Chapter: LEP

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Chapter: TOA

TABLE OF AMENDMENTS

Approval*

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

Note: THE APPROVAL IS GIVEN TO ALL CHAPTERS EXCEPT THE AIRWORTHINESS LIMITATIONS SECTION 04-00-00 WHICH IS SUBJECT TO SPECIFIC APPROVAL OF THE EASA.

no.	chapter	page	date of change	remark for approval	date of approval from authorities	date of issue	signature
0	INTRO	all	09 01 2012	DOA*			
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NOTES

Chapter: TOA

SUMMARY OF AMENDMENTS

Content

Summary of the relevant amendments in this context, but makes no claim to completeness.

Current No.	chapter	page	date of change	Comment
0	all	all	09 01 2012	New Edition.
0	05-00-00	5	09 01 2012	Valid time.
0	05-10-00	5, 8	09 01 2012	Storage period of engine, Time limit for fuel pump.
0	05-20-00	17	09 01 2012	Smooth performance of the engine
0	12-20-00	22, 49	09 01 2012	Inspect rotary seal for leakage, compressed air
1	05-10-00	6,7	01 01 2013	Footnote number changed.
1	05-20-00	11	01 01 2013	Change of text.
		12	01 01 2013	Change of 600 hr.
		13	01 01 2013	Change of reference.
		14	01 01 2013	Compression check changed to every 200 hr.
		14	01 01 2013	Carburetor synchronization changed to mech. and pneumatic synchronization.
		15	01 01 2013	Float chamber assy. check changed to every 200 hr.
		16	01 01 2013	Checking the propeller gearbox: footnotes added.
		16	01 01 2013	Oil change: footnote added, reference changed.
		16	01 01 2013	Check the oil tank: changed to every 200 hr.
		17	01 01 2013	Engine test run: Reference added.
		18	01 01 2013	Change of text.
1	05-50-00	1	01 01 2013	Change of text.
		3	01 01 2013	Chapt. 1.1: change of text.
		4	01 01 2013	Chapt. 1.2: change of text.
		9	01 01 2013	Chapt. 3.1: change of text.
		11	01 01 2013	Chapt. 3.4: change of text.
		12-23	01 01 2013	Change of chapter number.
		13	01 01 2013	Cylinder head temperature instead of coolant temperature.
1	12-20-00	1,5,7	01 01 2013	Change of text.
		9	01 01 2013	Text deleted.
		11	01 01 2013	Change of text.
		12	01 01 2013	Change of text.
		15	01 01 2013	Text deleted.
		24,25	01 01 2013	Graphic reference added. page 25 step 3 added.
		32	01 01 2013	Change of text.
		49	01 01 2013	Change of text.
		52	01 01 2013	Change of text. possible foreign matter added
		54	01 01 2013	Change of text.
		56	01 01 2013	Change of text.
		60	01 01 2013	Text deleted.
		68	01 01 2013	Checking the friction torque: formular added.

NOTES

2) Time limit

General

NOTICE

A general overhaul is due after a defined period of operation or after a specified calendar life since initial start of operation (whichever comes first).

The time limit for engine operation will be specified by the TBO.

After reaching this time limit

NOTICE

After reaching this time limit, the engine has to be shipped to an authorized ROTAX overhaul facility.

For an overhaul, the engine must be removed from the aircraft, be cleaned, preserved and all openings to be closed to prevent entering of contaminants.

Storage period of the engine

Observe the storage and preservation directives!

NOTE: The maximum possible storage period of the engine is limited to 24 months.

If this period is exceeded, the engine must be sent to an ROTAX authorized overhaul facility for inspection.

Engine Type description	engine affected engine S/N	TBO Time Between Overhaul
912 A	up to and incl. 4,076.191	600 hr. or 10 years, whichever comes first(1
912 A	from 4,076.192 up to and incl. 4,410.065	1000 hr. or 10 years, whichever comes first (1
912 A	from 4,410.066 up to and incl. 4,410.471	1200 hr. or 10 years, whichever comes first (1
912 A	from 4,410.472 up to and incl. 4,410.856	1500 hr. or 12 years, whichever comes first (1
912 A	from 4,410.857	2000 hr. or 15 years, whichever comes first
912 F	up to and incl. 4,412.585	1000 hr. or 10 years, whichever comes first (1
912 F	from 4,412.586 up to and incl. 4,412.816	1200 hr. or 10 years, whichever comes first (1
912 F	from 4,412.817 up to and incl. 4,412.974	1500 hr. or 12 years, whichever comes first (1
912 F	from 4,412.975	2000 hr. or 15 years, whichever comes first
912 S	up to and incl. 4,922.776	1200 hr. or 10 years, whichever comes first (1
912 S	from 4,922.777 up to and incl. 4,923.889	1500 hr. or 12 years, whichever comes first (1
912 S	from 4,923.890	2000 hr. or 15 years, whichever comes first
912 UL	up to and incl. 4,152.666	600 hr. or 10 years, whichever comes first (1
912 UL	from 4,152.667 up to and incl. 4,404.717	1200 hr. or 15 years, whichever comes first (1
912 UL	from 4,404.718 up to and incl. 4,409.715	1500 hr. or 15 years, whichever comes first (1
912 UL	from 4,409.716	2000 hr. or 15 years, whichever comes first
912 ULS	up to and incl. 4,427.532	1200 hr. or 10 years, whichever comes first (1
912 ULS	from 4,427.533 up to and incl. 6,775.789	1500 hr. or 12 years, whichever comes first (1

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Engine Type description	engine affected engine S/N	TBO Time Between Overhaul
912 ULS	from 6,775.790	2000 hr. or 15 years, whichever comes first
912 ULSFR	up to and incl. 4,429.714	1200 hr. or 10 years, whichever comes first (1
912 ULSFR	from 4,429.715 up to and incl. 6,775.789	1500 hr. or 12 years, whichever comes first (1
912 ULSFR	from 6,775.790	2000 hr. or 15 years, whichever comes first

For the TBO of the specific engine type/version refer to the table below.

(1 Extension of the TBO is possible and will be specified by a Service Bulletin (SB) for the respective engine type. For extensions already effective refer to the engine log book or release certificate.

Authorized exceeding

Extension or exceeding of the TBO by 5 % or 6 months is allowed whichever comes first.

Shipment

The shipment to an authorized ROTAX overhaul facility must include the following:

1	Engine log book.
2	Maintenance records of the engine (i.e. all maintenance check lists, and reports of operation, of maintenance, of findings and of oil analyses).
3	The engine assembly as per supply volume. Additionally all added-on parts as in the supply volume such as carburetors, filters, fuel pump, external generator, sensors, ignition unit, electric starter, oil tank.
4	Indication of total engine operating hours (TSN) and where applicable, engine operating hours since a previous overhoul (TSO). NOTE: This information must be supplied to allow the service history of components to be traced.
5	Data about the type of aircraft used.
6	Useful remarks and observations concerning the engine.

2.1) Time limit for rubber parts

General note

NOTICE This time limit must be followed **independently** and **in addition** to the visual inspections (see chap. 05-20-00 section: 5.1)) of the respective components.

Time limit

The following components and systems must be replaced every 5 years:

- venting hose of the carburetors	
- all rubber hoses of the cooling system	
- all rubber hoses of the fuel system (incl. teflon hoses)	Fuel pump and insulating flange, if this is fixed with fuel hoses.
- venting hose of the fuel pump	
- all rubber hoses of the lubrication system which are part of the engine supply volume and if they are not in the maintenance schedule of aircraft manufacturer	
- carburetor sockets	
- connecting hose of the air intake system	
- diaphragm on both carburetors	
- rubber hoses on compensating tube	
- V-belt	

2.2) Time limit for fuel pump

General note

The fuel pump must be replaced every 5 years.

2.3) Time limit for the coolant

General note

Coolant must be replaced as per manufacturers instructions, at the latest during overhaul or when the engine is replaced.

2.4) Annual inspection

General note

A 100 hr. inspection is to be carried out periodically after every 100 hours of operation **or every 12 months**, whichever comes first.
See chap. 05-10-00 section: 2).

5) Check List/Maintenance Schedule

Identification	
AIRCRAFT	
Registration number	
Aircraft make	
Aircraft model and S/N	
Time since new	
Propeller	
Propeller brand	
Propeller model and S/N	
Governor brand	
Governor model and S/N	
ENGINE	
Engine type	
Engine S/N	
TSN (**t**ime **s**ince **n**ew)	
TSO (**t**ime **s**ince **o**verhaul)	
Used operating fluids:	
coolant	
- mixture ratio	
fuel	
oil - type - viscosity	
AIRCRAFT OPERATOR	
Name	
Contact	
Address	
Telephone/Fax/E-mail	

Identification						
MAINTENANCE FACILITY						
Maintenance workshop						
Address						
Telephone/Fax/E-mail						
Certificate						
This check is applicable (circle on)	25 hr.	50 hr.(1	100 hr.	200 hr.	600 hr.	1000 hr.
(1 leaded fuel more than 30% of operation						
Next check due at:	_____hr. (TS_____) (engine hr.)					

5.1) Maintenance Schedule

General note

Perform the following maintenance tasks at the intervals shown in the maintenance check list. See chapter 05-20-00 25 hr. check.

Legend: X = do the task
blank = no task required

NOTES: If the points 1-3 in order to continue with the maintenance schedule.
If one of the points 1-3 not OK, the engine must be checked and repaired in accordance with the BRP-Powertrain instructions for continued airworthiness.

Points of Inspection	Interval Operating hours		Chapter Reference	Signature
	as indicated	100 hr.		
1.) Visual inspection of the engine				
General visual inspection of the engine for damage or abnormalities. Check cooling air duct and cooling fins of the cylinders for obstruction, cracks, wear and good condition. Take note of changes caused by temperature influence.	recommended 50 hr.	X	12-20-00 sec. 3)	
Visual inspection of the temperature sensor and the oil pressure sensor. Inspect for tight fit and good condition.		X		
Inspect all coolant hoses for damage, including leakage, hardening from heat, porosity, loose connections and secure attachment. Verify routing is free of kinks and restrictions.		X	12-20-00 sec. 9.1)	
Carry out visual inspection of leakage bore at the base of the water pump for signs of leakage.		X	12-20-00 sec. 4)	
Inspect the expansion tank for damage and abnormalities. Check coolant level, replenish as necessary. Inspect radiator cap. Inspect protection rubber on expansion tank base for correct fit.		X	12-20-00 sec. 9.1,9.4) 12-10-00 sec. 3.1)	
Inspect the overflow bottle for damage and abnormalities. Verify coolant level, replenish as necessary. Inspect line from expansion tank to overflow bottle for damage, leakage and clear passage. Inspect venting bore in cap of overflow bottle for clear passage.		X	12-20-00 sec. 9.5) 12-10-00 sec. 3.1)	

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<table>
<tr><th>Points of Inspection</th><th colspan="2">Interval
Operating hours</th><th>Chapter
Reference</th><th>Signature</th></tr>
<tr><th></th><th>as
indicated</th><th>100 hr.</th><th></th><th></th></tr>
<tr><td>Inspect all oil lines for damage, leakage, hardening from heat, porosity, security of connections and attachments. Verify routing is free of kinks and restrictions.</td><td></td><td>X</td><td>12-20-00
sec. 4)</td><td></td></tr>
<tr><td>Inspect all fuel lines for damage, leakage, hardening from heat, porosity, security connections and attachments. Verify routing is free of kinks and restrictions. In the case of steel fuel lines (912 F, 912 S and/or optional), also check for any cracks and/or scuffing marks.</td><td></td><td>X</td><td>12-20-00
sec. 4)</td><td></td></tr>
<tr><td>Inspect the wiring and its connections for secure fit, damage and signs of wear.</td><td></td><td>X</td><td>12-20-00
sec. 13.1)</td><td></td></tr>
<tr><td colspan="5">2.) Magnetic plug</td></tr>
<tr><td>Check the magnetic plug.</td><td></td><td>X</td><td>12-20-00
sec. 12)</td><td></td></tr>
<tr><td colspan="5">3.) Compression check</td></tr>
<tr><td>Check the compression by the differential pressure method.
Test pressure_____hPa (psi)

<table><tr><th colspan="5">Pressure drop (% or fraction)</th></tr><tr><th>Cyl #</th><th>1</th><th>2</th><th>3</th><th>4</th></tr><tr><th>bar/psi</th><td></td><td></td><td></td><td></td></tr></table></td><td>every 200 hr.</td><td></td><td>12-20-00
sec. 5)</td><td></td></tr>
<tr><td colspan="5">4.) Checking the engine suspension</td></tr>
<tr><td>Inspect engine suspension and fasteners for secure fit, including damage from heat, deformation, cracks.</td><td></td><td>X</td><td>12-20-00
sec. 3.1)</td><td></td></tr>
<tr><td colspan="5">5.) Checking the air intake system</td></tr>
<tr><td>Inspect suspension and fasteners for secure fit, including damage from heat, deformation, cracks.</td><td></td><td>X</td><td></td><td></td></tr>
<tr><td></td><td></td><td></td><td></td><td></td></tr>
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Points of Inspection	Interval Operating hours		Chapter Reference	Signature
	as indicated	100 hr.		
6.) Engine external parts				
Inspect screws and nuts of all external parts for tight fit. Inspect safety wiring, replace as necessary.		X		
7.) Engine cleaning				
Engine cleaning		X	12-20-00 sec. 1)	
8.) Checking the air filter				
Checking the air filter.		X	12-20-00 sec. 2)	
9.) Checking the carburetors				
Checking the idle speed.		X	12-20-00 sec.10.3.1)	
Checking the ventilation of the float chambers. Any trouble with the float chamber ventilation impairs engine and carburetor function and must therefore be avoided. Check that the passage of the ventilation lines is free and that no kinks can arise.	200 hr.			
Check for free movement of the carburetor actuation (throttle lever and starting carburetor). Check that the bowden cable allows the full travel of the throttle lever from stop to stop.		X	12-20-00 sec. 10.6)	
Removal/assembly of the two carburetors for carburetor inspection.	every 200 hr.		Heavy MM 73-00-00 sec. 3)	
Check carburetor synchronization. Mechanical and pneumatic synchronization.		X	12-20-00 sec. 10.1) 10.2) 10.3)	
Inspect the float chamber assy. for contamination and corrosion. See SI-912-021 - latest edition.	every 200 hr.		12-20-00 sec. 10.4)	
10.) Inspecting carburetor sockets and drip tray				
Inspect the carburetor sockets for damage and abnormalities, checking for cracks, wear and good condition. Take note of changes caused by temperature influence. (1 See SB-912-030 - latest edition.	every 200 hr. (1		Heavy MM 73-00-00 sec. 3.4.3)	
11.) Spark plug connectors				
Check that resistance spark plug connectors fit tightly on the spark plugs. Minimum pull-off force is 30 N (7 lb).	every 200 hr.			

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Points of Inspection	Interval Operating hours		Chapter Reference	Signature
	as indicated	100 hr.		
12.) Spark plugs				
Remove all spark plugs, check the heat range designation, clean, check electrode gap and adjust if necessary. Replace as required.		X	12-20-00 sec. 13.2)	
Replacing spark plugs.	every 200 hr.	X(1	12-20-00 sec. 13.2)	
(1 use of leaded fuel more than 30% of operation.				
13.) Flushing the cooling system				
Flushing the cooling system where conventional coolants are used.	when replacing the coolant		12-20-00 sec. 9.3)	
14.) Checking the propeller gear box				
Check the friction torque in free rotation on gearboxes with overload clutch. Actual friction torque_____ Nm (in.lbs)		X	12-20-00 sec. 14.1)	
Gearboxes with overload clutch (1 use of leaded fuel more than 30% of operation. Inspect overload clutch.	every 600 hr.(1		05-50-00 sec. 2) SB-912-033	
Checking the propeller gearbox with overload clutch. (2 only for engine type 912 S/ULS/ULSFR	every 1000 hr.(2		12-20-00 sec. 14.2)	
Checking the propeller gearbox without overload clutch. (3 only for engine type 912 UL/ULS/ULSFR	every 600 hr.(3		12-20-00 sec. 14.2)	
15.) Oil change				
Drain oil from oil tank.	every 50 hr.(1	X	12-20-00 sec. 11.2)	
Check the oil tank and clean the oil tank if contaminated. (1 use of leaded fuel more than 30% of operation.	every 200 hr.	X(1	12-20-00 11.5)	
Remove old oil filter from engine and install new oil filter.	every 50 hr.(1	X	12-20-00 sec. 11.3)	
Cut old oil filter without producing any metal chips and inspect filter mat. Findings:_____ _____	every 50 hr.(1	X	12-20-00 sec.11.4)	

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Points of Inspection	Interval Operating hours		Chapter Reference	Signature
	as indicated	100 hr.		
Refill oil tank with approx. 3 litres of oil. For oil quality, see Operators Manual and SI-912 -016, latest edition.	every 50 hr.(1	X	12-20-00 sec. 11.2)	
(1 use of leaded fuel more than 30% of operation				
16.) Oil level check				
Verify oil level, replenish as necessary.		X	12-10-00 sec. 4.1)	
17.) Checking the V-belt tension				
On configurations with auxiliary generator, check the attachment and the V-belt tension.		X	12-20-00 sec. 6)	
18.) Smooth performance of the engine				
Inspection of turning of the crankshaft. For all engines with crankcase up to S/N 27811 inclusive. torque _____Nm NOTE: At engines with new crankecase S/N 06.0010 or higher only inspect in case of suspected hard movement.		X	05-50-00 sec. 3.13)	
19.) Engine test run				
Observe the safety instructions!				
Start the engine and run to operating temperature. Limits see Operators Manual 912 series. Ignition check at _____ rpm engine speed. Speed drop without ignition circuit: A (Off)_____rpm B (Off)_____rpm A/B (difference)_____rpm Inspect carb heat system. Hit the preheating and make a note of speed drop. Speed drop_____rpm. Preheating “OFF“, engine idle running and make a note of idle speed running _____rpm. After engine test run, re-tighten the oil filter by hand (only at cold engine). Checks for leaks.		X	12-20-00 sec. 8) 12-20-00 sec. 4)	
General note				
All Service Instructions and Service Bulletins are complied with.		X		

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Points of Inspection	Interval Operating hours		Chapter Reference	Signature
	as indicated	100 hr.		

Return to service

At the identified engine (as per sec. 5), on (Date) _____ the_____hr.
Check at_____hr. (TSN___, TSO___) was carried out according to recommendations of the engine manufacturer and was recorded in the Engine Log book.

Location, Date_____

Inspector_____

Aircraft mechanic_____

Certificate No._____

Chapter: 05-50-00

UNSCHEDULED MAINTENANCE CHECKS

Introduction

NOTICE

In the course of special checks specify if **additional checks** for components (e.g. hydraulic governor) is applicable.
After each special check/repair work, an engine test run and a leakage check must be carried out.

NOTICE

Observe without fail all the specified instructions.

Special checks must be carried out immediately in the event of an engine fault (e.g. abnormal operation as defined in the Operators Manual) which impairs the airworthiness of the engine.

Table of contents

This chapter of the Maintenance Manual contains general information regarding unscheduled maintenance checks and their associated procedures.

NOTES

1) Engine check after propeller strike incidents

Definition

A propeller strike is:

- Any incident while the engine is stationary or running which makes it necessary to perform repairs on the propeller.

See SL-912-015, SL-914-012, SL-2ST-009, current edition.

1.1) Propeller gearbox with integrated overload clutch

General note

After any propeller strike the following inspections must be performed before operation can continue.

Step	Procedure
1	Inspect the engine for damage. If any damage is detected, inspect, repair or overhaul the whole engine in accordance with the relevant Manual. Inspect all systems for correct functioning.
2	Inspect add-on components e.g. propeller governor, vacuum pump, external alternator. Observe the manufacturers instruction(s).
3	Observe the directives from the aircraft manufacturer.
4	Remove the fuel pump and gearbox.
5	Remove the roller bearing in crankcase for propeller shaft.
6	The whole gearbox must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness - but not limited too - Carry out detailed inspection of all gearbox components. - NDT for cracks on gearbox housing, propeller shaft and gear set. - Inspect drive for governor and vacuum pump (if fitted).
7	Inspect the crankshaft on the power take off side for out-of roundness. See chapter 72-00-00 section 3.9) of the Heavy Maintenance Manual.
8	Re-install the gearbox.

1.2) Propeller gearbox without integrated overload clutch

Propeller strike

The following inspections must be performed before operation can continue.

Step	Procedure
1	Inspect the engine for damage. If any damage is detected, inspect, repair or overhaul the whole engine in accordance with the BRP-Powertrain instructions for continued airworthiness. Inspect all systems for correct functioning.
2	Inspect add-on components.
3	Observe the directives of the aircraft manufacturer.
4	Remove the fuel pump.
5	Remove the gearbox and roller bearing of the propeller shaft.
6	The whole gearbox must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness - but not limited too - Carry out detailed inspection of all gearbox components. - NDT for cracks on gearbox housing, propeller shaft and gear set. - Inspect drive for governor and vacuum pump (if fitted).
7	Observe the manufactures instructions for the governor, vacuum pump and propeller.
8	Inspect the crankshaft on the power take off side for out-of-roundness. Propeller shock load - Inspection of crankshaft distortion on installed crankshaft. See chapter 72-00-00 section. 3.9) of the Heavy Maintenance Manual.
9	Re-install the gearbox.

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3.1) Returning engine to service after submerging in water

General note

NOTICE The engine must be marked clearly “Engine submerged in water“. Define whether fresh or salt water.

An engine which has been submerged in water must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.

- Inspect all systems for correct functioning.
- Carry out detailed inspection of affected engine components.

3.2) Inspection in extreme climatic conditions

General note

NOTICE Every 25 hr. checks of air filter, coolant radiator and oil cooler are necessary.

Flying in deserts or areas with heavily contaminated or dusty air causes increased wear on all components. For this reason, shorter maintenance intervals are recommended.

Flying in areas with extreme climatic conditions or in extreme altitudes requires adjustment of the carburetor jetting and of the cooling system. To do this, it is necessary to contact the aircraft manufacturer and an authorized ROTAX distributor.

3.3) Returning engine to service after influence by fire

General note

An engine after influence by fire must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness. See therefore affected Maintenance Manual, latest issue.

Inspection

- Inspect all systems for correct functioning.

NOTE: Prior to the detailed inspection, all parts should be cleaned and inspected for weld penetration or melted materials.

If an engine was influenced by fire, first a visual inspection of all parts has to be done and then a hardeness test of all mechanical parts must be performed (e. g.: crankcase, cylinder, cylinder heads etc.).

In most cases an overhaul is necessary, in this regard send the engine without delay to an authorized ROTAX overhaul facility for inspection.

3.4) Exceeding of max. admissible engine RPM

General note

NOTICE

Any exceeding of the max. admissible engine RPM must be entered by the pilot into the engine log book stating duration extent of overspeeding and pertinent detail.

5800 rpm up to max. 6200 rpm

If the limit was exceeded for max. 1 minute and max. 6200 rpm

Step	Procedure
1	No action needed.

5800 rpm up to max. 6200 rpm

If the limit was exceeded for more than 1 minute and max. 6200 rpm

Step	Procedure
1	Check that the push-rods are straight.

6200 rpm up to max. 6500 rpm

If the limit was exceeded for max. 1 minute and max. 6500 rpm

Step	Procedure
1	Check that the push-rods are straight.

6200 rpm up to max. 6500 rpm

If the limit was exceeded for more than 1 minute and max. 6500 rpm

Step	Procedure
1	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Check that the push-rods are straight.
3	Inspect the crankshaft for out-of-roundness. See chapter 72-00-00 section 3.9) of the Heavy Maintenance Manual.
4	Inspect all systems for correct functioning.
5	Detailed inspection of affected engine components.

more than 6500 rpm

If the speed of 6500 rpm was exceeded

Step	Procedure
1	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Check that the push-rods are straight.
3	Check differential pressure.
4	Inspect crankshaft with mounted drive gear for runout and distortion. See chap. 72-00-00 section 3.9) and 3.18) of the Heavy Maintenance Manual.
5	Check if piston had contact with valve.
6	Check roundness of valves.

Step	Procedure
7	Inspect all systems for correct functioning.
8	Detailed inspection of affected engine components.

3.5) Non compliance with the coolant specification

General note

NOTICE Use only coolant as recommended in the current Operators Manual and SI-912-016 “Selection of suitable operation fluids“, current issue.

Non compliance with the coolant specification	
Step	**Procedure**
1	When a different coolant as the former one (conventional coolant) is used, then the coolant system has to be flushed. See chapt. 12-20-00 section: 9.3)
2	Fill in with new coolant See chapt. 12-10-00 section: 3.1).
3	Re-install the radiator cap.
4	NOTE: Run engine for a minute and replenish as required.

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3.6) Exceeding of max. cylinder head temperature

General note

NOTICE If the maximum cylinder head temperature is exceeded, other limits are also often exceeded, e.g. oil temperature. Please observe the relevant instructions.

NOTES: Any exceeding of the max. admissible cylinder head temperature must be entered by the pilot into the engine log book, stating duration extent of excess temperature and pertinent detail.

Graphic

Overview and proceed:

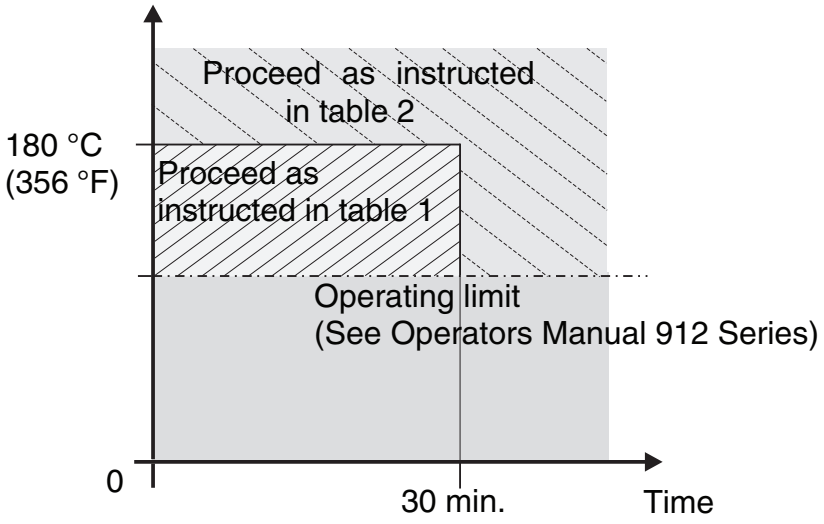

Fig. 2 07140

Exceeding up to 180 °C

Table 1.

Exceeding up to 180 °C (356 °F)- short-term	
Step	**Procedure**
1	The whole cooling system must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect all further systems for correct functioning.
	Carry out detailed inspection of the affected engine components such as. - Leakage check on the cooling system. - Check that the cylinder head attachment is fitted securely. If the cylinder head nut is loose, proceed as instructed in sec. “Excess temperature of over 180 °C (356 °F) and/or for longer than 30 min.“ - Check all coolant fittings (feed/outflow) for secure fit.

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Exceeding over 180 °C

Table 2.

Excess temperature of over 180 °C (356 °F) and/or for longer than 30 min.	
Step	**Procedure**
1	The whole cooling system must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect all further systems for correct functioning.
3	Carry out detailed inspection of the affected engine components.
4	Check compression by carrying out a differential pressure check.
5	All cylinder heads and cylinders must be removed and subjected to a detailed check including hardness testing. See chap. 72-00-00 in the Heavy Maintenance Manual.

3.7) Exceeding the max. permissible oil temperature

General note

NOTICE

If the max. permissible oil temperature is exceeded, other limits are often exceeded, too, e.g. the cylinder head temperature. Please observe the relevant instructions.

NOTES: Any exceeding of the max. admissible oil temperature must be entered by the pilot into the engine log book, stating duration extant of excessive temperature and pertinent detail.

Graphic

Overview and proceed;

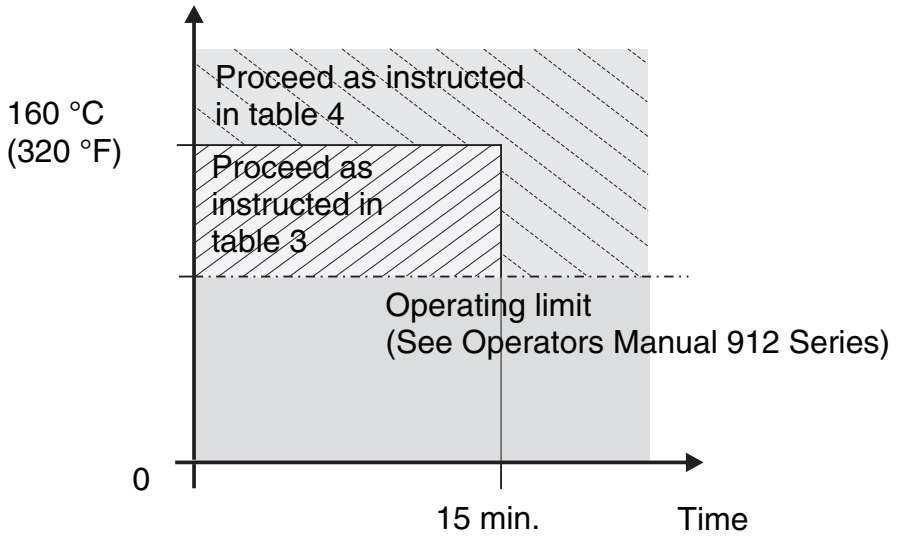

Fig. 3 07140

Exceeding up to max. 160 °C (320 °F)

Table 3.

Excess temperature up to max. 160 °C (320 °F) max. 15 min.	
Step	**Procedure**
1	The whole oil system must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect oil level in the oil tank.
3	Inspect oil cooler for contamination and check the entire oil circuit for correct functioning.
4	Check that oil lines are routed correctly and undamaged.
5	Cut oil filter housing and inspect filter mat for foreign matter.
6	Carry out oil change.
7	Inspect all further systems for correct functioning.

Exceeding over 160 °C (320 °F)

Table 4.

Excess temperature over 160 °C (320 °F) for longer than 15 min.	
Step	**Procedure**
1	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect all further systems for correct functioning.
3	Carry out detailed inspection of the affected engine components.
4	The whole oil system (oil cooler, oil lines) must be inspected.
5	Cut oil filter housing and inspect filter mat for foreign matter.
6	Carry out oil change.

3.8) Oil pressure below minimum value

General note

NOTICE

If the oil pressure falls below the minimum value, other limits are often exceeded, e.g. the oil temperature. Please observe the relevant instructions.

NOTES: Any exceeding of the min. admissible oil pressure must be entered by the pilot into the engine log book, stating duration extent of excessive pressure and pertinent details.

Graphic

Overview and instruction

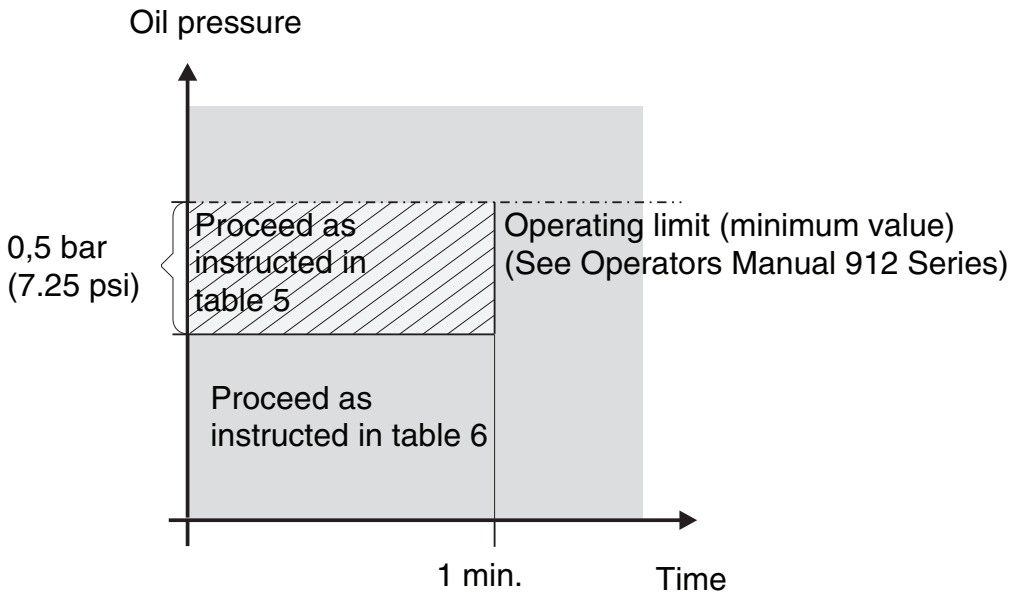

Fig. 4 07188

Minimum oil pressure on the ground

Oil pressure below minimum oil pressure on the ground

If noticed **on ground**, immediately stop the engine and determine the cause.

- Inspect the complete lubrication system, trace cause and rectify. See SI-912-005, latest issue.

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Minimum oil pressure falls below 0.5 bar (7.25 psi) max. 1 min. in flight

If the oil pressure falls below the minimum value up to max. 0,5 bar (7.25 psi) and for max. 1 min., the cause must be determined. Table 5.

Oil pressure below minimum permissible oil pressure up to max. 0.5 bar (7.25 psi) max. 1min. in flight	
Step	**Procedure**
1	Inspect all oil lines for restrictions and clear passage.
2	Verify oil quantity.
3	Inspect pressure sensor.
4	Inspect indicating instrument to specifications of the manufacturer, replace as required.
5	Inspect crankcase pressure (See Installation Manual 912 Series, latest issue.)
6	If no cause for the low oil pressure is found after the above checks, carry out an oil change.
7	If after the previous checks and oil change the oil pressure is still too low, repair or overhaul the engine in accordance with the BRP-Powertrain instructions for continued airworthiness.
8	Inspect all systems for correct functioning.
9	Carry out detailed inspection of the affected engine components.

NOTICE

Replace the oil cooler and oil lines. Before the reinstallation of the engine the complete lubrication system (inclusive oil tank) must be flushed.

Minimum oil pressure in flight more then 0.5 bar (7.25 psi)

Consequent damage can be expected if the oil pressure falls below the minimum value more than 0.5 bar (7.25 psi). Table 6.

Oil pressure below minimum permissible value more than 0.5 bar (7.25 psi) in flight	
Step	**Procedure**
1	The whole cooling system must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness. - Replace the crankshaft.
2	Carry out detailed inspection of the affected engine components.
3	Cut oil filter housing and inspect filter mat for foreign matter.
4	Inspect all further systems for correct functioning.

3.9) Oil specification not respected

General note

NOTES: An entry by the pilot in the engine log book of all pertinent details is required.

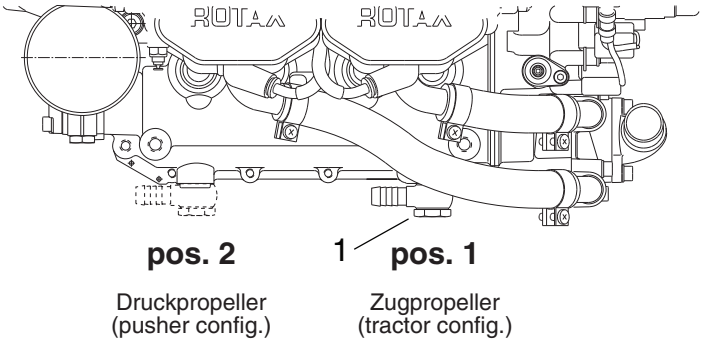
If by error engine was serviced with oil, which does not correspond with oil specification in the Operators Manual and the engine has been in operation for **less than 5 hours**, the following measures must be taken:

less than 5 hr.

Oil specification not respected	
Step	**Procedure**
1	Oil change.
2	Remove the lowest positioned banjo screw (1) (banjo bolt, plug screw or screw socket) and drain the remaining oil from the crankcase. Screw in banjo bolt or plug screw. Tightening torque see Installation Manual 912 Series.
3	Replace oil filter.
4	Drain oil completely from oil cooler.
5	Drain oil from oil tank.
6	Refill oil tank with oil as specified, refer to Operators Manual.
7	Purge air from oil system. See chap. 12-20-00, section: 11.6).
8	Run engine for approx. 1 hour and replace oil and oil filter once more, as stated above.

Graphic

Position of the plug screw or banjo bolt



Part	Function
1	banjo bolt

Fig. 5 02712

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longer than 5 hr.

If the engine has been operated **longer than 5 hours** with engine oil not corresponding with specification in the Operators Manual the following work is required.

Oil specification not respected	
Step	**Procedure**
1	Remove propeller gearbox.
2	The gearbox must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
3	Carry out detailed inspection of the affected engine components.
4	Oil change.
5	Remove the lowest positioned banjo screw (1) (banjo bolt, plug screw or screw socket) and drain the remaining oil from the crankcase. Screw in banjo bolt or plug screw. Tightening torque see Installation Manual 912 Series.
6	Replace oil filter.
7	Check contact surfaces camshaft/hydraulic tappet.
8	Drain oil completely from oil cooler.
9	Drain oil from oil tank.
10	Refill oil tank with oil as specified, refer to Operators Manual.
11	Purge air from oil system. See chap. 12-20-00, section: 11.6).
12	Run engine for approx. 1 hour and replace oil and oil filter once more, as stated above.

3.10) Spark plug not in accordance with specification

General note

If by error any of the spark plugs were installed which are not according to specification of the engine manufacturer and/or not genuine ROTAX parts, the following verification will be necessary.

Spark plug not in accordance with specification	
Step	**Procedure**
1	Mark position of the spark plugs (e.g. cyl. 1 top) and remove all spark plugs.
2	Inspect the spark plugs for damage (formation of melt beads, burn off). At heavy melt beads or bad burn off, inspect the piston dome and cylinder wall by borescope. If parts are damaged, the engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
3	Inspect all systems for correct function.
4	Detailed inspection of affected engine components.
5	Inspect spark plug thread for damage (especially at bad burn off).
6	Differential pressure check. See chap. 12-20-00 section: 5).
7	Change oil and oil filter.

3.11) Non compliance of fuel quality

General note

The use of unsuitable fuel quality has to be entered in the engine log book.

Non compliance with fuel quality	
Step	**Procedure**
1	Visual inspection of engine
2	Empty the fuel system according to the instructions of cell manufacturer
3	Replace fuel filter
4	Flush fuel system
5	Check differential pressure
6	Engine test run

3.12) Smooth performance of the engine

General note

See Fig. 6.

⚠WARNING Risk of electric shock!
Ignition “OFF“ and system grounded! Disconnect negative terminal of aircraft battery.

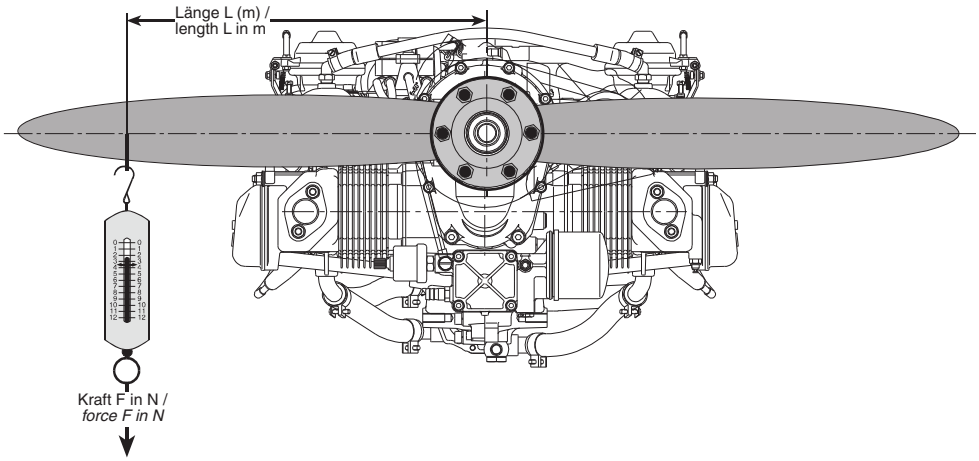
Inspection

Carry out inspection at a temperature from 0° C up to 60° C (140 °F).

Engine runs sluggishly	
Step	**Procedure**
1	Remove spark plug connector and remove 1 spark plug from each cylinder.
2	Torque must be determined with a suitable jig. To do this, determine the maximum occurring torque on the propeller shaft necessary to move the whole crank drive. The torque must be max. 150 Nm (110.64 ft.lb). If the max. permissible torque is exceeded, following inspections are to be performed: - Carry out detailed inspection of the affected gearbox components - Carry out detailed inspection of crank driv

Graphic

Measuring torque required to turn crank drive



NOTES: Always use a propeller guard (edge protection) when performing this inspection.

Fig. 6 05694

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3.13) Reporting

General note

According to the regulation of EASA part 21A.3 / FAR 21.3 the manufacturer shall evaluate field information and report to the authority. In case of any relevant occurrences that may involve malfunction of the engine, the form on the next page should be filled out and sent to the responsible authorized ROTAX distributor.

NOTES: The form is also available from the official ROTAX AIRCRAFT ENGINES Homepage in electronic version.

www.FLYROTAX.com

Register: **Document type/Miscellaneous**

NOTES

Chapter: 12-20-00

SCHEDULED MAINTENANCE

Introduction

This chapter relates in particular to the maintenance work mentioned in the Maintenance Schedule for the various engine systems and covers the work in more detail.

Table of contents

This chapter contains information which is required to perform scheduled servicing on the engine.

2) Checking air filter

General note

NOTICE In the event of dust formation, clean air filter at correspondingly shorter intervals. If filter mat is damaged, replace air filter.

NOTICE A dirty filter insert will not only reduce the engine performance but might also promote premature wear of the engine.

Carry out visual inspection of air filter after prescribed maintenance interval. Clean dirty air filter as described in aircraft manufacturers Maintenance Manual.

2.1) Cleaning the air filter

General note

NOTICE Never use gasoline, steam, caustic liquids, strong detergents, particle cleaning agents or high pressure cleaners during this step.

NOTICE Do not dry over naked flame, with compressed air or with hot air gun.

Cleaning

To clean the air filter the following steps are necessary:
See Fig. 1 and Fig. 2.

NOTES: The procedure for cleaning air filter applies to the K&N style filter supplied by ROTAX (BRP-Powertrain) but may vary for filters used by aircraft manufacturer.

Step	Procedure
1	Lightly tap and brush off surface dirt (**A**).
2	Spray K&N filter cleaner onto filter surface and leave to soak for approx. 10 min. (**B**).
3	Rinse air filter with low pressure water from inside to outside and let element dry naturally (**C**).

Graphic

Cleaning of the filter

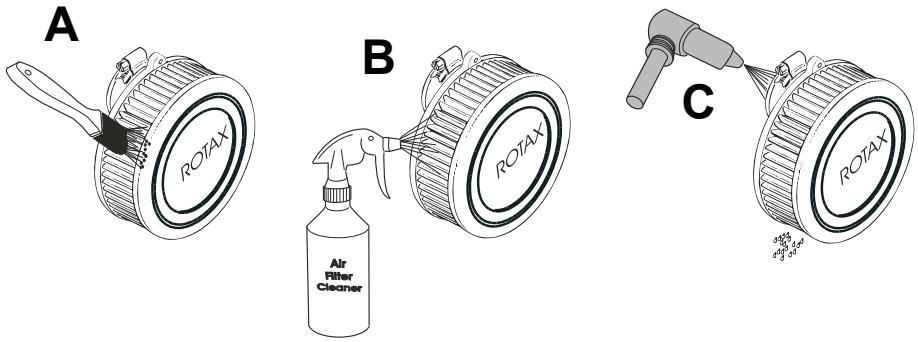

Fig. 1 *08525*

After cleaning

NOTICE Never use gear oil, diesel or engine oil, as they attract humidity.

NOTES: Each filter pleat must be sprayed with oil.

After 5 to 10 min. the filter will be soaked with oil, noticeable by the uniform red coloring.

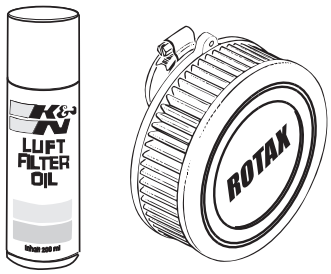

Fig. 2 *08526*

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2.2) Replacing the air filter

General note

See Fig. 3.

NOTICE

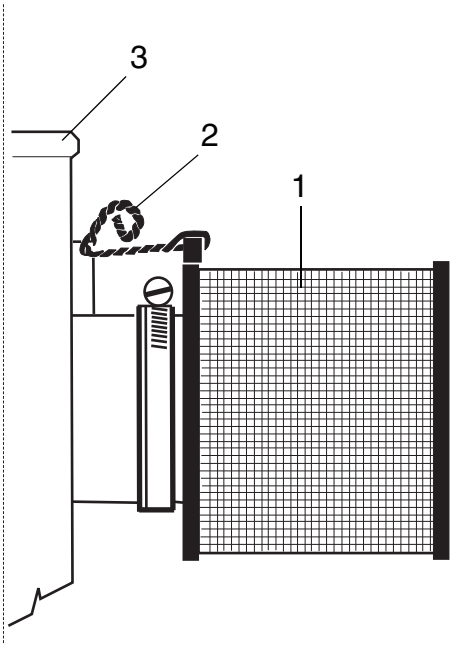
Each air filter must be secured by clamp attachment and a wire securing element. See chap. 05-00-00 section: 1.6). Filter connection must be free of oil.

NOTICE

Attach new air filter, free of grease, at connection faces, and wire-secure against loss.

Graphic

Only use dry type air filters which are specified by the aircraft manufacturer and from ROTAX.



Part	Function
1	Air filter
2	Safety wire
3	Carburetor

Fig. 3 08527

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NOTES

3) Visual inspection

General note

General visual inspection of the engine for damage or abnormalities. For definition and scope of visual inspection (See chap. 05-20-00 section: 3).

Abnormalities

Take note of changes caused by temperature influence.

During a visual inspection you should focus on the following points in particular:

- Exhaust system
- Airbox
- Engine suspension frame
- Heat shrink sleeve
- Oil cooler
- Venting hoses (oil tank)
- Fuel lines
- Cooler
- Coolant hoses

3.1) Checking the engine suspension

General note

NOTICE Exactly observe the tightening torques for screws and nuts. Overtightening or too loose connection could cause serious engine damage.

Checking the engine suspension

Step	Procedure
1	Inspect the engine suspension points on the crankcase for tight fit and damage including cracks.
2	Inspect the surroundings of engine attachment on crankcase and gearbox. If there is discoloration of the crankcase around the attachment points (black ring), there may be loose attachments.
3	Inspect engine isolating mounts for heat damage, wear and cracks.
4	Visual inspection of the engine suspension frame for cracks.

3.2) Corrosion

Definition

Corrosion is a natural process which attacks and potentially damages metals via an electro-chemical reaction. For more detailed information about different types of corrosion and corresponding methods for dealing with corrosion refer to the FAA Advisory Circular AC 43.13.
See chapter “AC 43.13-1B Maintenance and Repair“.

4) Leakage check

General note

NOTICE Leaking connections can lead to engine problems or engine failure!

Visual inspection of the whole engine for leaks. If leaks are visible, locate the cause and remedy the fault.

Instruction

NOTES: If a leak is suspected, then the following check is possible:

Step	Procedure
1	Cleaning the engine.
2	Operate the engine until the temperatures have stabilized for a period of 5 min (engine oil temperature between 50 to 70 °C (122 - 160 °F).
3	Switch off ignition and secure engine against unintentional operation. Secure aircraft against unauthorized operation.
4	For a period of 1 minute after the engine has been stopped, no liquid must drip down.

Water pump

Checking water pump for leaks.

If the leakage bore, located at the base of the ignition housing, is dripping oil, the oil seal on the water pump shaft may be defective and must be replaced. In the case of coolant drips at the leakage bore, the coolant mechanical seal must be replaced (inspect the quality of the coolant).

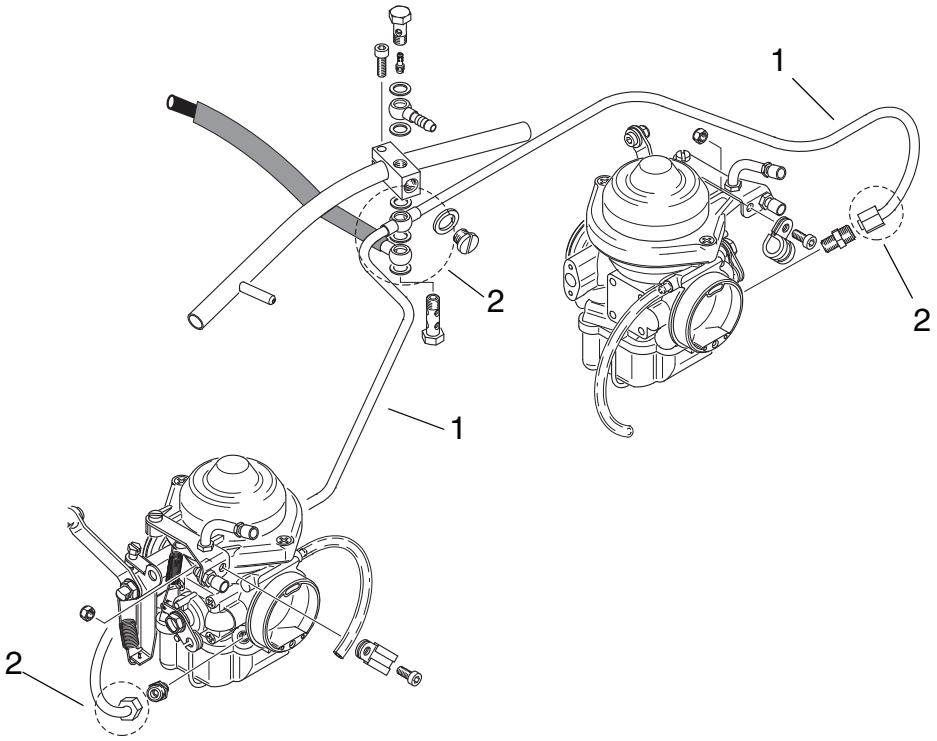
Fuel lines

Inspect fuel lines, their connections and screw fasteners. Look for scuffing marks.

NOTICE Avoid overstretching the fixing elements. Always comply with the specified torque!

Detailed visual inspection specially on steel fuel lines in the area of connections (fittings) (2) for leaks and cracks is necessary. See Fig. 4.

Graphic Connections and fuel lines



Part	Functions
1	Fuel lines (Steel)
2	Connections (Fittings)

Fig. 4 09034

Fuel pump Inspect fuel pump and isolating flange for leaks.For a period of 1 minute after shut down the engine must not drip oil out of the venting tube. In case of uncertainty determine the oil amount. An oil leak is when after 20 min engine run more than 0.5 ml of oil loss is detected.

Coolant hoses Check coolant hoses and connections and fittings for leakage. Examine the surrounding area to see if there are any leaks!

Oil lines Inspect all oil feed lines from the oil tank to the oil cooler and to the engine. Also inspect the oil return line from the crankcase to the oil tank. Check the pressure oil line from the oil pump to the governor flange of the governor.

Hose clamps, kinks Check all hoses, particularly in the area of the hose clamps and hose connections, for porosity, damage and kinks. If damage is detected, replace hose immediately.

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5.1) Compression check for fault-tracing

General note

In the course of fault-tracing a **compression check** can also be performed.

A compression tester is required to check compression. The compression should be between 9 and 12 bar (130 and 174 psi).

Instruction

Compression check for fault-tracing.

Step	Procedure
1	Operate the engine until the temperatures have stabilized for a period of 5 min (engine oil temperature between 50 to 70 °C (122 - 160 °F).
2	Unscrew and remove top spark plugs.
3	Press compression tester (1) over the spark plug hole and use the starter to turn the engine over with open throttle until maximum pressure is reached.
4	Successively take readings on all four cylinders and compare results.

Measurement

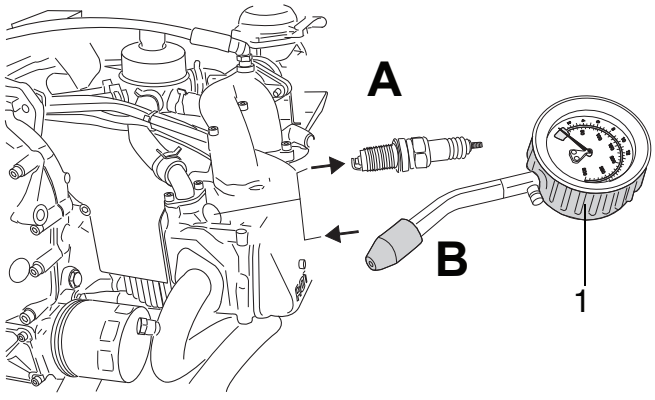
Individual readings for the cylinder must not differ by more than 2 bar (29 psi).

If the value is below 6 bar (87 psi), inspection, repair or overhaul must be carried out in accordance with the BRP-Powertrain instructions for continued airworthiness.

- Detailed inspection of affected engine components.

Graphic

Compression check for fault-tracing



Part	Function
1	Compression tester

Fig. 6 08651

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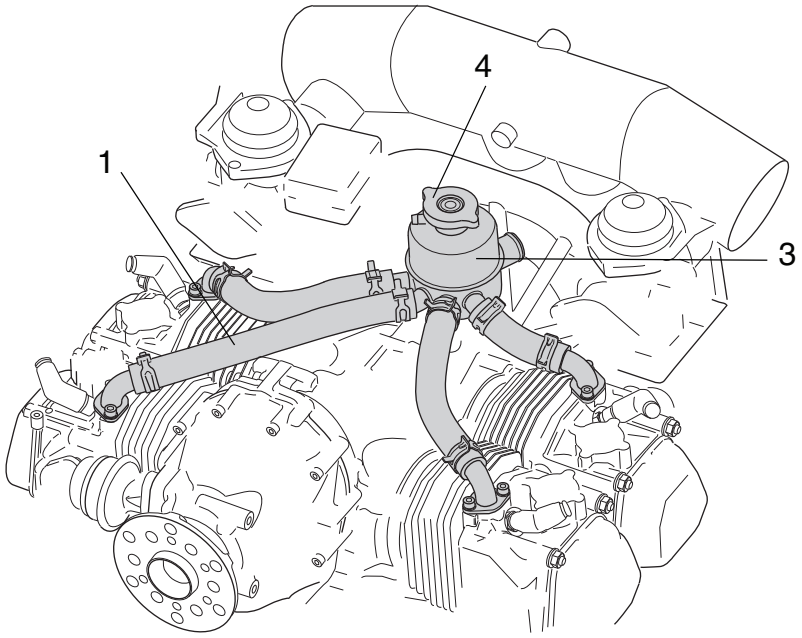
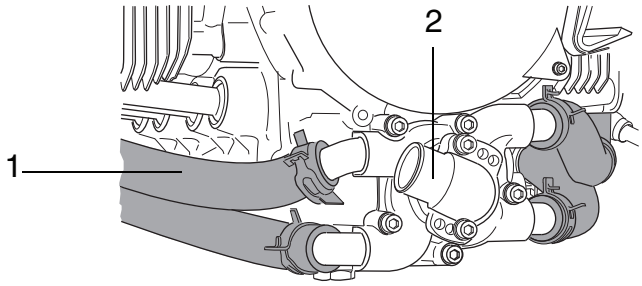
NOTES

9) Cooling system

9.1) Checking the cooling system

Overview





Part	Function
1	Coolant lines
2	Water pump
3	Expansion tank
4	Radiator cap with gasket

Fig. 11 08532

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General note

⚠WARNING Risk of severe burns and scalds!
Hot engine parts!
Always allow engine to cool down to ambient temperature before start of any work.

See Fig. 11.

Coolant hoses Carry out visual inspection of all coolant hoses (1) for damage, leaks, hardening as a result of heat and porosity.

Water pump Inspect all connections on the top and bottom of the cylinder head and on the water pump (2).

Expansion tank Inspect expansion tank (3) for damage. Inspect protection rubber at the bottom of the tank for tight fit.

Radiator cap Inspect the gasket of the radiator cap (4) and check the pressure release valve and return valve for proper operation.

See chap. 12-20-00 section: 9.4).

9.2) Replacing the coolant

General note See Fig. 12.

⚠WARNING Risk of severe burns and scalds!
Never open the radiator cap when the cooling system is hot. For safety's sake, cover cap with a rag and open slowly. Sudden opening of the cap could provoke the escape of boiling coolant and result in scalding.

NOTICE Use only coolant as recommended in the current Operators Manual and also see SI-912-016.

ENVIRONMENT NOTE
Coolant and mixtures of coolant and water have to be treated as hazardous waste!

Instruction To replace the coolant the following steps are necessary:

Step	Procedure
1	Open the radiator cap on the expansion tank.
2	Remove the bottom attachment screw (1) (with sealing ring) of water pump (2).

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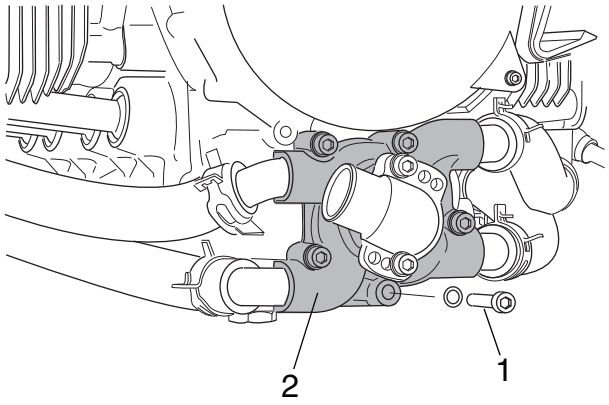
Step	Procedure
3	Drain the engine coolant. NOTES: If the radiator is located below the engine, also detach the lowest positioned coolant hose.
4	Fit attachment screw (stainless steel) along with a new sealing ring. Tighten to 10 Nm (90 in.lb).
5	If the coolant is being replaced with a different type, (conventional coolant, waterless coolant) the cooling system must be flushed. See chap. 12-20-00 section: 9.3).
6	Refill newly mixed coolant into the expansion tank (highest point of the cooling system). See chap. 12-10-00 section: 3.1).
7	Fit radiator cap.
8	NOTES: Run the engine briefly and replenish with clean coolant as required.

Graphic

Replacing the coolant



Part	Function
1	Attachment screw (stainless steel)
2	Water pump

Fig. 12 08533

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9.3) Flushing the cooling system

General note

⚠WARNING Hot steam can cause scalds in the face and on hands! Never open the radiator cap when the cooling system is hot. For safety's sake, cover cap with a rag and open slowly.

Instruction

To flush the coolant the following steps are necessary:

Step	Procedure
1	The system is flushed using pure water at a pressure of 2 bar (29 psi). ***NOTICE*** Where water-free coolant is used, the cooling system must be drained of water correspondingly after flushing. The residual water must not exceed the max. permissible limit prescribed by the coolant manufacturer. NOTES: For the flushing, open the lowest located coolant hose (either at water pump or radiator).
2	Refill newly mixed coolant into the expansion tank (highest point of the cooling system). See chap. 12-10-00 section: 3.1).
3	Fit radiator cap.
4	NOTES: Run the engine for a minute and replenish coolant as required.

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10) Fuel system

10.1) Carburetor synchronization

Idle speed

Checking the synchronization at idle speed

See Fig. 15.

For smooth idling, synchronization of the throttle valves is necessary. When synchronizing, slacken both bowden cables (throttle lever lies close on the adjustment screw).

Instruction

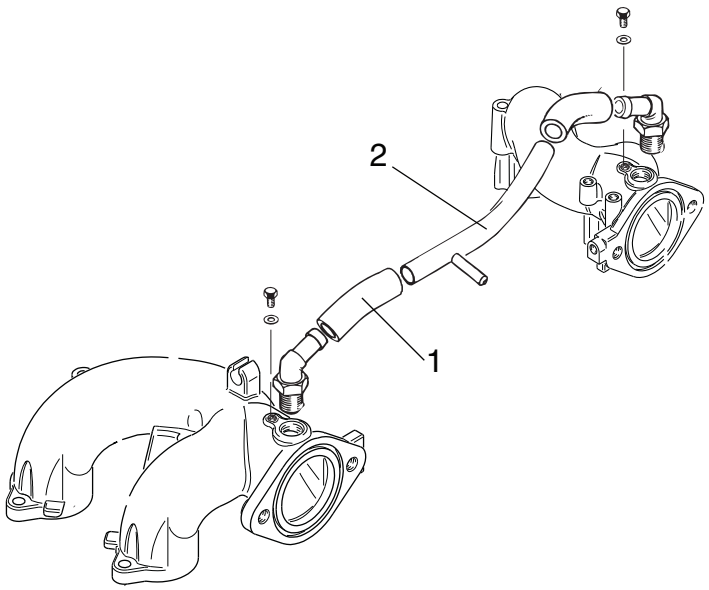
To synchronize when idling the following steps are necessary.

Step	Procedure
1	Detach the resonator hose (1) of the compensating tube (2) to separate the two air intake systems. In this condition, a slight difference in the engine running should be noticeable.

NOTES: First carry out the mechanical synchronization and then the pneumatic synchronization (if required).

Graphic

Synchronization at idle speed



Part	Function
1	Resonator hose
2	Compensating tube

Fig. 15 05491

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10.2) Mechanical synchronization

General note

See Fig. 16.

⚠WARNING Danger of life threatening injuries caused by the propeller, rotating and stressed parts of the engine! Always observe the engine from a safe place while it is running.

Basic throttle adjustment

For synchronous basic throttle adjustment proceed as follows.

Step	Procedure
1	Remove cable fixation (4) on throttle lever (1).
2	Return the throttle lever (1) to its idle stop position (3) by hand. There should be no resistance during this procedure.
3	Unscrew idle speed adjustment screw (2) until it is free of the stop.
4	Insert a 0.1 mm (0.004 in.) feeler gauge (gap X) between the idle speed adjustment screw (2) and the carburetor idle stop (3), then gently turn the idle screw clockwise until contact is made with the 0.1 mm (0.004 in.) feeler gauge.
5	Pull out the feeler gauge and then turn each idle speed adjustment screw (2) 1.5 turns clockwise.
6	Gently turn each idle mixture screw (6) (clockwise) until it is fully inserted and then reopen by 1.5 turns counter clockwise.
7	Check that the throttle valve opens fully automatically.
8	Adjust the two bowden cables for simultaneous opening of the throttle valves.

Carry out the above procedure on both carburetors.

Synchronization

You must at this point place the throttle lever in the cockpit to the idle stop position. It is an advantage at this point to enlist the help of an assistant to ensure that the throttle lever remains in this position during the next steps of the synchronization process.

Step	Procedure
1	As soon as the throttle lever in the cockpit remains is in the idle stop position, check the throttle valve lever (1) to the carburetor idle stop position (3).
2	Using the cable fixation (4), secure the bowden cable accordingly.
3	As soon as the two carburetor bowden cables are installed (throttle lever in cockpit in idle position), you must check that the idle speed adjustment screw (2) rests fully on the idle stop (3) without pressure.

11.2) Oil change

Procedure

NOTES: Run engine to warm oil before beginning oil change procedure.

To change the oil the following steps are necessary:

Step	Procedure
1	Crank engine by hand to transfer the oil from the crankcase. See chap. 12-10-00 section: 4.1).
2	Remove safety wire and oil drain screw from the oil tank, drain the used oil and dispose of as per environmental regulations.
3	Replace oil filter at each oil change and inspect the filter insert. See chap. 12-20-00 section: 11.4).
4	Dispose of oil filter according to environmental regulations.
5	Install oil drain screw with new gasket with tightening torque 25 Nm (18 ft.lb) and safety wire.

NOTICE

Only use brand name oil in accordance with the latest Operators Manual and SI-912-016, “Selection of suitable operating fluids“ latest issue.

NOTICE

The engine must not be cranked when the oil system is open. When the crankshaft was turned, then the oil system must be purged.

NOTICE

Compressed air must not be used to blow through the oil system (or oil lines, oil pump housing, oil bores in the housing).

ENVIRONMENT NOTE

Be careful that no oil enters the sewerage system or the soil -
Risk of contamination of drinking water!
Collect waste oil and take it to the recycling center.

Step	Procedure
6	Install new oil filter.
7	Pour in approx. 3l (0.8 gal (US)) of fresh oil.
8	After carrying out the oil change, the engine should be cranked by hand in the direction of engine rotation (approx. 20 turns) to completely refill the entire oil circuit.

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11.3) Oil filter replacement

General note

⚠WARNING

Risk of severe burns and scalds!
Hot engine parts!
Always allow engine to cool down to ambient temperature before start of any work.

NOTICE

To ensure correct functioning of the oil circuit and the forced flow lubrication, use GENUINE ROTAX-oil filter only. Only these filters will ensure correct pressure in the by-pass valve.

At every oil change, unscrew the oil filter and cut open using special tool taking care not to produce chips.

Special tool

To carry out the procedure the following steps are necessary:

part number	Description
part no. 877620*	(1) Oil filter wrench
part no. 877670*	(2) Cutting tool
* or equivalent	

Graphic

Special tool

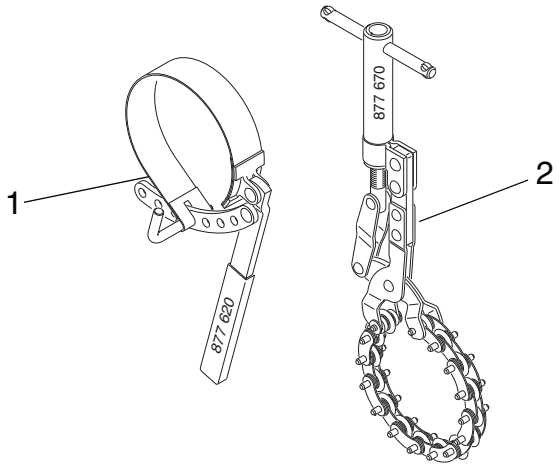

Fig. 25 02734

11.3.1) Install/Remove of oil filter

General note

See Fig. 26.

NOTICE

After test run inspect tight fit of oil filter.

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Procedure

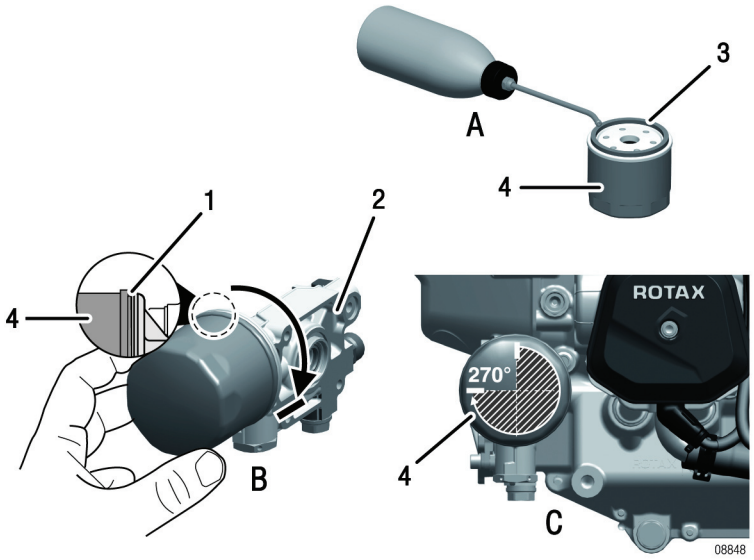
To install/remove the oil filter the following steps are necessary:

Step	Procedure
1	Remove used oil filter with oil filter wrench.
2	Clean the contact surface (1) of the oil pump housing (2) with a clean cloth.
3	Apply a thin film of engine oil on the gasket (3) of the new oil filter (4).
4	Install the new oil filter on the engine.
5	Screw on oil filter until oil filter gasket is seated solidly. NOTE: Sign 270 °C-mark on oil pump housing, so that the tightening of oil filter can be controlled.
6	Tighten oil filter with 3/4 turn (270°).
7	Inspection of used oil filter. See therefore chap. 12-20-00 section 11.4).

Inspect all systems for correct function.

Graphic

Install oil filter.



Part	Function
1	Contact surface
2	Oil pump housing
3	Gasket
4	Oil filter

Fig. 26 *08550*

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11.4) Inspection of the filter insert

General note

NOTICE The filter insert must be inspected carefully for metal chips.

This inspection is important as it allows conclusions to be drawn regarding the internal condition of the engine and provides information about the possible cause of any damage.

Procedure

To carry out the procedure the following steps are necessary:

Step	Procedure
1	Oil filter cut open using special tool taking care not to produce chips.
2	Remove filter insert.
3	Cut top and bottom edges off the mat with a knife.
4	Remove filter mat, fold up and press remaining oil out.
5	Unroll and inspect it for metal chips, foreign matter, contamination and abrasion.
6	Pass over matt with a clean magnet and inspect for metal.

Possible foreign matter

Steel chips	Bronze chips
Aluminium chips	Sliver of bearing material
Remains of sealing compound	Plastic (thrust washer)
Carbon fiber	Sliver of copper

Increased foreign matter

If an increased amount of metal particles is found, such as brass- or bronze chips or sliver from bearing abrasion, repair or overhaul the engine in accordance with the BRP-Powertrain instructions for continued airworthiness. If the filter mat is clogged by foreign matter, the lube oil reaches the bearing points unfiltered via the by-pass valve in the oil filter.

Unclear findings

In the case of unclear findings:

Step	Procedure
1	Flush the oil circuit.
2	Fit a new oil filter.
3	Engine test run. See chap. 12-20-00 section: 8).
4	Inspect the oil filter once more.

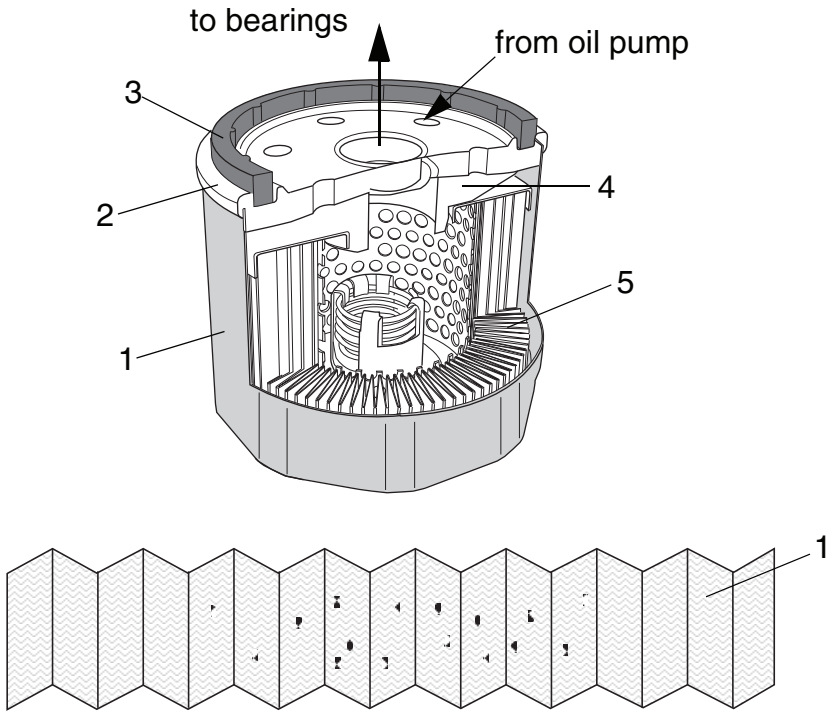
Contaminated

NOTICE

If the oil circuit is contaminated, replace the oil cooler and flush the oil circuit. See chap. 12-20-00 section: 11.7). Proper judgement requires years of experience in repair of piston engines.

Graphic

Oil filter



Part	Function
1	Filter housing
2	Filter cover
3	Gasket ring
4	Filter element
5	Filter mat

Fig. 27 *08427,00181*

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11.5) Cleaning the oil tank

See Fig. 28.

Procedure

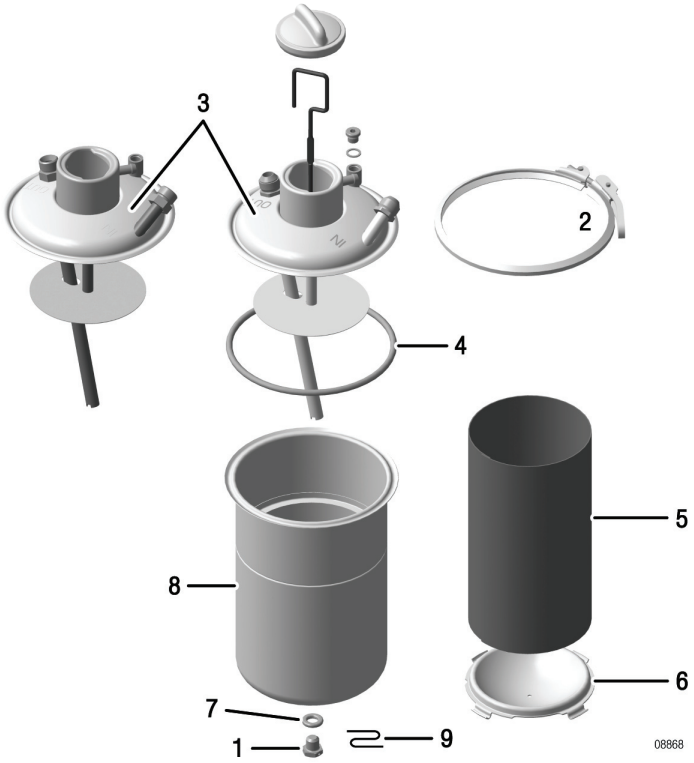
Procedure to clean the oil tank:

Step	Procedure
1	Detach the profile clamp (2) and remove the oil tank cover (3) together with the O-ring (4) and the oil lines.
2	Remove the inner parts of the oil tank such as the baffle insert (5) and the partition (6).
3	Clean oil tank (8) and inner parts (5, 6) and check for damage.

NOTICE Incorrect assembly of the oil tank components can cause engine faults or engine damage.

Step	Procedure
4	Fit hex.Double ignition screw (1) M12x12 with a new gasket ring (7). Tighten to 25 Nm (18.5 ft.lb).
5	Safety wire (9).
6	Reassemble the oil tank by following the same steps in reverse order.
7	Purge the oil system.

Graphic Cleaning the oil tank



Part	Function
1	Hex. screw M12x12
2	Profile clamp
3	Oil tank cover
4	O-ring
5	Baffle insert
6	Partition
7	Gasket ring
8	Oil tank
9	Safety wire

Fig. 28

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11.6) Purging the oil system

General note

NOTICE

Purging of the oil system is extremely important for operation and service life of the engine and therefore the procedure must be followed meticulously. It must be carried out in accordance with SI-912-018,“Purging the lubrication system“, latest issue.

Procedure

Purging the oil system is necessary:

- before each first start up (e.g. after overhaul)
- after maintenance work during which the lubrication system was opened and voided.
- when engine was cranked with open oil lines (e.g. during oil change).
- when oil system or oil lines were blown through with compressed air.

11.7) Flushing the oil circuit

General note

⚠WARNING

Risk of electric shock!
Switch off ignition and remove key! Disconnect negative terminal of aircraft battery.

Oil lines

Dismantle and flush oil lines as per instructions of the aircraft manufacturer.

Oil tank

Clean the oil tank.

Temporary oil lines

Temporary oil lines (only for flushing) must be fitted so that the oil cooler is not connected. The return line is routed into a separate, clean receptacle and not back to the oil tank.

NOTES: Otherwise, metal chips could penetrate the radiator or oil tank during flushing.

Filling

Fill the oil tank with approx. 3 l (0.8 gal (US)) of engine oil.

Procedure

The following steps have to be carried out after refilling:

NOTICE

The oil level in the tank must not drop below the end of suction pipe, otherwise air will be sucked in again.

12) Inspecting the magnetic plug

General note

See Fig. 29.

NOTES: The magnetic plug is located on the crankcase between cylinder 2 and gearbox.

This inspection is important because it allows conclusions to be drawn on the internal condition of the gearbox and engine and reveals information about possible damage.

Procedure

Remove the magnetic plug and inspect it for accumulation of chips.

Steel chips in low numbers

Steel chips in low numbers as depicted in Fig. 29 can be tolerated if the accumulation is below 3 mm (0.125 in).

Steel chips in larger numbers

If there are larger accumulations of metal chips on the magnetic plug, the engine must be repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.

Unclear findings

In the case of unclear findings:

Step	Procedure
1	Flush the oil circuit.
2	Fit a new oil filter.
3	Engine test run. See chap. 12-20-00 section: 8).
4	Inspect the oil filter once more.

Contamination

NOTICE

If the oil circuit is contaminated, replace the oil cooler and flush the oil circuit.
See chap. 12-20-00 section: 11.7)11.7). Detailed inspection of affected engine components.

Trace the cause and remedy.

Graphic

Inspecting the magnetic plug.

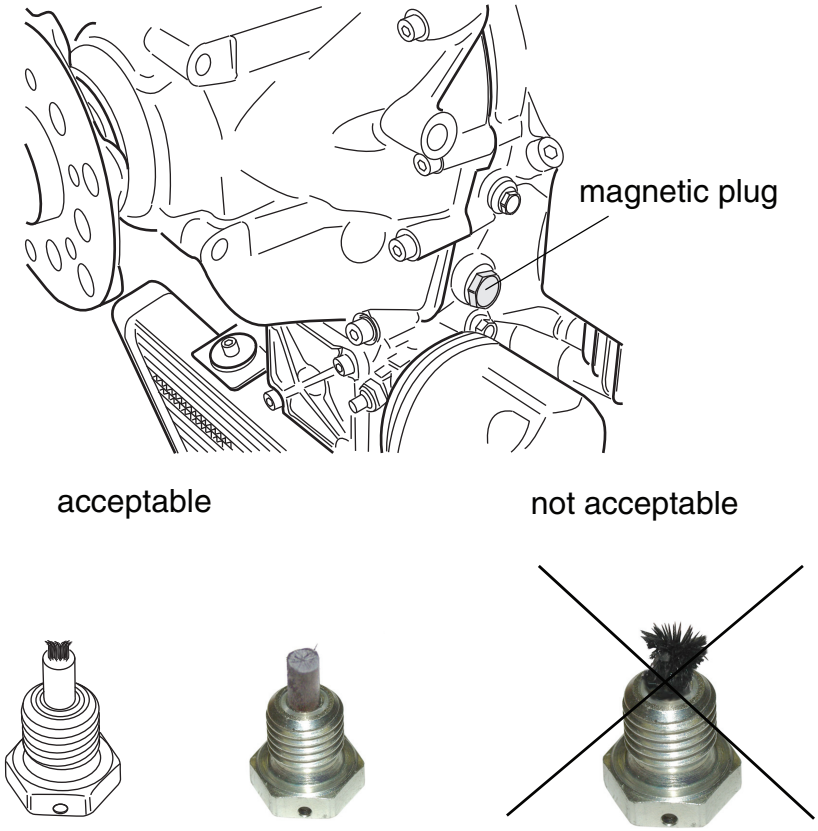

Fig. 29 *08565,08566,08564,08563*

12.1) Installation of the magnetic plug

Install

The following steps are necessary:

Step	Procedure
1	Clean the magnetic plug and oil tank.
2	Install magnetic plug. Tightening torque 25 Nm (18 ft.lb)
3	Install safety wiring.

Inspect all system for correct function. Detailed inspection of affected engine components.

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14) Propeller gearbox

General note

NOTES: The following “free rotation check“ and “friction torque check“ are necessary only on engines with the overload clutch as optional extra.

Engine without the overload clutch

Engines without the overload clutch (slipper clutch) have no free rotation.

For this reason the friction torque method cannot be applied on engines without overload clutch.

14.1) Checking the friction torque in free rotation

General note

See Fig. 32.

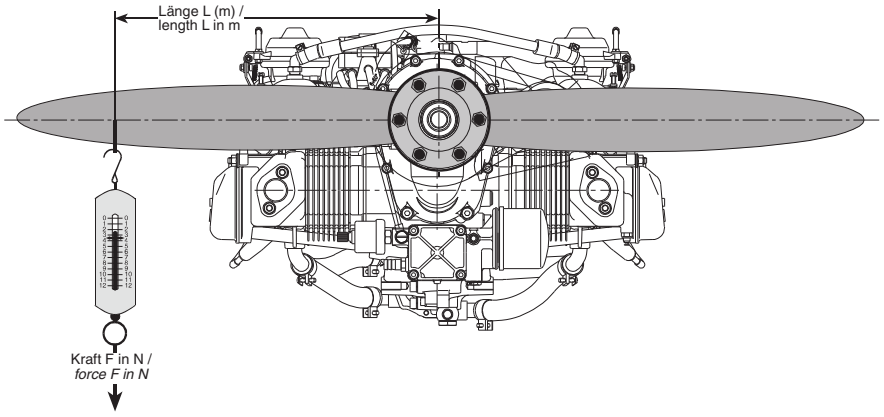
⚠WARNING Risk of electric shock!
Switch off ignition and remove key! Disconnect negative terminal of aircraft battery.

Test procedure

The following steps are necessary for the testing procedure:

Step	Procedure
1	Fit the crankshaft locking pin. See chap. 12-20-00 section: 7).
2	With the crankshaft locked, the propeller can be turned by hand 15 or 30 degrees depending on the profile of the dog gears installed. This is the maximum amount of movement allowed by the dog gears in the torsional shock absorption unit.
3	Turn the propeller by hand back and forth between ramps, taking into consideration the friction torque. No odd noises or irregular resistance must be noticeable during this moment.
4	Attach a calibrated spring scale to the propeller in distance (L) from the center of the propeller. Measure the force required to pull the propeller through the 15 or 30 degree range of free rotation.
5	Calculate friction torque (Nm) by multiplying the force (N) obtained on the spring scale by the distance the scale is attached from the center of the propeller (L). The friction torque must be between 30 Nm and max. 60 Nm (22 to 44.3 ft.lb). See calculation example. ***NOTICE*** If the above mentioned friction torque is not achieved, inspect, repair or overhaul the gearbox in accordance with the instructions for continued airworthiness.
6	Remove crankshaft locking pin. See chap. 12-20-00 section: 7).

Graphic Checking the friction torque.



Friction torque (Nm) = L (m) (ft) x F (N) (lbf)

Fig. 32 *05694*

14.2) Checking the propeller gearbox

General note The gearbox must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.

Detailed inspection of the affected gearbox components in accordance chap. 72-00-00 section: 3.9) in the Heavy Maintenance Manual.

Crack testing of the propeller shaft is not normally planned, but can be carried out if cracks are suspected.