eccentric (14).

◆ **NOTE:** To check the friction torque of the dog hub in free rotation, see the corresponding Maintenance Manual (Line Maintenance) for the respective engine type, 912 Series or 914 Series.

3.9.15) Disc spring pre-tension adjustment (with dog hub)

See Fig. 72-53

Completely compress disk springs utilizing mounting yoke part no. 876885. The lower edge of the groove (25) in the propeller shaft must align with the top edge of the retaining ring (24) (distance must not be more than 0.2 mm (0.008 in)). Set distance by shims to max. 0.2 mm (0.008 in).

After completing the adjustment of the disk spring travel, depress dog gear (2) with mounting yoke, part no. 876885, until both ring halves can be inserted.

■ **CAUTION :** Always use new ring halves.

Insert ring halves and release pressure, see 72-00-00 sec. 3.9.4.

■ **CAUTION :** If the spacing is insufficient, never overpress the springs, as this will cause the dog gear to collide with the gear cover.

■ **CAUTION :** The ring halves must be completely inserted in the groove on propeller shaft!

Check that the ring halves are positioned correctly.

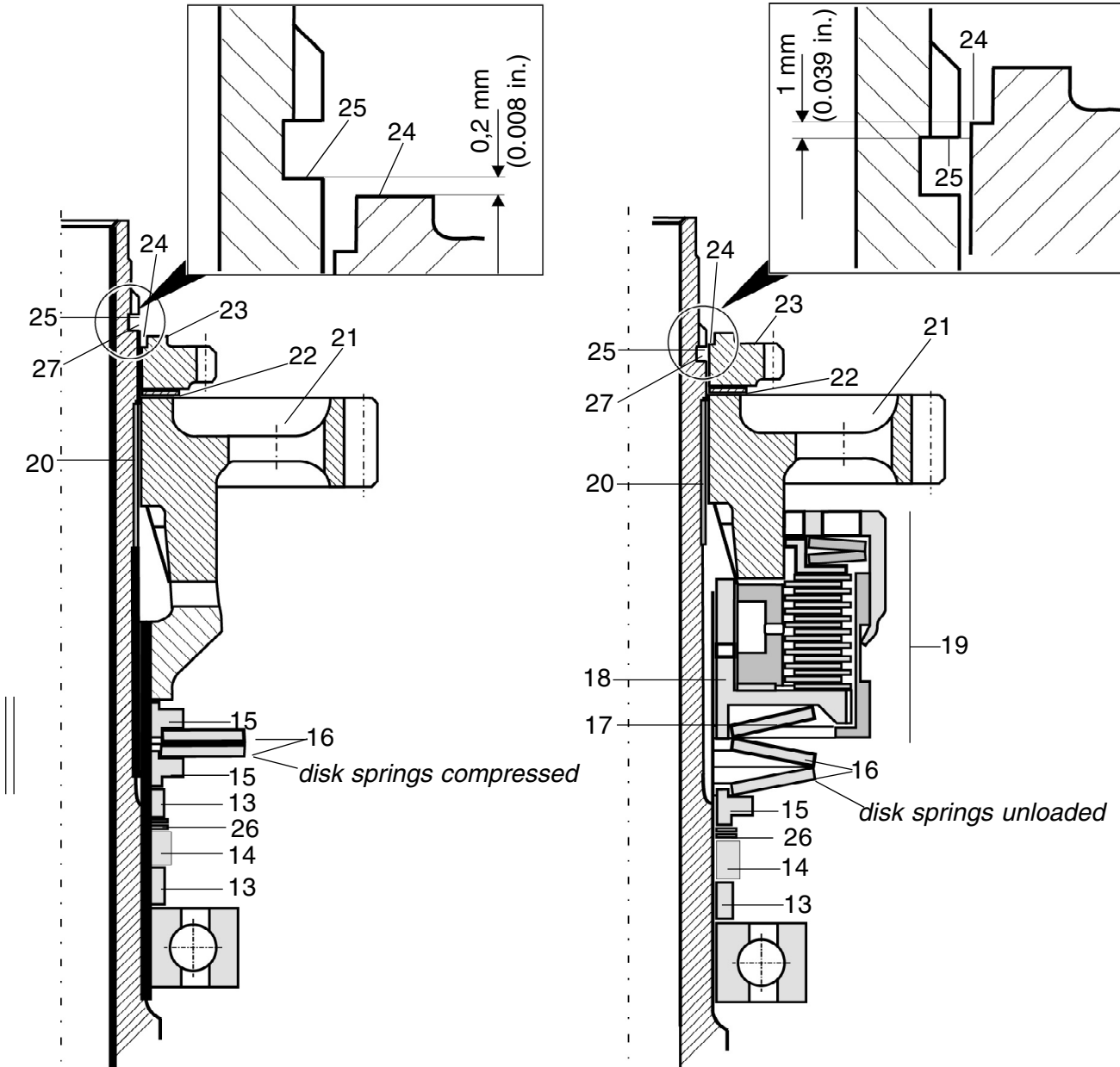
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Fig. 72-53

Version with dog hub

Version with overload clutch



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3.11) Cylinder head - disassembly

See Fig. 72-59.

If the rocker arms are to be dismantled without removing the cylinder head, turn the crankshaft to set the piston of the respective cylinder to ignition T.D.C. so that only little pressure remains on the rocker arm. Depress rocker arm with check lever part no. 877690 towards the hydraulic valve tappet. Now the rocker arm is completely released and the rocker arm shaft can be removed.

◆ **NOTE:** Never use force to press out the rocker arm shaft. The hexagon of the collar cap nut may be in an unfavorable position and prevent removal of the rocker arm shaft. In this case, loosen the nut.

Withdraw rocker arm shaft and remove both rocker arms.

◆ **NOTE:** Newer engine versions have plastic bushings as bearings. These plastic bushings must be laid aside in an ordered manner to prevent any mixup.

Compress the valve springs using valve spring mounting device (1), part no. 877380, valve spring mounting pliers (2) or similar tool and lift out valve cotters. Release valve spring. Remove valve spring retainer and both springs and withdraw valve.

◆ **NOTE:** Prior to removal of valves, clear burrs which may be present on valve stems to prevent damage to valve stem seal and valve guide. Mark valves coordinately.

Repeat procedure for the second valve. Clean cylinder head.

Check oil return tubes for leaks (visual inspection). If there is leakage in area (3), the respective oil return tubes must be replaced. For this procedure, heat the return tubes with a hot air gun to max. 120 °C (248 °F). Extract the oil return tubes and remove any glue residues from the bore. Apply LOCTITE 648 on the new oil return tubes in the area of the two grooves and twist and push tube into position in the preheated cylinder head. After that heat the cylinder head 10 to 15 minutes to 100 °C (212 °F) so that the LOCTITE hardens.

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When replacing the coolant elbow, mark its position, heat the area with a hot air gun to max. 120 °C (248 °F) and unscrew the fitting. Remove residues of LOCTITE means and check threads. Apply LOCTITE 648 to the thread on the cylinder head and to the new coolant fitting and screw the fitting into the cold cylinder head. Leave cylinder head to harden for approx. 10 minutes at 100 °C (212 °F).

If there are oil carbon residues on the sealing face with the cylinder, remove them carefully. Check that the sealing face is level.

In the case of slight wear, valve and valve seat may be seal-lapped, using emery paste.

Clean cylinder head and individual components with suitable cleaning agents. See 00-00-00 sec. 10.3.

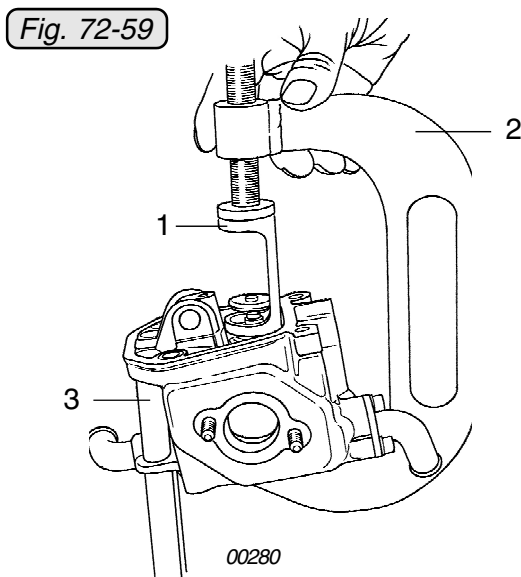
■ **CAUTION:** For valves sandblasting is not allowed (as cleaning method).

Check cylinder head sealing surface and if necessary, blue it and the cylinder. The flat surface of the cylinder and the cylinder head may only be slightly machined.

◆ **NOTE:** In the event of more serious leakage, cylinder and cylinder head can be reworked as described in the Overhaul Manual by a ROTAX authorized overhaul facility.

If the engine has been "run hot", the hardness of the cylinder head and the cylinder material must be checked.

See 72-00-00 sec. 5 and the corresponding Maintenance Manual (Line Maintenance) for the respective engine type 912 or 914 Series.



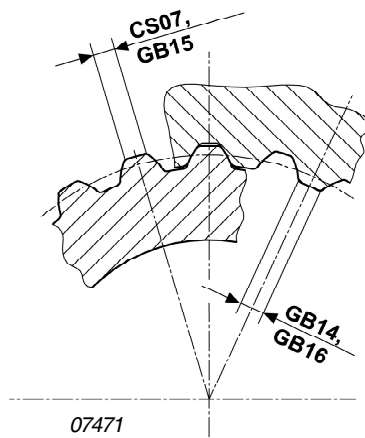
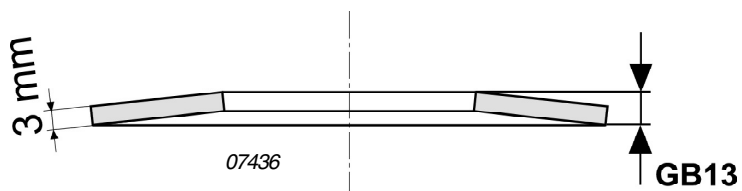
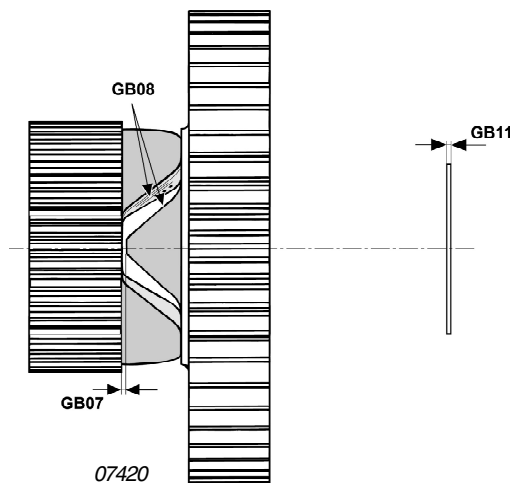
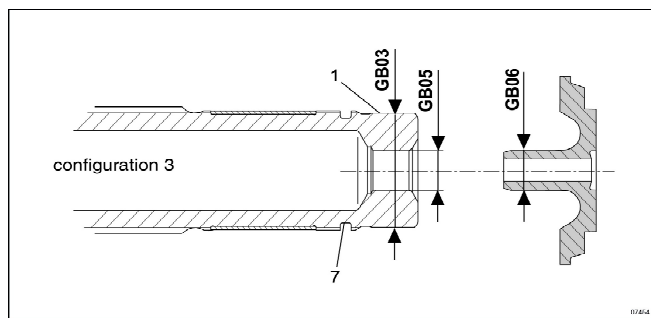
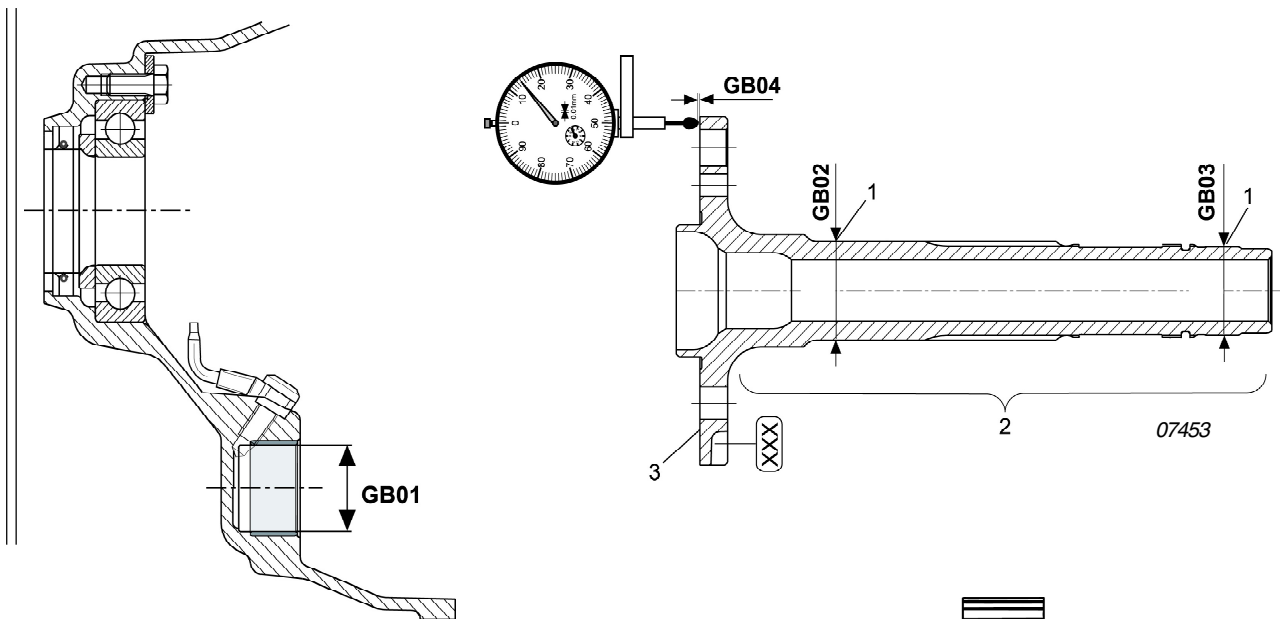
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Description	Code	Reading new		wear limit	wear limit		Readings				
		min	max	100%	50%						
Cylinder head											
							Cyl. 1	Cyl. 2	Cyl. 3	Cyl. 4	
Push rod deflection	Int. V	VT09	0,000 0,0000	0,100 0,0039	0,200 0,0079	0,150 0,0059	actual				
			renewed								
	Exh. V	VT09	0,000 0,0000	0,100 0,0039	0,200 0,0079	0,150 0,0059	actual				
			renewed								
Intermediate gear of electric starter											
Idle gear bore \varnothing	ES01	12,000 0,4724	12,035 0,4738	12,057 0,4747	12,046 0,4743	actual					
		renewed									
Idle gear shaft \varnothing	ES02	11,973 0,4714	11,984 0,4718	11,950 0,4705	11,962 0,4709	actual					
		renewed									
Radial clearance	ES01/ ES02	0,016 0,0006	0,062 0,0024	0,107 0,0042	0,084 0,0033	actual					
		renewed									

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