

# **SERVICE INSTRUCTION**

## **PURGING OF LUBRICATION SYSTEM**

### **FOR ROTAX® ENGINE TYPE 912 AND 914 (SERIES)**

**SI-912-018**

**SI-914-020**

#### **Repeating symbols:**

Please, pay attention to the following symbols throughout this document emphasizing particular information.

▲ **WARNING:** Identifies an instruction, which if not followed, may cause serious injury or even death.

■ **CAUTION:** Denotes an instruction which if not followed, may severely damage the engine or could lead to suspension of warranty.

◆ **NOTE:** Information useful for better handling.

#### **1) Planning information**

##### **1.1) Engines affected**

All versions of the engine type:

- 912 (Series) all serial numbers
- 914 (Series) all serial numbers

##### **1.2) Concurrent ASB/SB/SI and SL**

Further to this Service Instruction the following additional Service Instructions and Service Bulletins must be observed and complied with:

- SI-912-010 oil change, current issue
- SI-914-011 oil change, current issue
- SI-912-016 Selection of suitable operating fluids for Rotax engine type 912 and 914 (series), current issue
- SI-914-019 Selection of suitable operating fluids for Rotax engine type 912 and 914 (series), current issue
- SI-27-1997 Oil level check for ROTAX engine type 912 and 914 (Series), current issue

##### **1.3) Reason**

ROTAX® was informed of a limited number of engine failures in the field resulting from a lack of proper oil purging after the engine had been first installed and /or the engine had been re-worked. This Service Instruction should help to make sure that the engines do not suffer such engine failures in the field. As air can be trapped in the valve tappets and cause valve train failure it is very important to complete these instructions in their entirety.

##### **1.4) Subject**

Purging of lubrication system

##### **1.5) Compliance**

These inspections have to be performed

- before first engine run,
- after re-installation (e.g. after overhaul),
- after lubrication system opened or drained during maintenance work (e.g. removal of oil pump, oil cooler or suction line).

##### **1.6) Approval**

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

##### **1.7) Manpower**

Estimated man-hours:

engine installed in the aircraft - - - manpower time will depend on installation and therefore no estimate is available from the engine manufacturer.

**1.8) Mass data**

change of weight - - - none  
moment of inertia - - - unaffected

**1.9) Electrical load data**

no change

**1.10) Software accomplishment summary**

no change

**1.11) References**

In addition to this technical information refer to current issue of

- Operator’s Manual (OM)
- Installation Manual (IM)
- all relevant Service Instructions (SI)
- all relevant Service Bulletins (SB)
- Maintenance Manual (MM)

◆ NOTE: The status of Manuals can be determined by checking the table of amendments of the Manual. The 1<sup>st</sup> column of this table is the revision status. Compare this number to that listed on the ROTAX WebSite: [www.rotax-aircraft-engines.com](http://www.rotax-aircraft-engines.com). Updates and current revisions can be downloaded for free.

**1.12) Other publications affected**

The following documentations must be replaced as a consequence of this Service Instructions and will become invalid therefore.

- SI-04-1997 “Venting of lubrication system“, current issue
- SB-912-036 “Inspection for correct venting of the oil system“, current issue
- SB-914-022 “Inspection for correct venting of the oil system“, current issue

**1.13) Interchangeability of parts**

not affected

**2) Material Information**

parts requirement:

Fig.no.	New p/n	Qty/engine	Description	Old p/n	Application
	881920	1	O-ring set		valve cover
consisting of:					
	-	4	O-Ring 105x2,5	250285	valve cover
	-	4	O-Ring 6,4x1,8	430205	valve cover

◆ NOTE: Additional new parts are only necessary if wear was found in the engine valve train. Order only the current need in accordance with Illustrated Parts Catalog (IPC), current issue.

**2.1) Material - cost and availability**

none

**2.2) Company support information**

none

**2.3) Material requirement per engine**

parts requirement  
none

**2.4) Material requirement per spare part**

none

**2.5) Rework of parts**

none

**2.6) Special tooling/lubricant-/adhesives-/sealing compound - Price and availability**

none

### 3) Accomplishment / Instructions

#### Accomplishment

All the measures must be taken and confirmed by the following persons or facilities:

- ROTAX<sup>®</sup> -Airworthiness representative
- ROTAX<sup>®</sup> -Distributors or their Service Centers
- Persons approved by the respective Aviation Authority

▲ **WARNING:** Proceed with this work only in a non-smoking area and not close to sparks or open flames. Switch off ignition and secure engine against unintentional operation. Secure aircraft against unauthorized operation. Disconnect negative terminal of aircraft battery.

▲ **WARNING:** Risk of scalds and burns! Allow engine to cool sufficiently and use appropriate safety gear while performing work.

▲ **WARNING:** Should removal of a locking device (e.g. lock tabs, self-locking fasteners, etc.) be required when undergoing disassembly/assembly, always replace with a new one.

◆ **NOTE:** All work has to be performed in accordance with the relevant Maintenance Manual.

#### 3.1) Instructions

##### 3.1.1) Purging of lubrication system

(see fig. 1).

- Verify that oil tank connections are connected correctly and secured, and that the oil cooler (if fitted) is in the suction line (1) between the oil tank and the oil pump inlet. Verify that the oil tank is filled up to the maximum level (to the top of the flat portion of the dipstick). Additional oil (up to 0.5 litre) may be added to the tank for the purpose of this procedure.

◆ **NOTE:** Consult appropriate engine installation manual for diagrams to identify oil tank and oil pump connections. Older engines may be equipped with oil tanks that have oil ports in different locations.

■ **CAUTION:** Incorrectly connected oil lines to the oil tank or to the engine will result in severe engine damage.

- Disconnect oil line (2) at the oil tank connection.
- Place the free end (3) of the return oil line into a suitable container (4) below the engine.
- Plug open connection (5) at the oil tank with suitable air tight cap. See fig. 1
- Remove the spark plug connectors.
- For easier rotation of engine remove one spark plug from each cylinder.

■ **CAUTION:** Prevent entering of foreign substance through spark plug hole.

- Using a compressed air line, pressurize the oil tank through its breather connection (6) (on the neck of the tank). Adjust the compressor outlet regulator so that the air line pressure is between 0,4 (6 psi) and 1 bar (15 psi). Do not exceed 1 bar (15 psi).

◆ **NOTE:** Oil tank cover is not designed to hold pressure. Some air will escape.

▲ **WARNING:** Do not remove oil tank or cover before ensuring that air pressure has been completely released from the tank.

- The pressure in the oil tank has to be maintained during the following step.

■ **CAUTION:** It is possible to empty the oil tank and as a result introduce more air into the oil system. Pay attention to the oil level and fill tank as required.

- Turn the engine in direction of normal rotation until the first pressure indication on the oil pressure gauge. Normally this will take approx. 20 turns. Depending on installation it may take up to 60 turns.
- Release the pressure from the oil tank.

- Un-block the oil return port on (5) the oil tank and reconnect the engine return oil line (2) to the oil return port on the oil tank.

■ **CAUTION:** Ensure that the oil suction line (1) and engine oil return lines (2) are connected to the proper fittings on the oil tank. If the oil lines from the engine to the oil tank are incorrectly connected at the oil tank, severe engine damage may result.

- Replace spark plugs and restore aircraft to original operation condition.
- Residual oil will have accumulated in the crankcase, return it to the oil tank by following the oil check procedures in Operators Manual (or SI-27-1997 Oil level check for ROTAX<sup>®</sup> engine type 912 and 914 (Series), current issue).

- Add oil to engine oil tank to bring the oil level up to the full mark on the dipstick.
- ▲ **WARNING:** Carefully check all lubrication system connections, lines and clamps for leaks and security.

#### **3.1.1.1) Purging of turbocharger lubrication system on ROTAX® 914 (Series)**

- ▲ **WARNING:** Observe the appropriate safety precautions. Make sure that there are no foreign items including tools in the engine compartment. Secure aircraft to the ground appropriately and place chocks under the wheels. Secure propeller zone to warrant safety for persons and property. Be sure to approach only from engine side of propeller. Permanently supervise engine operation from a secure position. The cockpit must be occupied during the testing by a licensed pilot or an authorized person to conduct test runs of an aircraft.

To verify operation of the turbo charger oil circuit detach the turbo sump oil return line (7) on the oil tank (banjo bolt M10x1x19) and route the line to a separate container. Start the engine in accordance to 3.1.2 and observe if oil is being returned back.

If oil is not flowing back within 10 sec. stop the engine immediately and find the trouble. Repeat previous steps until proper oil flow is observed. The engine must not be started before rectification.

Fit the turbo sump oil return line (7) on oil tank and tighten to 17 Nm (150 in.lb).

- Restore aircraft to original operating configuration.

#### **3.1.2) Warming up period**

- Ensure that all engine and actuation system like carburetor actuation , cooling system, ignition switch and propeller are installed and tested O.K. according to specifications of airframer.
- ◆ **NOTE:** At a new installation or modifications to installation do not start the engine before all installation checks are finished.
- Connect negative terminal of aircraft battery.
- Start engine and observe oil pressure.
- **CAUTION:** If oil pressure does not raise within 5 sec. after engine start, stop engine again. Do not start engine before lubrication system was checked and purging procedure was repeated.  
Repeated test starts with no indicated oil pressure will severely damage the engine.
- Run engine for about 2 min. at 2000 rpm. Then warm up engine at 2200 to 2500 rpm depending on ambient temperature until an oil temperature of 50 °C (122 °F) is reached.
- Check temperature and pressure values.
- Stop engine and secure aircraft against unauthorized operation.
- Refill oil level in the tank to max. mark. Do not overfill, otherwise oil would exit through vent hole during operation. At oil level check the max. mark must not be exceeded.

### 3.1.3) Inspect for correct purging of hydraulic valve tappets

(See fig. 2)

The subsequent check procedure describes the correct method to verify adequate priming of hydraulic valve tappets.

■ CAUTION: Engine has reached operating temperatures here. Use appropriate safety equipment and clothing.

- Remove valve cover on cylinder 1.
- Turn crankshaft in direction of normal rotation so that the piston on cylinder 1 is on ignition top dead center (both valves are closed).
- Press on push rod side of rocker arm with a force (F) of about 70 N (15.0 lbf.) for about 3 sec.. Approximate force can be verified with a fan belt tester. Repeat on other rocker arms.
- Check distance between rocker arm and valve contact surface. Max. allowable distance 0,5 mm (0,02 in.).
- Repeat on all other cylinders.

■ CAUTION: If it is possible to push the valve tappets further than this limit, an additional engine run for about 5 min. at 3500 rpm after refitting the valve covers. To get the hydraulic valve tappets primed, this process can be repeated another 2 times.

### 3.1.4) Replacement of components

If a malfunction of hydraulic valve tappet should be found during this check of priming process, the relevant hydraulic valve tappet has to be replaced. The valve spring support has to be inspected for wear.

All work has to be performed in accordance with the relevant Maintenance Manual.

- Inspect valve spring support (8). Measure the wear referring to the reference surface (inner area of valve spring support) in radial direction (9) to outer side with a dial gauge. Value  $t = \max. 0,04 \text{ mm (0,0016 in.)}$ . See fig. 3. An exceeding of max. 0,04 mm (0,0016 in.) is not acceptable.

◆ NOTE: The valve spring support indicates a possible malfunction of valve train caused by incorrectly or insufficiently purged hydraulic valve tappets. At standard conditions no wear is visible even after a long time of operation. If the visual inspection shows some wear on the valve spring support surface, measure the actual wear with a dial gauge.

If the valve spring support indicates wear, replace valve spring retainer, valve spring support, both valve cotters, valve and hydraulic valve tappet. Additionally perform a detailed visual inspection of relevant valve train components of push rod, rocker arm and valve spring for abnormal wear condition.

Carry out further warm up and inspection of the hydraulic valve tappets in compliance with section 3.1.2) and 3.1.3) until all 8 hydraulic valve tappets are hard and the max. allowable distance is not exceeded.

### 3.2) Test run

Conduct test run including ignition check and leakage test.

### 3.3) Summary

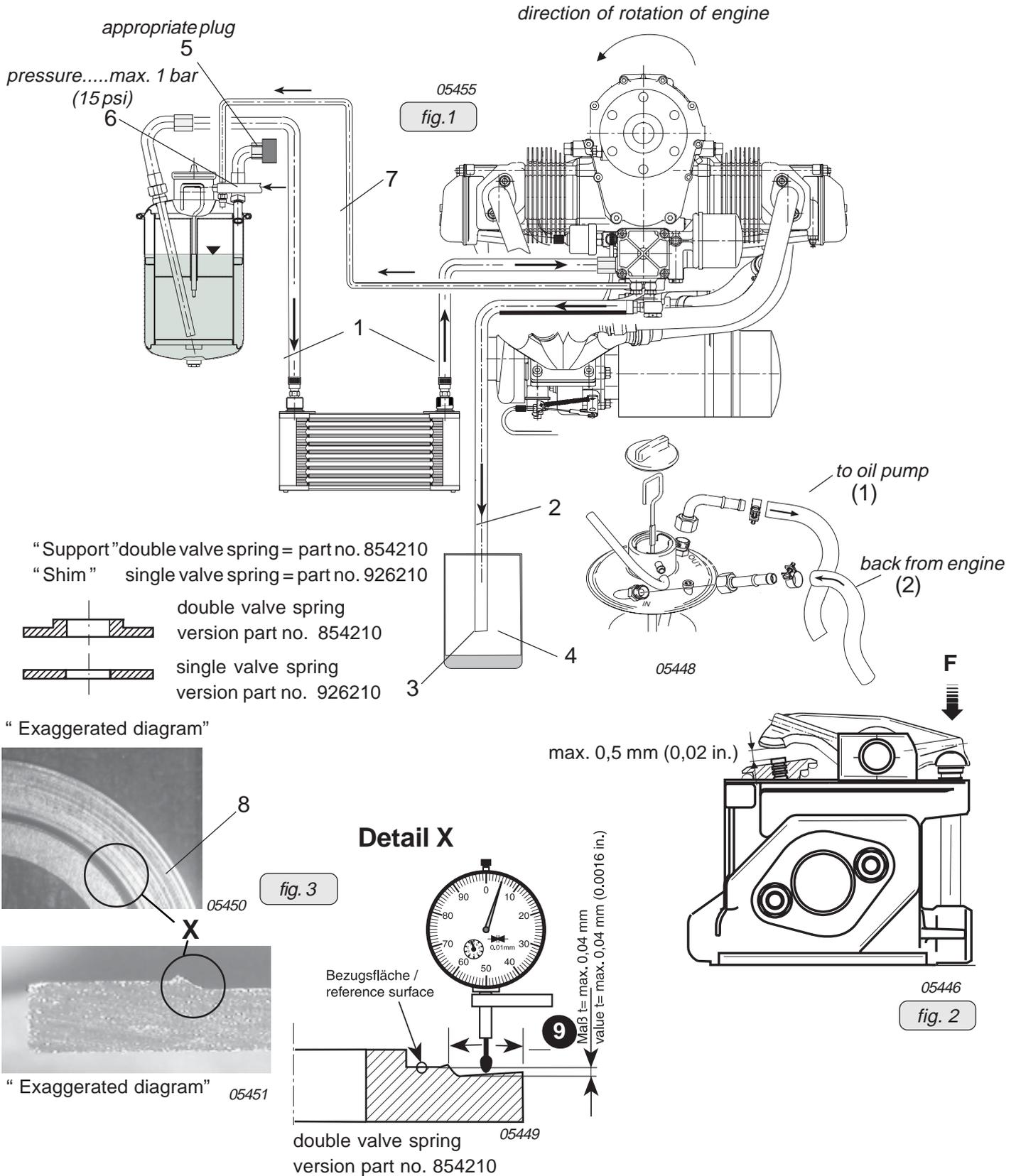
These instructions (section 3) have to be conducted in compliance with section 1.5.

◆ NOTE: Document the repair in engine log book.

Approval of translation to best knowledge and judgement - in any case the original text in German language and the metric units (SI-system) are authoritative.

#### 4) Appendix

The following drawings should convey additional information:



◆ **NOTE:** The illustrations in this document show the typical construction. They may not represent full detail or the exact shape of the parts which have the same or similar function.

Exploded views are **no technical** drawings and are for reference only. For specific detail, refer to the current documents of the respective engine type.