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INTRODUCTION

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4) Introduction

We are pleased you decided to purchase a ROTAX[®] aircraft engine.

Before carrying out maintenance work on the engine, carefully read the Maintenance Manual. It provides you with basic information on safe operation of the engine.

If any passages of the Manual are not clearly understood or in case of any questions, please, contact an authorized Distribution- or Service Center for ROTAX[®]-aircraft engines.

4.1) Remarks

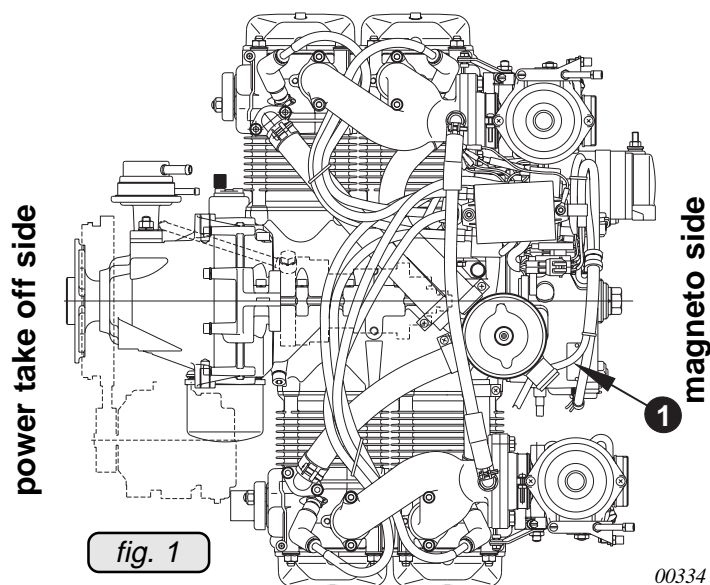
The purpose of this Manual is to acquaint maintenance service staff approved by the local aviation authorities with some basic maintenance and safety information for service work.

For competent maintenance and servicing, please, refer to the documentation provided in the Operator's Manual, Installation Instructions and Illustrated Parts Catalog.

For additional engine-, maintenance- and parts information you may also contact the nearest ROTAX[®]-aircraft engine distribution, or Service Center.

4.2) Engine serial number

On all enquiries or parts orders, always indicate the engine serial number **(1)**, as the manufacturer makes modifications to the engine for product improvement Kalenderdevelopment. The engine serial number is on the top of the crankcase, magneto side. See fig. 1.





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4.3) Conversion table and abbreviations

Units of length:

$$1 \text{ mm} = 0,03937 \text{ in}$$

$$1 \text{ in} = 25,4 \text{ mm}$$

$$1 \text{ ft} = 12 \text{ in}$$

$$= 0,3048 \text{ m}$$

Units of area:

$$1 \text{ cm}^2 = 0,155 \text{ sq in (in}^2\text{)}$$

$$1 \text{ sq in (in}^2\text{)} = 6,4516 \text{ cm}^2$$

Units of volume:

$$1 \text{ cm}^3 = 0,06102 \text{ cu in (in}^3\text{)}$$

$$1 \text{ cu in (in}^3\text{)} = 16,3871 \text{ cm}^3 \text{ (in}^3\text{)}$$

$$1 \text{ dm}^3 = 1 \text{ l}$$

$$1 \text{ dm}^3 = 0,21997 \text{ gal (UK)}$$

$$1 \text{ gal (UK)} = 4,5461 \text{ dm}^3$$

$$1 \text{ dm}^3 = 0,26417 \text{ gal (US)}$$

$$1 \text{ gal (US)} = 3,7854 \text{ dm}^3$$

Units of mass:

$$1 \text{ kg} = 2,2046 \text{ lb}$$

$$1 \text{ lb} = 0,45359 \text{ kg}$$

Density:

$$1 \text{ g/cm}^3 = 0,016018 \text{ lb/ft}^3$$

$$1 \text{ lb/ft}^3 = 62,43 \text{ g/cm}^3$$

Units of force:

$$1 \text{ N} = 0,224809 \text{ lbf}$$

$$1 \text{ lbf} = 4,4482 \text{ N}$$

Units of pressure:

$$1 \text{ Pa} = 1 \text{ N/m}^2$$

$$1 \text{ bar} = 100\,000 \text{ Pa (1000 hPa)}$$

$$1 \text{ bar} = 14,5037 \text{ lbf/in}^2 \text{ (psi)}$$

$$1 \text{ lbf/in}^2 \text{ (psi)} = 0,0689 \text{ bar}$$

$$1 \text{ in HG} = 33,8638 \text{ hPa}$$

Units of power:

$$1 \text{ kW} = 1,341 \text{ hp}$$

$$1 \text{ hp} = 0,7457 \text{ kW}$$

$$1 \text{ kW} = 1,3596 \text{ PS}$$

$$1 \text{ PS} = 0,7355 \text{ kW}$$

Units of temperature:

$$\text{K} = \text{° C} + 273,15$$

$$\text{° C} = (\text{° F} - 32) / 1,8$$

$$\text{° F} = (\text{° C} \times 1,8) + 32$$

Units of velocity:

$$1 \text{ m/s} = 3,6 \text{ km/hr.}$$

$$1 \text{ ft/min} = 0,3048 \text{ m/min}$$

$$= 18,288 \text{ m/sek}$$

$$1 \text{ m/s} = 0,0555 \text{ ft/min}$$

$$1 \text{ kn} = 1,852 \text{ km/hr.}$$

$$1 \text{ km/hr.} = 0,53996 \text{ kn}$$

spec. fuel consumption:

$$1 \text{ g/kWh} = 0,001644 \text{ lb/hph}$$

$$1 \text{ lb/hph} = 608,277 \text{ g/kWh}$$

Units of torque:

$$1 \text{ Nm} = 0,737 \text{ ft lb}$$

$$= 8,848 \text{ in lb}$$

$$1 \text{ ft lb} = 1,356 \text{ Nm}$$

$$1 \text{ in lb} = 0,113 \text{ Nm}$$



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Abbreviations:

*	Reference to another section (only in the illustrated parts catalog)	IM	Installation Manual
@	at	IPC	Illustrated Parts Catalog
☹	a drop indicates usage of sealing adhesive or lubrication compound. (only in the illustrated parts catalog)	ICR	Inspection-Cleaning-Repair Manual
⊕	center of gravity	ISA	International Standard Atmosphere
912 A	see Operator's Manual (Type designation)	JAA	Joint Aviation Administration
912 F	see Operator's Manual (Type designation)	JAR	Joint Aviation Requirements
912 S	see Operator's Manual (Type designation)	MAL	ATA— Master Assignment List
912 UL	see Operator's Manual (Type designation)	MM	Maintenance Manual
912 ULS	see Operator's Manual (Type designation)	MS	magneto side
914 F	see Operator's Manual (Type designation)	N	newly introduced part (only in the illustrated parts catalog)
914 UL	see Operator's Manual (Type designation)	n.a.	not available
a.r.	as required (only in the illustrated parts catalog)	OM	Operator's Manual
ACG	Austro Control GesmbH	p/n	part number
AD	Airworthiness Directives	PTO	power take off
CCW	counter-clockwise	Rev.	Revision
CM	Collective Manual	rpm	revolutions per minute
CW	clockwise	s.v.	still valid (only in the illustrated parts catalog)
EGT	Exhaust gas temperature	S/N	Serial number
EM	Engine Manual (Overhaul Manual)	SI	Service Information
FAA	Federal Aviation Administration	TB	Technical Bulletin
FAR	Federal Aviation Requirements	TC	Transport Canada
hr	hours	TSN	Time Since New
		TSO	Time Since Overhaul
		VFR	Visual Flight Rules
		XXX	in illustration this sign indicates the location of the current serial number or special part coding

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5) Safety

Although the mere reading of these instructions will not eliminate a hazard, the understanding and application of the information herein will promote the proper use of the engine.

The information and components-/system descriptions contained in this manual are correct at the time of publication. ROTAX[®] however, maintains a policy of continuous improvement of its products without imposing upon itself any obligation to install them on its products previously manufactured.

ROTAX[®] reserves the right at any time to discontinue or change specifications, designs, features, models or equipment without incurring obligation.

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

Specifications are given in the SI metric system with the USA equivalent in parenthesis. Where precise accuracy is not required, some conversions are rounded off for easier use.

This document has been translated from the German language and the original German text shall be deemed authoritative.

5.1) Repeating symbols

This Manual uses the following symbols to emphasize particular information:

- ▲ **WARNING:** Identifies an instruction which, if not followed, may cause serious injury including the possibility of death.
- **ATTENTION:** Denotes an instruction which, if not followed, may severely damage the engine or other component.
- ◆ **NOTE:** Indicates supplementary information which may be needed to fully complete or understand an instruction.

5.2) Safety information

▲ **WARNING:** Never fly the aircraft equipped with this engine at locations, airspeeds, altitudes, of other circumstances from which a successful no-power landing cannot be made, after sudden engine stoppage.

Aircraft equipped with this engine must only fly in DAYLIGHT VFR conditions.

- ☞ It should be clearly understood that the choice, selection and use of *this* particular engine on any aircraft is at the sole discretion and responsibility of the aircraft manufacturer, assembler and owner/user.
- ☞ Due to the varying designs, equipment and types of aircraft, ROTAX[®] makes no warranty or representation on the suitability of its engine's use on any particular aircraft. Further, ROTAX[®] makes no warranty or representation of this engine's suitability with any other part, component or system which may be selected by the aircraft manufacturer, assembler or user for aircraft application.
- ☞ You should be aware that any engine may seize or stall at any time. This could lead to a crash landing and possible severe injury or death. For this reason we recommend strict compliance to the maintenance, operation and any additional information which may be given to you by your dealer.
- ☞ Select and use proper aircraft instrumentation. This instrumentation is not included with the ROTAX[®] engine package. Only approved instrumentation can be installed.
- ☞ Unless in a run up area, never run the engine with the propeller turning while on the ground. Do not operate engine if bystanders are close.
- ☞ To prevent unauthorized use, never leave the aircraft unattended with the engine running.
- ☞ Keep an engine log and respect engine and aircraft maintenance schedules. Keep the engine in top operating condition at all times. Do not operate any aircraft which is not properly maintained or has engine operating irregularities which have not been corrected.

Since special tools and equipment may be required, engine servicing should only be performed by an authorized ROTAX[®] engine dealer or a qualified trained mechanic approved by the local airworthiness authority.

- ☞ To eliminate possible injury or damage, ensure any loose equipment or tools are properly secured before starting the engine.
- ☞ When in storage protect the engine and fuel system from contamination and exposure.



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- ✎ Never operate the engine and gearbox without sufficient quantities of lubricating oil.
- ✎ Periodically verify level of coolant.
- ✎ Never exceed maximum rated rpm. and allow the engine to cool at idle for several minutes before turning off the engine.
- ✎ Operating the engine at high rpm. at low throttle position, for example during descent, may increase engine and exhaust temperatures and cause critical overheating. Always compensate and match rpm. with throttle position.
- ✎ This engine may be equipped with an Airborne air pump. The safety warning accompanying the air pump must be given to the owner/operator of the aircraft into which the air pump is installed.

5.3) General operating and safety instructions

- ☞ Please, observe besides the instructions in our documentation also the generally valid safety- and accident preventive prescriptions and legal regulations as well as the relevant regulations by the competent aeronautical authorities.
- ☞ The information contained in the Maintenance Manual is based on data and experience and is considered to be applicable for a professional technician under normal working conditions. The instructions given in the Maintenance Manual are useful and necessary supplements to personal instruction, but can by no means substitute theoretical and practical personal instruction.
- ☞ The manufacturer or supplier has no influence on the personnel and operational conditions of the buyer and assumes no responsibility for sustaining effect of the personal instructions.
- ☞ We point to the fact that spare parts and accessories not supplied as genuine ROTAX[®] parts are not tested and therefore not released by ROTAX[®]. Installation and/or use of such products may change and negatively affect the constructive properties of the engine. For damages due to use of non-genuine parts and accessories ROTAX[®] refuses any liability.
- ☞ Unauthorized modifications and use of components or accessories not corresponding with the installation instructions exclude any liability of the manufacturer.
- ☞ The engine is accurately tested before delivery, this however does not exclude hazards in case of incompetent handling.
- ☞ Before taking the engine into operation, make yourself acquainted with the respective controls and their function. Searching during operation is too late! In case of vibrations or unusual noise, stop the engine and remedy the cause.
- ☞ Attention when draining hot oil: Danger of scalds!
- ☞ Disposal of used oil, fuels and filters as per local regulations.
- ☞ Liquids emerged (fuel or acids) can penetrate the skin and cause bad caustic injury. In case of accident immediately consult a doctor as bad infections may be engendered.
- ☞ Cleaning the engine with lye or alkaline solutions is forbidden, as a matter of principle. Use of a high pressure cleaner may cause engine failures and rust formation.
- ☞ When working on the electric system and on the engine, first detach the cable of the minus-pole and then of the plus-pole of the battery! When connecting the cables, first connect the plus- and then the minus-pole.
- ☞ Firmly attach engine removed from aircraft on an assembly trestle.



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- ☞ Do not let the engine run in a closed room (poisoning hazard)!
- ☞ Always observe the engine while running from a secure place.
- ☞ When stopping the engine, switch ignition off and remove ignition key.
- ☞ Before refuelling, always stop the engine and remove ignition key. Do not refuel in closed rooms. Immediately clean off spilt fuel.
- ☞ At handling of fuel be very careful - increased fire danger! Never refuel in the vicinity of open flames or sparks able to ignite. Do not smoke when refuelling.
- ☞ Only use oil and fuel of the specified quality and store them in approved containers only.

5.4) Technical documentation

The information given in the

- ☞ Installation Manual
- ☞ Operator's Manual
- ☞ Collective Manual
- ☞ Maintenance Manual
- ☞ ICR Manual
- ☞ Engine Manual
- ☞ Illustrated Parts Catalog (IPC)
- ☞ Technical Bulletins
- ☞ Service Information

are based on data and experience that are considered applicable for professionals under normal conditions.

The fast technical progress and variations of installation might render present laws and regulations inapplicable or inadequate.

The illustrations in this Manual are mere sketches and show a typical arrangement. They may not represent the actual part in all its details but depict parts of the same or similar function. Therefore deduction of dimensions or other details from illustrations is not permitted.

All necessary documentation is available from the ROTAX[®] Distribution- and Service Centers (see ATA-Chapter 14).

◆ **NOTE:** The Illustrations and Documents in this Manual are stored in a document data file/graphic data file and are provided with a consecutive irrelevant number.

This number (e.g. 00277) is of no significance for the content.

5.4.1) Use for intended purpose

- ☞ The engine ROTAX® 912 A/F/S is intended for use in certified aircraft. In case of doubt the regulations of the national authorities or the respective aviation federations must be observed.
- ☞ The certified aircraft engine 912 models A/F/S are tested as per aeronautical standards for safety and time between overhaul. It was developed to the latest state of the art and intensively tested.
- ◆ **NOTE:** The 912 engine models UL/ULS are not certified engines. These engines have not received any safety or durability testing, and conform to no aircraft standards. These engines are for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety.

The operator assumes all risk of use, and acknowledges by this use that he/she knows this engine is subject to sudden stoppage.
- ☞ Use for intended purpose also means respecting the prescribed operational-maintenance-and repair conditions. This also increases the engine time between overhaul efficiency.
- ☞ **Never** run the engine without propeller, this inevitably causes engine damage and is an explosion hazard.



5.4.2) Instruction

Engines require specified instructions regarding their application, operation, maintenance and repair.

Technical documentation and directions are useful and necessary complementary elements for personal instruction, but can by no means substitute theoretical and practical instructions. These instructions should cover explanation of the technical context, advice for operation, maintenance, use and operational safety of the engine.

☞ This engine must only be operated with accessories supplied, recommended and released by ROTAX[®]. Modifications are only allowed after consent by the engine manufacturer.

☞ After engine standstill (longer than 2 months) observe without fail the instructions for engine "out of use". Protect fuel- and carburetor system against contamination.

■ **ATTENTION:** Spare parts must meet with the requirements defined by the engine manufacturer. This is only warranted by use of GENUINE ROTAX[®] spare parts and/or accessories (see Illustrated Parts Catalog (IPC)).

All Manuals are available at the authorized ROTAX[®] Distribution- and Service centers.

If using other than GENUINE ROTAX[®] spare parts and/or accessories, any warranty by ROTAX[®] is null and void (see Warranty Conditions).

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no.	section	page	date of change	remark for approval	date of approval from authorities	date of issue	signature
0	00-00-00	1 to 22	98 09 01	english version not required	german version 1.9.1998	98 09 01	AA/HeC

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TIME LIMITS / MAINTENANCE SCHEDULE

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2) Maintenance

2.1) General note

In this Manual the maintenance of engine Type 912 is described.

The Manual is subdivided into sections that contain the description and function of the various systems. Some overlapping maintenance instructions are treated as generally valid information at the beginning of this section. The information given in the Maintenance Manual is based on data and experience which are considered to be applicable for a skilled mechanic under normal working conditions. The guidelines given in the Maintenance Manual are useful and necessary supplements to training. They, however, cannot substitute competent theoretical and practical personal instruction.

Maintenance of engines and systems requires special knowledge and special tools.

We particularly emphasize that parts and accessories not supplied as genuine ROTAX[®] parts are not verified for suitability by ROTAX[®] and thus are not authorized for use. Installation and/or use of such products may possibly change or negatively influence the operational characteristics of the engine. For damages resulting from use of non-genuine parts and accessories ROTAX[®] refuses any liability.

Non-authorized modifications as well as the use of components and auxiliary components not corresponding to the installation instructions exclude any liability by the engine manufacturer.

Besides our instructions in the documentation supplied, also respect the generally valid safety and accident preventive directives and legal regulations.

2.2) Authorized personnel

▲ WARNING: Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to carry out maintenance and overhaul work.

2.3) Procedure notes

Prior to maintenance or service work make absolutely sure to comply with the stated safety instructions.

- ▲ **WARNING:** Principally ensure the following at **each maintenance event**
- Ignition „OFF“ and system grounded,
 - disconnect battery
 - secure engine against unintentional operation.

At maintenance work which requires ignition „ON“ and battery connected, take care of the following:

- secure the propeller against unintentional turning by hand and
- secure and observe propeller zone.

This precautionary measure serves to avoid any injuries in case of an unintentional start of the engine. Non-compliance can result in injuries or death.

- **ATTENTION:**The ignition is **switched on**, as long as the ground-cable is not properly connected to ground.

At maintenance of cooling, lubricating and fuel system take care without fail that no contamination, metal chips, foreign material and/or dirt enters the system.

- ▲ **WARNING:** Always allow engine to cool down to outside air temperature before start of any work.

Severe burns and scalds may result if this is not respected.

Before re-using parts, clean, check and refit them per relevant instructions.

- **ATTENTION:**Generally, all metal parts are cleaned with a suitable cleaning agent.

Before each re-assembly check units for missing parts. Only use adhesives lubricating and cleaning agents and solvents indicated in the maintenance instructions. If not respected, damage may be the consequence.



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Strictly observe the tightening torques for screws and nuts. Over or under tightening could cause severe engine damage.

▲ **WARNING:** To warrant proper maintenance and repair the use of genuine ROTAX® parts is mandatory.

▲ **WARNING:** Utilization of special tools, accessories and lubricants is a necessity.

Never loosen or tighten screws and nuts with pliers, always use the specified tool.

Once loosened, **always** renew self-securing nuts.

Use clean screws and nuts only and inspect face of nuts and thread for damage. If in doubt, use new screws and nuts.

At reassembly of the engine, renew all sealing rings, gaskets, securing elements, O-rings and oil seals.

At disassembly of the engine, mark the components as necessary to avoid any mix-up. Take care of the markings, do not remove them prior to re-assembly.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.

2.4) Trouble shooting

In the Operator's Manual, possible troubles as well as feasible remedies are listed.

See section 12) in the Operator's Manual of the engine type 912.



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2.5) Consumable materials

■ **ATTENTION:** Use only the specified or **technically equivalent** materials for all maintenance work.

The materials specified have been tested and are suitable for all operating conditions indicated by the manufacturer.

▲ **WARNING:** At handling of chemicals, comply with all the customary regulations and specifications of the producer.

No. part no.	description, application	Qty.
1	297 431 LOCTITE Anti-Seize, to prevent fretting corrosion High-temperature lubricating and anti-corrosion agent. LOCTITE ANTI-SEIZE is always applied on both components mated and warrants maintenance-free bearing seats due to the hermetically sealed sliding surface.	10 g
2	899 788 LOCTITE 648 green, heavy-duty screw securing agent Heavy duty adhesive or screw securing agent. Its cure time depending on the materials and temperatures is max. 12 hours and it resists temperatures from -55°C (-67°F) up to +175°C (+347 °F). To separate parts secured by this agent, it may be necessary to heat the parts to approx. +250°C (+480°F).	5 g
3	899 789 LOCTITE 603, heavy-duty screw securing agent Heavy duty adhesive or screw securing agent, similar to LOCTITE 648, especially for applications where the mating surfaces can not be made absolutely free of grease.	10 ml
4	899 784 LOCTITE 574 orange, sealing compound Is a sealing material used as alternative to conventional solid gaskets where a high friction factor and exactly defined distance between parts is required. LOCTITE sealing compound is a solvent-free liquid gasket applied to the sealing surfaces. After assembly it cures under hermetical conditions with metal contact within several hours. This gives a sealing completely adapted to the surface structure of the parts to be sealed. Its surface sealing properties are guaranteed for temperature range between -55°C and +200°C (-67°F to + 390°F). No corrosion is allowed in the sealing gap.	50 cm ³



- 5 899 785** **LOCTITE 221 violet,**
 medium-duty screw securing agent 10 cm³

Medium duty adhesive or screw securing agent suitable for materials of different properties. In case of strain the stress is distributed evenly over the whole surface of the connection. The adhesive connection creates hermetic sealing for gas and other liquids. This sealing property protects the parts from corrosion.

LOCTITE 221 is suitable for screws and nuts up to M12 threads and for low duty connections.

- 6 297 433** **MOLYKOTE G-N,**
 Lubricant 100 g

Is used on highly loaded bearing positions as initial lubrication and at press fits for prevention of fretting corrosion. MOLYKOTE GN is applied to both components mated. Its use is specifically mentioned in the Manual.

- 7 897 511** **LOCTITE 380 black,**
 Adhesive medium-duty 20 g

Adhesive suitable for materials of different properties. Suitable for medium duty connections. Its cure time depending on the materials is max. 12 hours and it resists temperatures from - 55° C (-67 °F) up to + 150° C (+300° F).

- 8 897 330** **Lithium grease,**
 to avoid leakage current 250 g

Is used on all electrical connections, to avoid current leakage. After assembly is complete, apply Lithium grease to the connection as anti-corrosive.

- 9 897 870** **K&N Filter oil 99 - 1131,**
 bag 58 ml

To optimize filtration and to protect against moisture.

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- 10 297 368 SILASTIC 732**
 multi purpose, one component sealing compound on silicon ...
 base310 ml

Especially suitable for maintenance and repair. Vulcanizes at room temperature to a viscous rubber mass and is resistant against chemicals. To be applied only on a clean, dry and grease-free surface.
- 11 897 186 SILICONE HEAT CONDUCTIVITY PASTE 150 g**

Application of the heat conductivity paste will reduce heat transfer resistance. With the grease-like, temperature resistant silicone compound free space between component and cooling item (e.g. spark plug - cylinder head) will be filled, thus improving heat transfer.
- 12 n.a. Multi-purpose grease LZ.....**

Generally useable, neutrally coloured multipurpose grease, water resistant and highly adherent. Useable for temperatures from -35°C to +120°C (-31°F to +248°F). The grease resists to mechanical load.
- 13 n.a. Preservation oil, MobilArma 524**

Water insoluble preservation oil on hydro carbon base with additives. The pour point is below -18°C (-3°F).
- 14 n.a. Lapping fleece SR 4600 A - very fine grading.....**

Is sold by the meter and used for manual removal of smaller rust spots or oxidation, especially for optimum ground connections. It is most appropriate to remove LOCTITE from surfaces or threads to make them metallic clean. Before reapplying LOCTITE, clean surfaces with nitro-thinner or degreasing agent (CASTROL ZA 30 or OMV-SOFT SOL). When using solvents, mind the safety regulations for persons and environment.

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15 n.a. Cleaning agents

▲ **WARNING:** Use only approved cleaning agents (e.g. fuel, kerosine, varsol, etc.) for cleaning metal parts.

Do not use cold cleaner of lye base for degreasing agents. Do not clean coolant or oil hoses with aggressive solutions. Clean off remains of sealing compound with sealant remover.

Soak combustion chamber, piston and cylinder head with cleaning agent and remove combustion residues with a bronze brush. Very good results were achieved with CASTROL "Clenvex 2000" as a cold cleaning agent on basis of laboratory fuel and kerosine. It is a solvent - cold cleaner, free of halogen, on base of selected fuel fractions and it is biologically disposable.

Never use caustic or corrosive cleaning agents.

▲ **WARNING:** Proceed with great caution when using solvents. Inhaling of vapours is hazardous to health.

16 n.a. Valve lapping paste

This paste, produced by various manufacturers, is a fine granulate lapping paste for valve seats and valves. The paste is usually available in 3 different granulate sizes. Use as per manufacturer's directives.

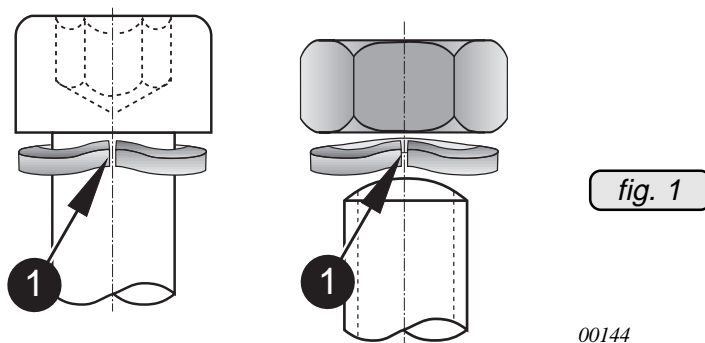
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2.6) Securing elements

■ **ATTENTION:** Self-locking nuts, cotter pins, tab washers and safety wires must be replaced with new parts each time they have been removed.

Respect without fail all additional information regarding securing and sealing means and lubrication of fixation elements. Adhere to specified tightening torques.

◆ **NOTE:** Fit the lock washers with the bent up ends (1) facing the screw head or nut.



Safety wiring

Safety wiring serves to secure screws or nuts to prevent unintended loosening. The screws or nuts are secured by a 0,8 mm (.0315 in.) safety wire twisted 3 to 4 turns per 10 mm (.4 in.). The wire must by no means be overstretched.

Nut securing

When using a self-locking nut, take care that the polyamide insert ring on nuts according to DIN 985 as well as the securing element on nuts according to DIN 980 is positioned towards outside.

SECTION 05-10

OPERATING-HOURS-RELATED CHECKS

1) **General note**

These checks, related to limited periods of operation, are planned to avoid engine troubles by the use of preventive maintenance.

2) Time limits for engine operation

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

After reaching this time limit the engine has to be shipped to an authorized overhaul facility. For an overhaul, the engine has to be removed from the aircraft, be cleaned, preserved and all openings to be closed to prevent entering of contaminants.

◆ **NOTE:** A general overhaul will become mandatory after a **defined period of operation** or after a **specified calendar life** since initial start of operation (whichever comes first).

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

Engine Type description	engines affected engine s/n	TBO Time Between Overhaul
912 A	up to 4, 076.191	600 h or 10 years, whichever comes first ⁽¹⁾
912 A	from 4, 076.192 to 4, 441.065	1000 h or 10 years, whichever comes first ⁽¹⁾
912 A	as from 4, 441.066	1200 h or 10 years, whichever comes first
912 F	up to 4, 412.585	1000 h or 10 years, whichever comes first ⁽¹⁾
912 F	as from 4, 412.586	1200 h or 10 years, whichever comes first
912 UL	up to 4, 152.666	600 h or 10 years, whichever comes first ⁽²⁾
912 UL	as from 4, 152.667	1200 h or 15 years, whichever comes first
912 S	all	1200 h or 10 years, whichever comes first
912 ULS	all	1200 h or 10 years, whichever comes first

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

⁽²⁾ Extension of the TBO is possible and will be specified by a Service Information (SI) for the respective engine type. For extensions already effective refer to the engine log book or to the maintenance records.

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

- Engine log book
 - Maintenance records of the engine (i.e. all maintenance check lists, and reports of operation, of maintenance, of findings and of oil analyses.
 - The engine assembly as per supply volume. Additionally all added-on parts as in the supply volume such as carburetors, filters, fuel pump, external alternator, sensors, intake silencer, ignition unit, oil tank, vacuum pump, hydraulic governor.
 - Statement of total period of operation (TSN / TSO)
 - Data about the type of aircraft used
 - Useful remarks and observations concerning the engine.
- ◆ NOTE: At a general overhaul the engine will be disassembled and a report of findings issued.

3) Time limit for rubber parts

Every five years the following components must be renewed:

- venting hose of the carburetors
- all rubber hoses of the cooling system
- carburetor sockets
- diaphragm on both carburetors
- rubber hoses on compensating tube
- V-belt
- fuel pump assy. with protective hoses

■ **ATTENTION:** This time limit must be followed **independently** and **in addition** to the visual checks (05-20 section 2.2) of the respective component.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and successful attendance of ROTAX® training course) are permitted to perform this work as per ICR-Manual.

4) Time limit for the coolant

The coolant must be renewed every two years. See section 12-00-00, chapter 3.2.

5) Time limit for maintenance intervals

The periodical 100 hr. check is also with a time limit.

I.e. this check must be conducted after 100 hr. of operation or one year whichever comes first. See section 05-20-00, chapter 1.

SECTION 05-20

PERIODIC MAINTENANCE

1) General note

Periodic inspection, is maintenance which must be carried out after a specified period of operation or calender life.

Periodic inspections are structured on 50, 100 and 200 hr. checks which must be performed according to the maintenance schedule. This means for instance that **every 100 hr.** of operation or 1 year, a 100 hr. check must be carried out.

Additionally, a check after the first 25 hr. of operation must be performed. This applies for newly supplied engines as well as for overhauled engines.

◆ **NOTE:** This maintenance schedule contains a column for a 50 hr. check. This check is recommended by the manufacturer but not mandatory, with the exception of oil change.

Furthermore, Rotax recommends at each maintenance event the following checks (if not already specified by the aircraft builder), non-observance could influence engine operation unfavourably.

- inspection of engine compartment cover (risk of overheating, etc. ...)
- inspection of the exhaust system (risk of fracture, wear on cylinder head)
- check of the fuel filter in the fuselage (misfiring, etc. ...)
- check of the battery. Verify specific gravity of the electrolyte (starting problems, etc. ...)
- oil analysis (additional information about condition/wear of engine)

(1) After 100 hours of operation or 1 year, whichever comes first.

See section 05-10.5

1.1) Maintenance schedule procedures

- All stated checks are visual inspections for damage and wear, unless otherwise stated.
- All listed work must be carried out within the specified period.
- For all the maintenance work an allowance of ± 10 hr. will be granted but these tolerances must not be exceeded. This means that if for instance after an 100 hr. check actually carried out at 110 hr. the next check will be due at 200 hr. ± 10 hr. and not at 210 hr. ± 10 hr.

If a maintenance interval falls short of the nominal period (e.g. the 100 hr. check already at 87 hours) than further maintenance events will be based on the premature check i.e. for the above example the next 100 hr. check would be due after 187 hours.

- Checks are carried out as per the maintenance schedule where type and volume of maintenance work is outlined in key words.

The maintenance schedule must be filled out at each maintenance event.

All pages of the maintenance check list must be marked with the respective check (e.g. 100 hr. check) on the head of the list.

All of the maintenance carried out must be initialled in the „signature“ area by the performing aircraft mechanic.

- After maintenance, checks must be entered in the maintenance records. The maintenance must be confirmed in the log book.
- All discrepancies and repairs must be recorded in the report of findings.



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2) Inspection sheet/maintenance schedule

2.1) Identification

AIRCRAFT

Registration number _____
Aircraft make _____
Aircraft model and S/N _____
TSN (time since new) _____
Propeller make _____
Propeller model and S/N _____

ENGINE

Engine type _____
Engine S/N _____
TSN (time since new) _____
TSO (time since overhaul) _____
Used operating media:
 coolant _____
 - mixing ratio _____
 fuel _____
 oil _____

AIRCRAFT OPERATOR

Name _____
Contact _____
Address _____

Tel. / fax / e-mail _____

MAINTENANCE FACILITY

Maintenance work shop _____
Address _____

Tel. / fax / e-mail _____
Certificate _____

Next check due at: _____ hr. (TS__)
(engine hr.)



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2.2) Maintenance schedule - mandatory maintenance

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Inspection items	check (hr.)				signature
	25	50	100	200	
2.2.1) Engine cleaning					
a) Engine cleaning See 12-00-00 section 2.1	X	X	X	X	
2.2.2) Visual inspection of the engine					
a) General inspection of the engine for damage and abnormalities. Inspect cooling air ducts, baffling and cylinder cooling fins for obstructions, cracks, wear and condition. Take note of temperature influence.	X	X	X	X	
b) Inspection of temperature and oil pressure sensors. Check for secure fit and condition.	X	X	X	X	
c) Inspection of all coolant hoses for damage, leakage, hardening from heat, porosity, for loose connections and secure attachments. Verify routing for kinks and restricted elbows. See 12-00-00 section 2.2	X	X	X	X	
d) Inspection of leakage bore at the base of the water pump for signs of leakage. See 12-00-00 chapter 2.2	X	X	X	X	
e) Inspection of the expansion tank for damage and abnormalities. Verify coolant level, replenish as necessary. Check radiator cap. Inspect rubber plate on expansion tank base for secure fit. See 12-00-00 section 3.1	X	X	X	X	

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Inspection items	check (hr.)				signature
	25	50	100	200	
f) Inspect the overflow bottle for damage and abnormalities. Verify coolant level, replenish as necessary. Check line from expansion tank to overflow bottle for damage, leakage and clear passage. Verify venting bore in cap of overflow bottle for clear passage. See 12-00-00 section 3.1	X	X	X	X	
g) Inspect all oil lines for damage, leakage, hardening from heat, porosity, security of connections and attachments. Verify routing for kinks or restricted elbows. See 12-00-00 section 2.2	X	X	X	X	
h) Inspect all fuel lines for damage, leakage, hardening from heat, porosity, secure connections and attachment. Verify routing for kinks or restricted elbows. See 12-00-00 section 2.2	X	X	X	X	
i) Verify the complete electrical wiring system for security, damage and wear. See 12-00-00 section 6.1	X	X	X	X	

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Inspection items	check (hr.)				signature
	25	50	100	200	
2.2.3) Verification of engine suspension					
a) Inspect engine mounts and fasteners for security fit, damage from heat, cracks and deformation. See 12-00-00 section 2.3	X	X	X	X	
2.2.4) Engine external parts					
a) Check attachment screws and nuts of all external parts for security and fit. Check safety wiring, renew as necessary.	X	X	X	X	
2.2.5) Check of propeller gear box					
a) Verification of the backlash See 12-00-00 section 7.1	X	X	X	X	
b) Verification of the friction torque Actual friction torque ____ Nm _____ in.lbs. See 12-00-00 section 7.2	X	X	X	X	
2.2.6) Oil level check					
a) Before checking oil level turn propeller over several times to ensure that crankcase oil has been returned to the oil tank. This process is finished when air is returning back to the oil tank and can be noticed by a murmur from the open oil tank. See 12-00-00 section 5.1	X	X	X	X	

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Inspection items	check (hr.)				signature
	25	50	100	200	
2.2.7) Oil change					
a) Remove oil drain screw from oil tank. Drain old oil and dispose as per enviromental regulations. See 12-00-00 section 5.2	X	X ⁽¹⁾	X	X	
b) Remove oil filter from engine and install new oil filter. Lubricate mating sealing ring of new oil filter with engine oil. Screw on new filter by hand. After the engine test run, tighten again by hand. See 12-00-00 section 5.3	X	X ⁽¹⁾	X	X	
c) Cut oil filter housing without producing any metal chips and inspect filter mat. Findings: _____ _____ See 12-00-00 section 5.3	X	X ⁽¹⁾	X	X	
d) Renew gasket ring of drain screw on oil tank. Fit drain screw and tighten to 25 Nm (220 in.lb).	X	X ⁽¹⁾	X	X	
e) Refill oil tank with approx. 3 litres of oil. For oil quality refer to Operator's Manual and Service Information 18 UL 97 D/E. See 12-00-00 section 5.2	X	X ⁽¹⁾	X	X	
(¹) for engine operation with AVGAS. See Service Information 18 UL 97 D/E.					

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Inspection items	check (hr.)				signature
	25	50	100	200	
2.2.8) Cleaning of the cooling system					
a) Flushing of the cooling system. See 12-00-00 section 3.3				X	
2.2.9) Check of the air filter					
a) Inspection of the air filter. See 12-00-00 section 2.4	X	X	X	X	

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Inspection items	check (hr.)				signature
	25	50	100	200	
2.2.10) Check of the carburetors					
a) Checking carburetor synchronization. Mechanical or pneumatic synchronization. See 12-00-00 section 4.1	X	X	X	X	
b) Verification of the idle speed. See 12-00-00 section 4.2	X	X	X	X	
c) Verification of the float chamber venting. Check venting lines for condition, secure attachment, clear passage and routing for kinks and restrictions.	X	X		X	
d) Check free movement of the carburetor activation (throttle lever and starting carb). Ensure that the Bowden cable allows the full travel of the throttle lever. See 12-00-00 section 4.3	X	X	X	X	
f) Removal and installation of the carburetors in the course of carburetor verification ⁽¹⁾ . See 12-00-00 section 4.4				X	
2.2.11) Inspection of the carburetor sockets					
a) Inspect the carburetor sockets for damage abnormalities, cracks, wear condition and unserviceabilities. Take note of temperature influence. See 12-00-00 section 4.7				X	

⁽¹⁾ ■ ATTENTION: Only qualified technicians, authorized by the Aviation Authority and after successful attendance of the relevant ROTAX® training course are permitted to carry out this work in accordance with the ICR Manual.

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Inspection items	check (hr.)				signature
	25	50	100	200	
2.2.12) Verification of the V-belt tension					
a) On engines with an external alternator, check the attachment and the V-belt tension. See 12-00-00 section 2.6	X	X	X	X	
2.2.13) Spark plugs					
a) Remove all spark plugs, verify caloric value, clean the spark plugs. Check electrode gap and adjust as necessary. Renew as required. See 12-00-00 section 6.2	X	X ⁽¹⁾	X		
b) Renewal of spark plugs. ■ ATTENTION: Apply heat conduction compound on spark plug thread. See 12-00-00 section 6.2	X		X ⁽¹⁾	X	
⁽¹⁾ applicable only on engine type 912 S / ULS					
2.2.14) Spark plug connectors					
a) Verify security of spark plug connectors. Minimum pull-off force is 30 N (7 lb).	X			X	
2.2.15) Check of compression					
a) Check compression by differential pressure method. Test pressure ___ hPa (psi) pressure drop (%) cyl. 1 ___ cyl. 2 _____ cyl. 3 ___ cyl. 4 _____ See 12-00-00 section 2.5			X ⁽²⁾	X	
⁽²⁾ recommended					

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Inspection items	check (hr.)				signature
	25	50	100	200	
2.2.16) Engine test run					
a) Start the engine and run to operating temperature. Check of ignition circuits at 4000 rpm engine speed. Speed drop without ignition circuit: A _____ rpm B _____ rpm Check carburetor preheating. Fully activate preheating and record rpm drop. Rpm drop _____ . Preheating OFF, bring engine to idle speed and record idle speed. _____ rpm. After engine test run, re-tighten the oil filter by hand. See 12-00-00 section 2.7	X	X	X	X	
2.2.17) General note					
a) All Service Informations and Technical Bulletins are complied with.	X	X	X	X	

Engine back to operation

On the engine identified as per point 2.1, on the _____ the ____ hr. check at _____ hr. (TS__) was carried out according to recommendations of the engine manufacturer and was recorded in the Engine Log book.

_____ (location) , (date)

_____ test person

_____ (authorized aircraft mechanic)

_____ (certificate no.)

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SECTION 05-50

SPECIAL CHECKS

1) General note

Special checks are required only at occurrence of engine unserviceabilities which have an unfavourable influence on the airworthiness of the engine.

- **ATTENTION:** If special checks require work beyond the scope of the Maintenance Manual or training of the technician is required. Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.

This work will be specially identified as required.

- ▲ **WARNING:** In the course of special checks specify if **additional checking** for components (e.g. hydraulic governor) is applicable.

After each special check/repair work, an engine test run and a leakage check must be conducted.

- ▲ **WARNING:** Observe without fail all the specified guidelines. Non-compliance could result in personal injury.

2) Special checks

2.1) Engine check after propeller ground contact or accidental propeller stoppage

2.1.1) Propeller gearbox with integrated overload clutch

- Inspection of engine for damage. If any damage is detected, send the engine to an authorized overhaul facility for repair or overhaul.
- Check additional equipment (external alternator, hydraulic governor, ignition unit, coolant and oil hoses) for damage.
- Observe directives of the aircraft manufacturer.
- **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.
- Remove gearbox and send it complete with the required documentation including the engine Log book to an authorized overhaul facility for verification and repair.
- Check or repair drive of the hydraulic governor (if fitted)
- Check the crankshaft for out-of-roundness.

2.1.2) Propeller gearbox without integrated overload clutch

Send the engine complete with the required documentation to an authorized overhaul facility for verification and repair.

- ◆ **NOTE:** Shipment of the complete engine is necessary as, in the course of a repair, a tear-down inspection of the engine and an inspection of the crankshaft for cracks must be carried out.

2.2) Checking of the overload clutch

At suspicion of slipping, verification of the slipping torque of the overload clutch must be carried out.

◆ **NOTE:** Slipping of overload clutch is apparent if at engine speed rise, the propeller speed does not increase in the same proportion.

- For verification of the slipping torque proceed as follows:

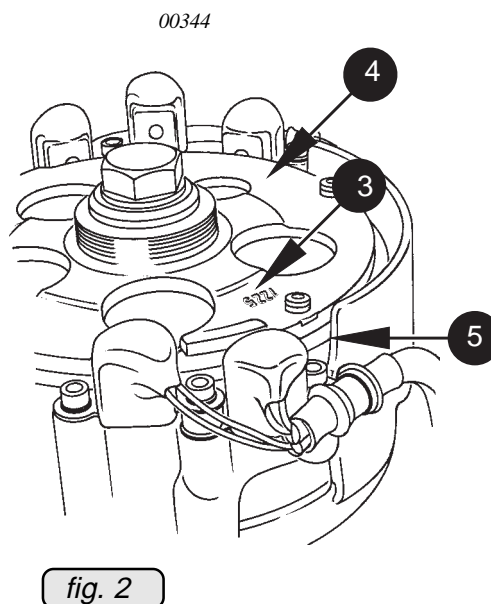
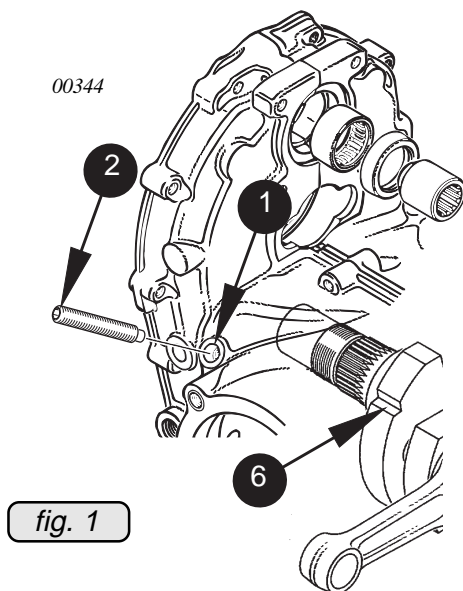
Remove the plug screw (1) M8x20 and washer from the crankcase half (cyl. 2/4). Turn crankshaft until the pistons of cyl. no. 1 and no. 2 are in T.D.C. and lock crankshaft in this position with the crankshaft locking screw (2) *part no.* 240 880.

◆ **NOTE:** The crankshaft locking screw is part of the standard tool kit supplied with each engine.

For easy location of the correct crankshaft position turn crankshaft so that the impressed 4-digit number (3) on the flywheel hub (4) aligns with the edge (5) of the ignition housing.

The required crankshaft recess position (6) can be additionally verified with a flashlight through crankcase hole (1).

Turn-in crankshaft locking screw and rotate crankshaft slightly to-and-fro until the screw engages noticeable in the recess (6) of the crankshaft and tighten locking screw to 10 Nm (90 in.lb).



- Fit a specially designed lever to the propeller flange (e.g. length 1,5 m / 5 ft., see fig. 3) and determine slipping torque with use of a spring scale. Applicable is the value determined during a slow turning motion. Repeat the measurement several times to get a stable value.

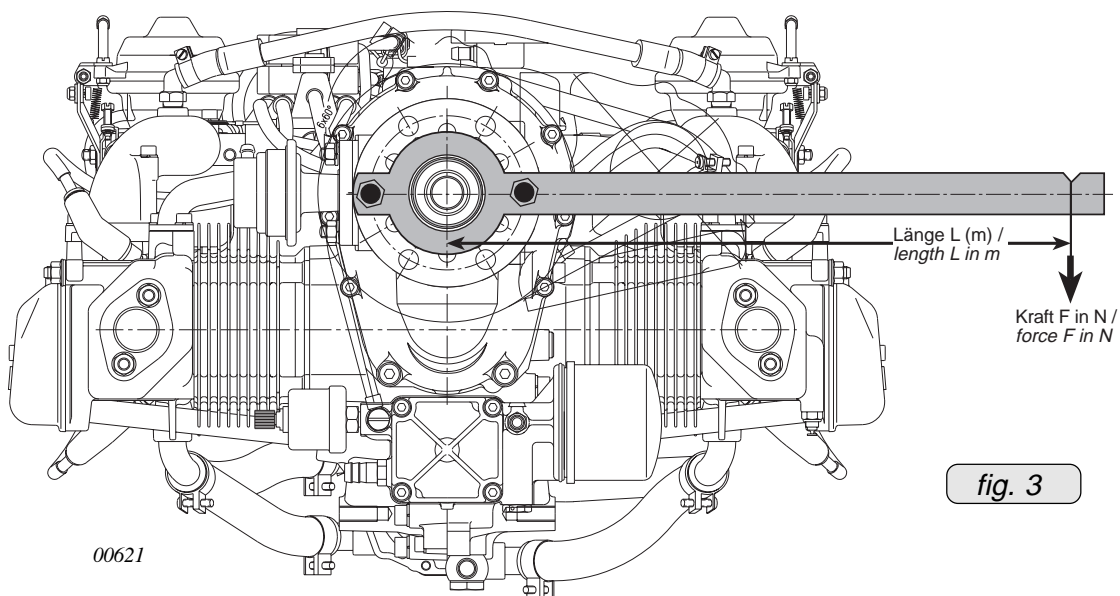
The slipping moment is calculated from the spring force (F) measured in N and the length of the lever arm (L) applied in m ($N \times m = Nm$).

- Remove crankshaft locking screw and fit the plug screw (1) M8x20 along with washer. Tightening torque 10 Nm.

The measured slipping torque must be between 420 Nm (310 ft.lb) and 600 Nm (440 ft.lb).

If the torque is above or below this value, the propeller gearbox must be removed and shipped complete with the necessary documents, including the Engine Log book to an authorized overhaul or repair facility for inspection and repair.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.



2.3) Examination after engine failure

- **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.

After a failure, it is important for cause-finding and to communicate all details available to an authorized workshop. Also observations on the aircraft and the engine suspension can be of help. To ease diagnosis of the failure, pay special attention to the engine operation described below

Engine runs erratic and misfires

May be caused by a failure of the fuel system (fuel supply, contamination, float chamber venting, false air intake due to defective carburetor flange, carburetor icing), or of the ignition system (shorting cable, electronic module, spark plugs, wrong spark plug connection, grounding defect etc.). See details regarding fuel- and ignition system.

Rough engine run

Either a failure of the ignition system or a fault in the carburetor may be the reason (fuel supply, contamination in float chamber or float needle valve, float chamber venting, false air intake due to defective carburetor flange, engine temperature too low, too lean carburetor jetting due to conditions prevailing in intake silencer).

Cylinder head temperature

A rise in cylinder head temperature above normal operating limits (see Operator's Manual) is a clear signal for a failure in the cooling system:

- insufficient coolant, badly vented system,
- radiator contaminated,
- malfunction of water pump.

Unintended engine stoppage by seizing

A failure in the lubricating system may be the cause. Oil pressure too low or no oil pressure due to oil shortage, contamination or bad venting of the oil system, defective oil pump. As a consequent damage, often the camshaft and/or the conrod bearings maybe seized. Send engine to authorized repair shop for complete tear-down inspection.

- ▲ **WARNING:** If one of the above failures should arise even only for a short time, an exact check is necessary. Localize trouble and rectify.

2.4) Engine back to operation after submerging in water

An engine having been submerged in water must be sent immediately for overhaul or repair to an authorized facility.

- **ATTENTION:**The engine must be marked clearly with the note „Engine submerged in water during operation“.

2.5) Checks in extreme climatic conditions

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

- ▲ **WARNING:** More frequent checks of air filter, coolant radiator and oil cooler are necessary.

Flying in areas of extreme climatic conditions or in extreme altitudes requires correction of carburetor jetting and of the cooling system. This requires consultation with the engine manufacturer.

- **ATTENTION:**Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.



2.6) Exceeding of max. admissible engine RPM

Cause finding and communication of all available details.

◆ **NOTE:** Any exceeding of the max. admissible engine RPM must be entered by the pilot into the Engine Log book stating duration and extent of overspeeding.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.

- Exceeding for max. 1 minute up to 6200 rpm:
Check push rods for straightness.
- Exceeding for more than 1 minute:
Complete check and/or repair of engine is necessary.
- Exceeding 6200 rpm:
Complete check and/or repair of engine is necessary.

2.7) Exceeding of cylinder head temperature

Cause finding and communication of all available details.

- ◆ **NOTE:** Any exceeding of the max. admissible cylinder head temperature must be entered by the pilot into the Engine Log book, stating duration and extent of excess temperature.
- At short term exceeding of the cylinder head temperature of up to 180 °C (360 °F) localize the cause and inspect the complete cooling system for damage.
- **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.
- If a cylinder head temperature above 180 °C (360 °F) is noticed for longer than 30 minutes, check by the differential pressure method is necessary.
- Hardness test of the cylinder head must be carried out.

2.8) Exceeding of the oil temperature

Cause finding and communication of all available details.

- ◆ **NOTE:** Any exceeding of the max. admissible oil temperature must be entered by the pilot into the Engine Log book, stating duration and extent of excessive temperature.

With oil temperature in excess of 140°C (280 °F) for max. 15 min. localize the cause.

- Check oil level in the oil tank.
- Inspect oil cooler for contamination and check oil circuit for operation.
- Cut oil filter housing and inspect filter mat for foreign matter.
- Carry out oil change.

- **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.

With oil temperature in excess of 160 °C (320 °F). consequential damage is likely.

- Cut oil filter housing and inspect filter mat for foreign matter.
- Specify complete examination and repair of the engine is required.

2.9) Oil pressure below minimum value

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

- Check the complete lubrication system, trace cause and rectify.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.

Oil pressure below 0,5 bar (7 psi.) at flight

Cause finding and communication of all available details.

- Check all oil lines for restrictions and clear passage.
- Verify oil quantity.

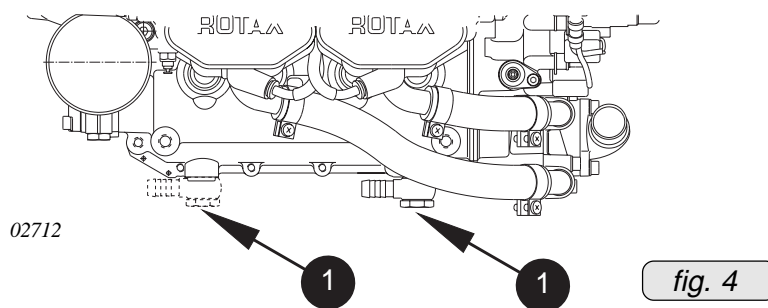
■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.

- Check pressure sensor.
 - Check indicating instrument to specifications of the manufacturer, renew as required.
 - Verify function of the pressure relief valve.
 - If no cause for the low oil pressure is found after the above checks, carry out an oil change.
 - If after the previous checks and oil change the oil pressure is still too low, the engine must be completely checked at an authorized facility.
- **ATTENTION:** Before the re-installation of the engine the complete lubrication system (inclusive oil tank) must be flushed and the oil cooler renewed.

2.10) Oil specification not respected

If by error engine oil was filled in which does not correspond with oil specification in the Operator's Manual (e.g. aircraft engine oil without additives) and the engine has been in operation for **less than 5 hours**, the following measures must be taken:

- Oil change.
- Open plug screw (1) and drain remaining oil from crankcase. Tightening torque 35 Nm.



- Renew oil filter.
- Drain oil completely from oil cooler.
- Refill oil tank with oil as specified, refer to Operator's Manual.
- Run engine for approx. 1 hour and renew oil and oil filter once more, as stated above.

If the engine has been operated **longer than 5 hours** with engine oil not corresponding with specification in the Operator's Manual (e.g. aircraft engine oil without additives) the following work is required.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.

- Remove propeller gearbox.

Ship the propeller gearbox complete with the required documentation inclusive Engine Log book to an authorized overhaul or repair facility for verification.

2.11) Spark plug not in accordance with specification

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

- Mark position of the spark plugs (e.g. cyl. 1 top) and remove all spark plugs.
- 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 endoscope. At actual damage, examination and repair or overhaul of the engine is required.

- Inspect spark plug thread for damage (especially at bad burn off).
- Check of pressure differential. Max. allowance, 10 % pressure loss since the last check.
- Change oil and oil filter.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.



SECTION 12-00

MAINTENANCE OF THE SYSTEMS

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SECTION 12-00 MAINTENANCE OF THE SYSTEMS

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2) General note

The section „Maintenance of the systems“ is associated with other sections. This section serves solely for supplement and detailed explanation of the Maintenance Schedule (section 05-20-00).

◆ **NOTE:** For reasons of clarity only headlines and keywords are listed in the Maintenance Schedule. Please find further explanation if needed on the following pages.

As far as feasible, the content has been coordinated with the systems.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.

2.1) Engine cleaning

Only clean engine as necessary. Check engine for leaks prior to cleaning. Repair leaks as required.

Use of a commercially available cold cleaning agent is recommended.

■ **ATTENTION:**For cleaning of engine do not use easily inflammable liquids or caustic cleaning agents.

Never clean an engine with a high pressure cleaner. This is detrimental to the electrical installations and engine seals. Oxidation of the various components and their failures are the consequence.

After each cleaning procedure, dry all electrical components, such as battery, ignition unit, spark plug connector, clamp connections etc. by use of low air pressure (approx. 10 p.s.i.) to prevent current loss.

■ **ATTENTION:**When cleaning the engine, the dissolved residues of fuel, oil and other environment-contaminating agents are rinsed off. Collect the cleaning water and dispose of it in an environment friendly way.



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2.2) Leakage check

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.

If the leakage bore, located at the base of the ignition housing is oily, the oil seal on the water pump shaft is defective and must be replaced. In the case of the presence of coolant at the leakage bore the coolant mechanical seal must be replaced.

Check fuel lines and their connections and screw fasteners. Look for scuffing marks. Check isolating flange of fuel pump for leaks.

Check all engine oil lines for damage, security and elbow restrictions.

Check fuel and water lines, their connections and screw plugs for tightness. Check surroundings for leaks.

At signs of operating media leaks find the reason and repair as required.

■ **ATTENTION:** Avoid overstressing of fastening elements.

Check all hoses, especially in the area of hose clamps and hose connections for porosity, damages or kinks. If damage is noticed, renew hose immediately.

2.3) Check of the engine suspension

- **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX[®] training course) are authorized to perform this work as per the ICR Manual.

Verify the engine suspension points on the crankcase for security and damage.

Check the surroundings of engine attachment on crankcase and gearbox. At discoloration of the crankcase around the fixation points (black ring) suspect loose fasteners.

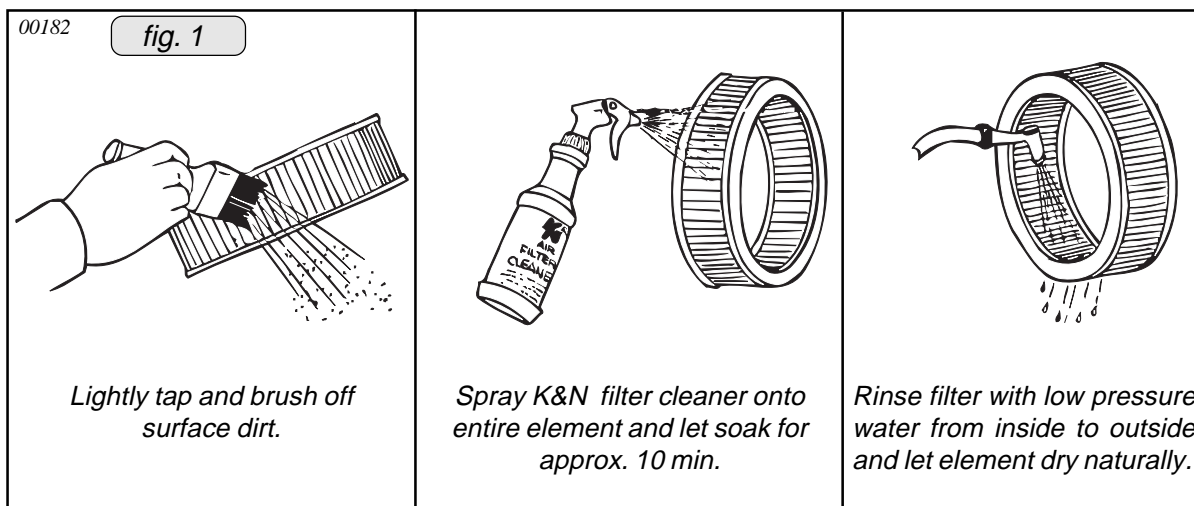
Check engine isolating mounts for heat damage, wear and cracks.

2.4) Check of the air filter

See fig. 1 and 2.

Inspect dry type air filter according to maintenance schedule. Clean dirty filter. When used in heavy dust condition, clean air filter at shorter intervals accordingly. If filter mat is damaged, renew air filter.

■ **ATTENTION:** A dirty filter will not only reduce the engine performance but might also promote premature wear of the engine.



Cleaning of dry air filter

■ **ATTENTION:** Never use gasoline, steam, caustic liquids, detergents or high pressure cleaning.

After soaking period, rinse with cold water from inside to outside, shake off and let it dry naturally.

▲ **WARNING:** Do not dry over naked flame or with hot air gun. Excessive heat will shrink the pores of the filter mat restricting engine air flow.

After cleaning, lubricate filter element evenly with K&N filter oil spray or K&N filter oil, *part no. 897 870*, to achieve optimum filtering effect.

◆ **NOTE:** Each pleat of filter element to be sprayed with oil.

After 5 to 10 min. the filter mat will be soaked with oil, noticeable on the uniform red colouring.

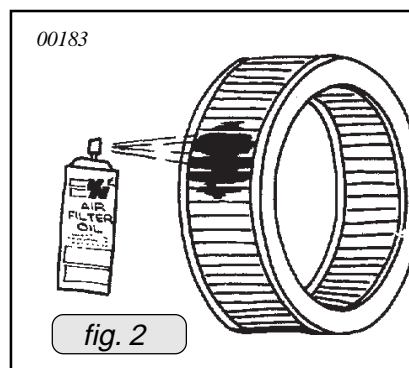
■ **ATTENTION:** Never use gear oil, diesel or motor oil as they attract water.

▲ **WARNING:** In addition to clamp attachment of the filters, additionally wire-secure filter against loss. Filter connection must be free of oil.

Renewal of dry type air filter

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

▲ **WARNING:** Attach new filter, free of grease at connection faces, and wire-secure against loss.



2.5) Differential pressure check

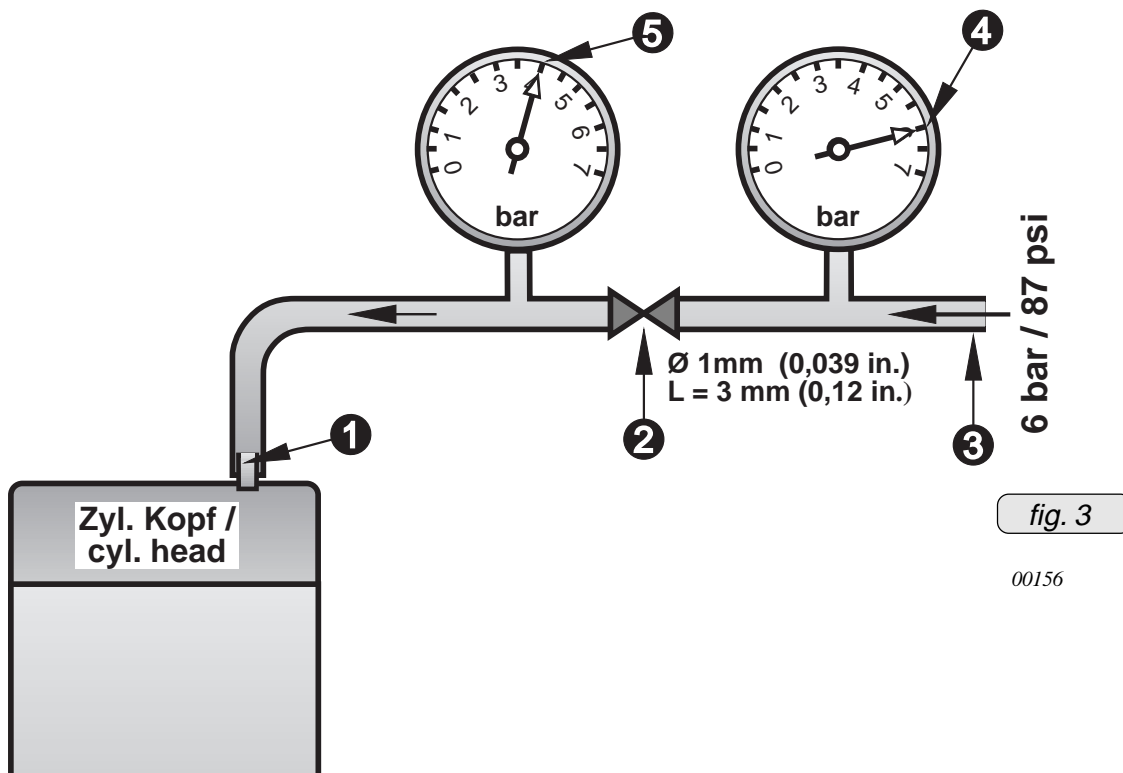
See fig. 3.

Differential pressure test procedure equipment.

For this you will need the following equipment: Compressed air supply of 5 to 7 bar (70 ÷ 100 psi), two pressure gauges, an orifice (2) of 1 mm (.04 in) dia. and 3 mm (.12 in) length and an adaptor to connect line to tapped spark plug hole.

PROCEDURE:

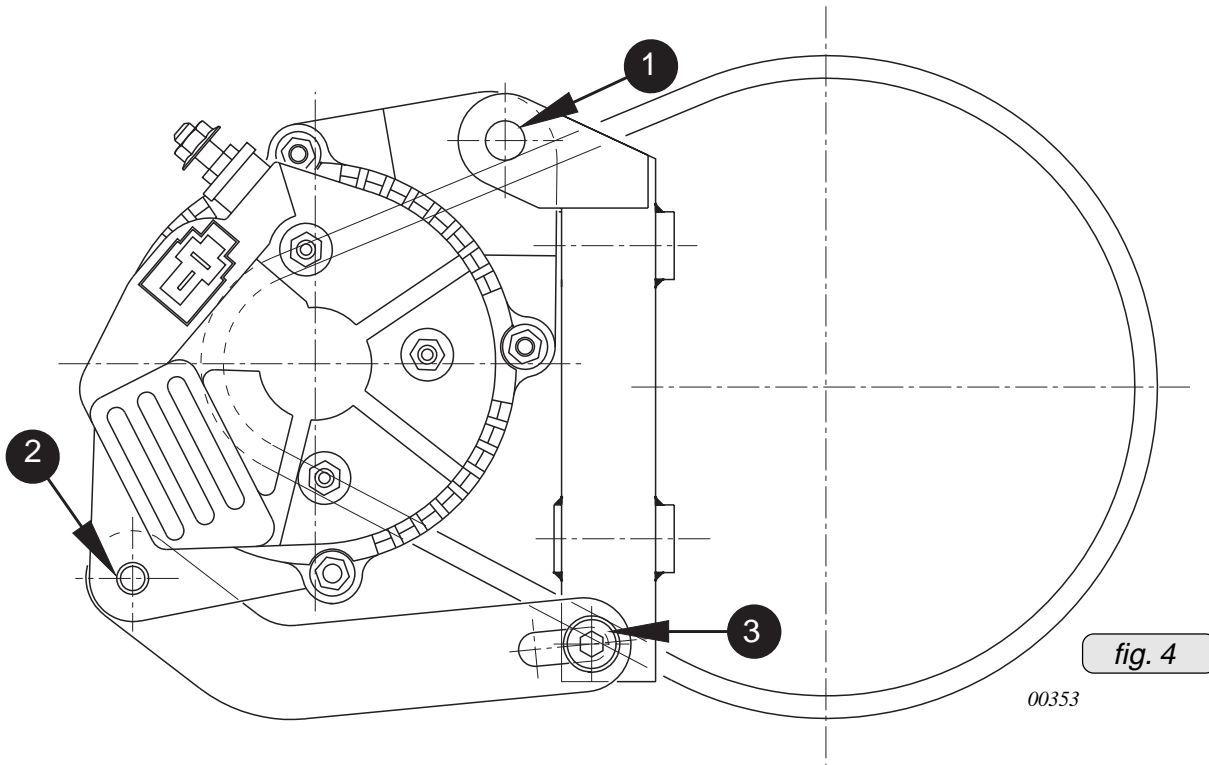
Bring engine to operating temperature. Lock crankshaft in ignition T.D.C. Remove respective spark plug and install adaptor (1) in spark plug hole and connect line with the two pressure gauges and intermediate orifice (2). Now put constant pressure of approx. 6 bar (~ 80 psi) on the line (3) and take readings on pressure gauges (4) and (5). The maximum allowable pressure drop is 25 %, e.g. from 6 to 4,5 bar (87 psi to 65 psi).



2.6) Check of V-belt tension

See fig. 4 and 5.

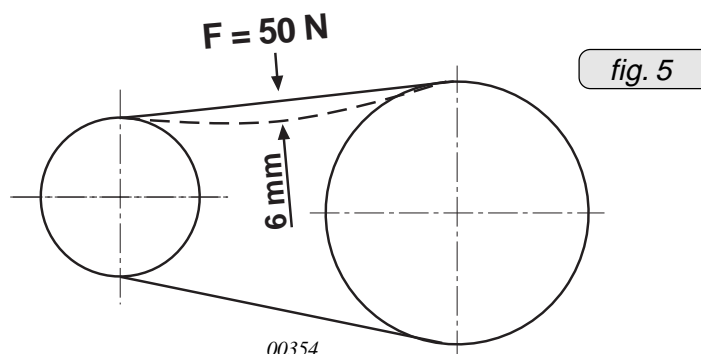
At configuration with additional external alternator, check attachment and V-belt tension.



For adjustment of the V-belt tension, loosen the hex. screw ① M10 and the two Allen screws ② and ③. Push alternator upward and tighten Allen screw ③. Then tighten the screws ① and ②.

Torque screws M8 to 22 Nm (195 in.lb) and screw M10 to 35 Nm (310 in.lb).

Check V-belt tension as per drawing below.





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2.7) Test run of engine

Ensure that all the operating fluids are replenished to the specified levels. Make sure that no loose objects are scattered in engine compartment. Check tight fit of propeller. Anchor aircraft suitably to ground and install wheel chocks.

Ensure that area is clear and secure before starting engine.

▲ **WARNING:** Always observe the engine while running from a secure place.

In succession:

- open fuel cock.
- activate choke.
- throttle to idle position.
- main switch "ON".
- ignition for both ignition circuits "ON".
- press starter button for max. 10 sec. followed by a cooling period of 2 min.
- after engine start, observe oil pressure. Pressure has to be built up within 10 sec.
- start warm up period by running engine at 2000 engine rpm., approximately for 2 minutes then proceed to 2500 engine rpm. until oil temperature reaches 50° C (120° F).
- observe temperatures and oil pressure. At a steady oil pressure above 2 bar (29 psi) engine speed may be increased.
- ignition check as per the current Operator's Manual.
- short full throttle run to ensure engine reaches max. full power. Consult aircraft manual for nominal engine speed as it depends on the propeller used.
- after full-load run, allow a short cooling period to prevent formation of vapour lock in cylinder heads.
- stop engine.

▲ **WARNING:** When stopping the engine, switch off ignition and remove the ignition key.

- replenish engine oil and coolant as required once engine has cooled down.
- ▲ **WARNING:** Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a cloth and open slowly. Sudden opening of the cap would provoke exit of boiling coolant and result in severe scalds.
- **ATTENTION:** If the oil filter has been renewed, re-tighten by hand after the test run.
- usual check engine for oil, fuel or coolant leaks and repair as necessary.

3) Cooling system

3.1) Check of the cooling system

Usually inspect all coolant hoses for damage by heat, cracking, wear and evidence of leaking. Check all connections on cylinder head top- and bottom side and on the water pump. Check expansion tank for damages. Check protection rubber at bottom of the tank for tight fit.

Check gasket of radiator cover as well as the pressure control valve and return valve. The pressure control valve opens at 0,9 bar (13 psi).

Check coolant with densimeter or glycol tester. If necessary, replenish with coolant of same composition. Remarkably discoloured or thickened coolant must be renewed.

■ **ATTENTION:** Use only coolant according to the current Operator's Manual.

▲ **WARNING:** Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a cloth and open slowly. Sudden opening of the cap would provoke exit of boiling coolant and result in severe scalds.

3.2) Renewal of the coolant

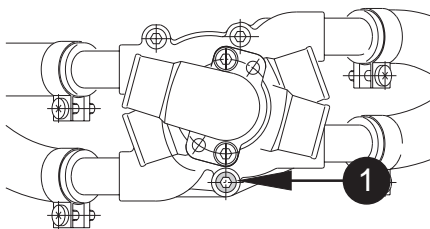
See fig. 6.

Open the radiator cap, remove the bottom attachment screw (1) (with sealing ring) of water pump and drain the coolant.

◆ **NOTE:** If the radiator is located below the engine, detach also the radiator hose.

Install attachment screw (stainless steel) along with a new sealing ring. Tighten to 10 Nm (90 in.lb).

Refill newly mixed coolant into expansion tank (highest point of the cooling system). Install radiator cap.



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fig. 6

◆ **NOTE:** Run engine to operating temperature and allow engine to cool down before checking coolant level. Replenish as necessary.

▲ **WARNING:** Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a cloth and open slowly. Sudden opening of the cap would provoke exit of boiling coolant and result in severe scalds.

3.3) Flushing of the cooling system

This can be done with a water hose at a max. pressure of 2 bar (30 p.s.i.).

◆ **NOTE:** For the flushing, open the lowest located coolant hose (either at water pump or radiator).

Refill newly mixed coolant into the expansion tank (highest point of the cooling system).

◆ **NOTE:** Run engine to operating temperature and allow engine to cool down before checking coolant level. Replenish as necessary.

▲ **WARNING:** Never open radiator cap when the cooling system is hot. For safety's sake, cover cap with a cloth and open slowly. Sudden opening of the cap would provoke exit of boiling coolant and result in severe scalds.



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4) Fuel system

4.1) Carburetor synchronization

4.1.1) Mechanical synchronization

See fig. 7.

For synchronous basic throttle adjustment (**mechanical synchronization**) proceed as follows.

Adjust the two Bowden cables for simultaneous opening of the throttles.

Remove throttle cable locking mechanism (4) from throttle actuating arm (1).

Release automatic full throttle spring (5) from its attachment on the throttle arm (1).

Return the throttle actuating arm (1) to its idle stop position by hand, there should be no resistance during this procedure.

Unscrew the carburetor idle speed adjustment screw (2) by turning it counter-clockwise, until it is no longer contacting the carburetor idle screw stop.

Insert a 0,1 mm (.004 in) feeler gauge (gap X) between the idle speed adjustment screw (2) and the carburetor idle stop (3), gently turn the idle screw clockwise until contact is made with the 0,1 mm feeler gauge.

As this point remove the feeler gauge and turn the idle speed adjustment screw (2) clockwise 1 1/2 complete additional turn.

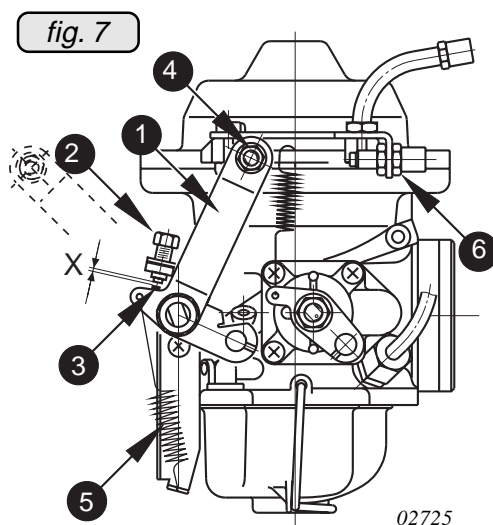
Hook - up the automatic full throttle spring (5), previously disconnected, back to its original position on the carburetor throttle actuating arm (1).

Carry out the above procedure on both carburetors.

You must at this point place the throttle lever in the cockpit on 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.

Ensure that the throttle lever in the cockpit remains on the idle stop position. Return throttle arm (1) to the carburetor idle stop position and, using throttle locking mechanism (4), secure the actuating throttle cable to the carburetor throttle actuating arm (1) accordingly. You must ensure that the throttle arm idle screw (2) is resting on the carburetor idle stop (3) and that there is no clearance between the two when throttle cables are permanently installed and the cockpit throttle lever is at the idle position.

◆ **NOTE:** Under normal circumstances the mechanical carburetor synchronization is adequate.



4.1.2) Pneumatic synchronization

See fig. 7, 8 and 9.

With suitable flow meters (synchro tester) ② or depression gauges both carburetors are adjusted to equal flow rate at idling. Remove the compensating tube (4) (connection between intake manifolds) and plug the connections.

Remove plug screws ③ M3,5x5 and connect the depression gauge(s).

◆ NOTE: The synchro tester may also be directly connected to the intake manifold as in this area the same depression prevails as on the plug screws of the carburetors. See fig. 9.

Remove the tube (4) from its location by removing the two securing clamps (5) from each push on connection (6).

Using the push on connection (6) already supplied with the balance tube, install in each push on connection a flexible rubber hose (7) leading to a manometer (2).

The next step is to secure the aircraft with wheel chocks and tie it down securely.

▲ WARNING: Secure and observe the propeller zone during engine operation.

Start the aircraft and check the RPM at idle, if the idle speed is too low or too high, simply adjust idle screws (2), fig. 7, accordingly.

▲ WARNING: Do not adjust idle speed screws more than 1/2 turn either way to achieve proper idle speed.

If a setting of more than 1/2 turn is required, repeat mechanical synchronization and make the necessary adjustments of the idle screw (2) accordingly to achieve the proper idle speed i.e.: if the idle speed is too high, the idle screw must be turned in less than one complete turn. If the opposite is the case and the idle speed is too low, the idle speed screw must be turned in more than one complete turn.

▲ **WARNING:** Too low of an idle speed will cause engine gearbox damage and too high of an idle speed will result in a hard starting engine.

Once that the proper idling RPM has been established, the next adjustment is the OFF IDLE setting.

First establish that the engine is developing full power when selected in the cockpit. At the same time we can verify and adjust the OFF IDLE setting.

Proceed as follows, select full power and verify that both manometers are registering the same readings, if the same reading is not accomplished on both manometers, shut down engine and verify that carburetor linkages are effecting full travel and that starting carburetors are in the full off position.

Repair any discrepancies as required to achieve full power on both carburetors prior to resuming synchronization procedure.

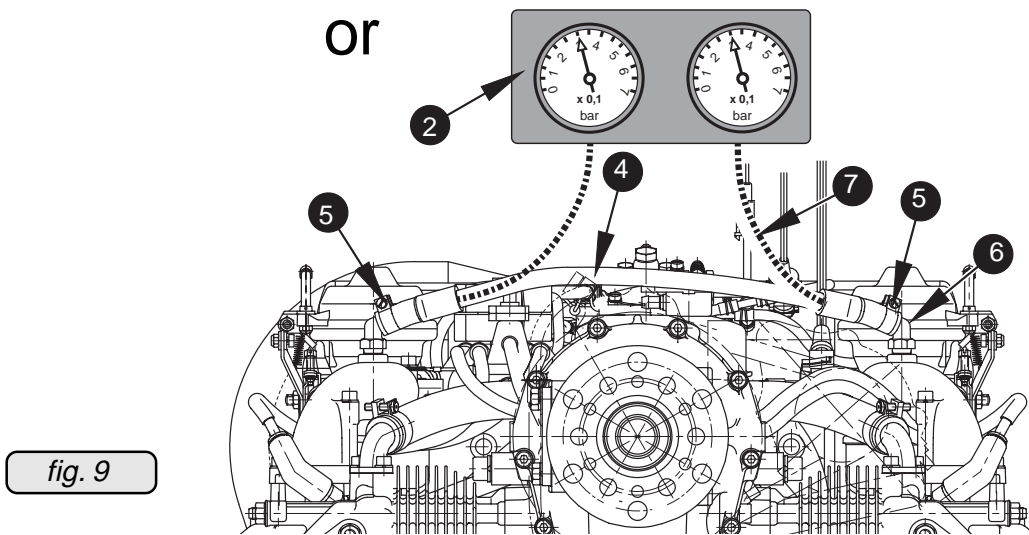
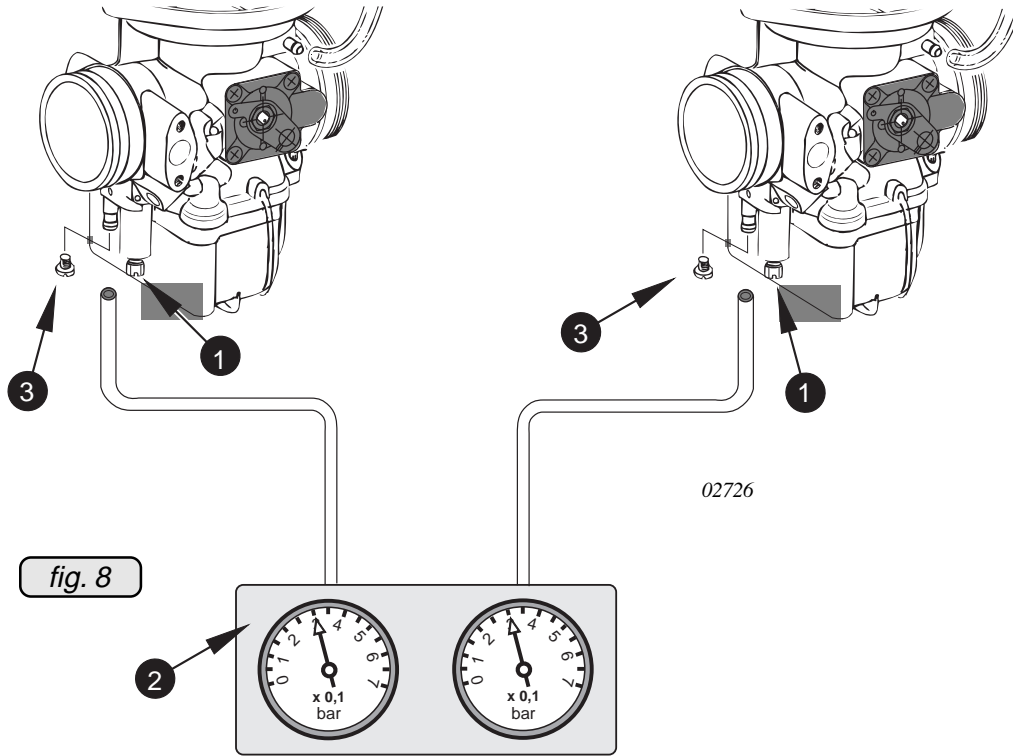
Once that full power has been established on both carburetors, retard the throttle one-inch and note the manometer settings. The manometers should be at the same reading for each carburetor, any discrepancies between the two readings must be rectified by the OFF IDLE adjustment (6) see fig. 7. The carburetor with the lower indication must be advanced to match the higher one. This is done by shutting down the engine, and loosening the securing locknut on the OFF IDLE adjustment and turning inward 1/2 turn the adjustment thimble then locking the adjustment with the locknut and re-testing the engine.

Any major adjustments required necessitate verification of all parameters mentioned in this procedure.

Install balance tube on engine in reverse sequence of removal. Any minor differences in balance at idle will be compensated for by the balance tube at low engine RPM.

■ **ATTENTION:** Respect the indication of the instrument manufacturer.

Refit plug screws M3,5x5.



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4.2) Idle speed adjustment

See fig. 9/1 and 9/2

General note:

In principle, engine idling is always adjusted at operating temperature of the engine.

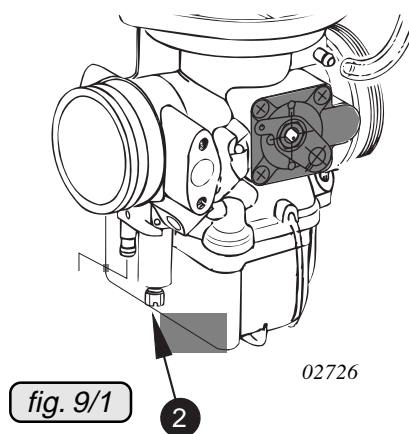
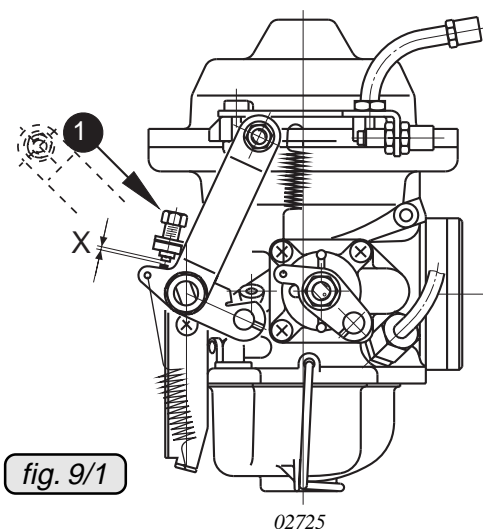
- The basic idle speed is set by the throttle lever stop screw (1). Refer to section mechanical synchronization.

Optimizing of running behaviour:

Close idle mixture control screw (2) by turning clockwise and open again 1,5 turns counter clockwise.

- ◆ **NOTE:** Turning idle mixture control screw in clockwise direction results in a leaner mixture and turning anti-clockwise in a richer mixture.

- **ATTENTION:** If no satisfactory engine idling can not be achieved, an additional pneumatic synchronization will be necessary.



4.3) Verification of carburetor actuation

See fig. 9/3.

Route Bowden cables in such a way that carburetor actuation will not be influenced by any movement of engine or fuselage, thus possibly falsifying idle speed setting and synchronization.

◆ **NOTE:** Each carburetor is actuated by two Bowden cables. At position (1) connection for throttle valve, and at position (2) connection for starting carburetor (choke) actuation.

Check Bowden cables and levers for easy movement. Bowden cable must allow full travel of lever from stop to stop. Adjust throttle cables to a clearance of 1 mm (.04 in).

▲ **WARNING:** Adjust the Bowden cables such that the Bowden cable for throttle and starting carburetor (choke) can be fully opened and closed. The Bowden cables must not stick.

Inspect and lubricate actuation linkage and joints with engine oil.

Check reset springs (3) and inspect engagement holes for wear.

▲ **WARNING:** With carburetors levers not connected, the carburetor is in full throttle position. Never start the engine without carburetor Bowden cable connected, as the home position of the CD-carburetor is with throttle fully open.

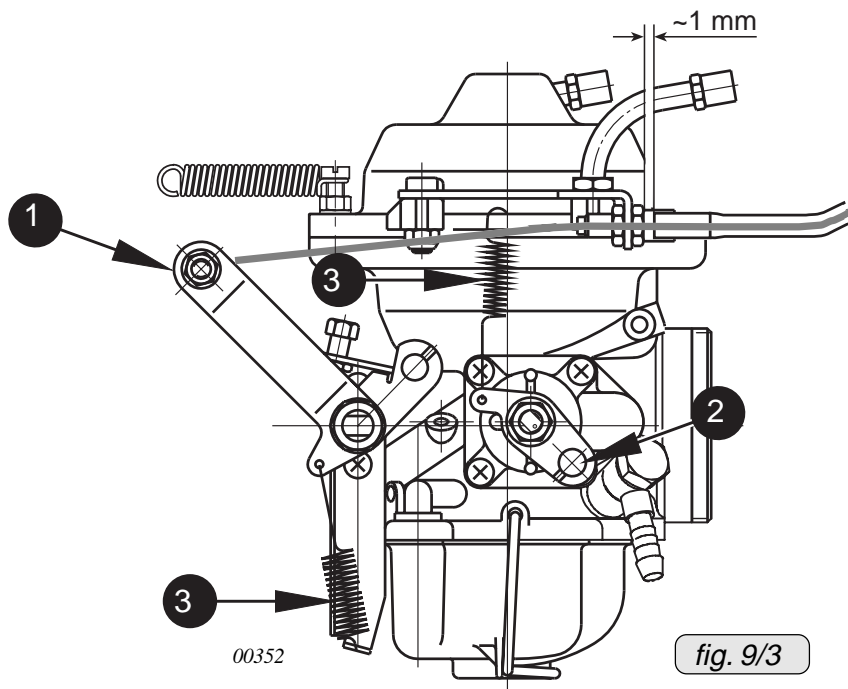


fig. 9/3

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4.4) Removal of carburetors and carburetor flange

See fig. 10 and 11.

Identify both carburetors to respective cylinders, e.g. carburetor for cyl. 1/3 and cyl. 2/4.

◆ **NOTE:** The standard attachment of the carburetors (1) is by flexible flanges (2) on the intake manifold (3).

Verify positioning of clamp screw (4) with position downward as delivered and 7 mm (.28 in.) gap between clamp lugs.

Remove tension spring (5) of carb support with a suitable tool.

Slacken clamp screw (4) and remove carburetor (1) by slight turning and swivel action. Remove spacer ring 36 / 43 / 4,2 from carb flange ass'y and cap inlet openings to prevent contamination.

■ **ATTENTION:** If the float chamber (6) should not have been drained yet, proceed as follows:

Swing open spring clip (7) take off and empty float chamber while holding both floats in position. Refit float chamber and secure with spring clip.

Ensure proper disposal of fuel.

The carburetor flange assemblies (2) can be taken off after removal of the hex. hd. screws M8x20 (8) and washers (9).

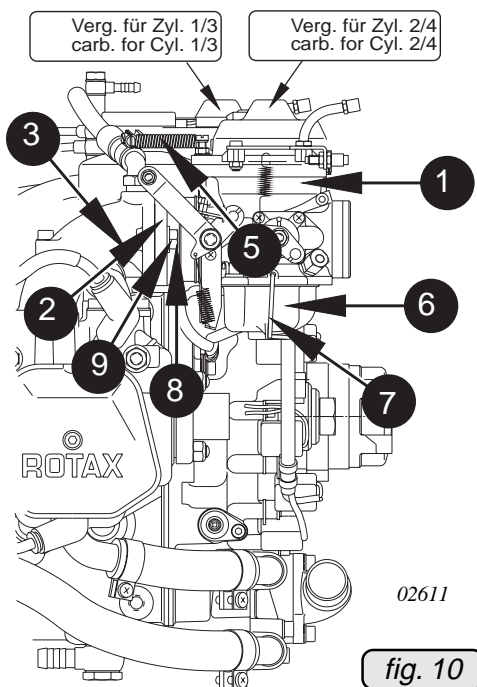


fig. 10

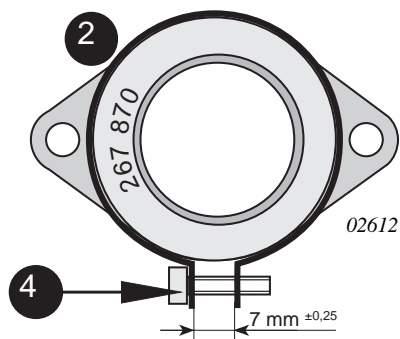


fig. 11



4.5) Inspection or repair of the carburetors

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.

◆ **NOTE:** At the check of the carburetors take care of the following:

- Cleaning
- Disassembly
- Inspection of all components inclusive jetting
- Leakage test of float needle valve

4.6) Installation of carburetor and carburetor flange

See fig. 12 and 13.

Fit carburetor flange (1) with 2 hex. screws (2) M8x25 secured with LOCTITE 221 and washers (3), tighten to 14 Nm (125 in.lb).

■ **ATTENTION:** The screw (4) of the hose clamp must face downward.

Place spacer 36/43/2,5 into carburetor flange socket. Put the carburetor into the carb flange socket, free of oil and grease. Align carbs and secure with hose clamp.

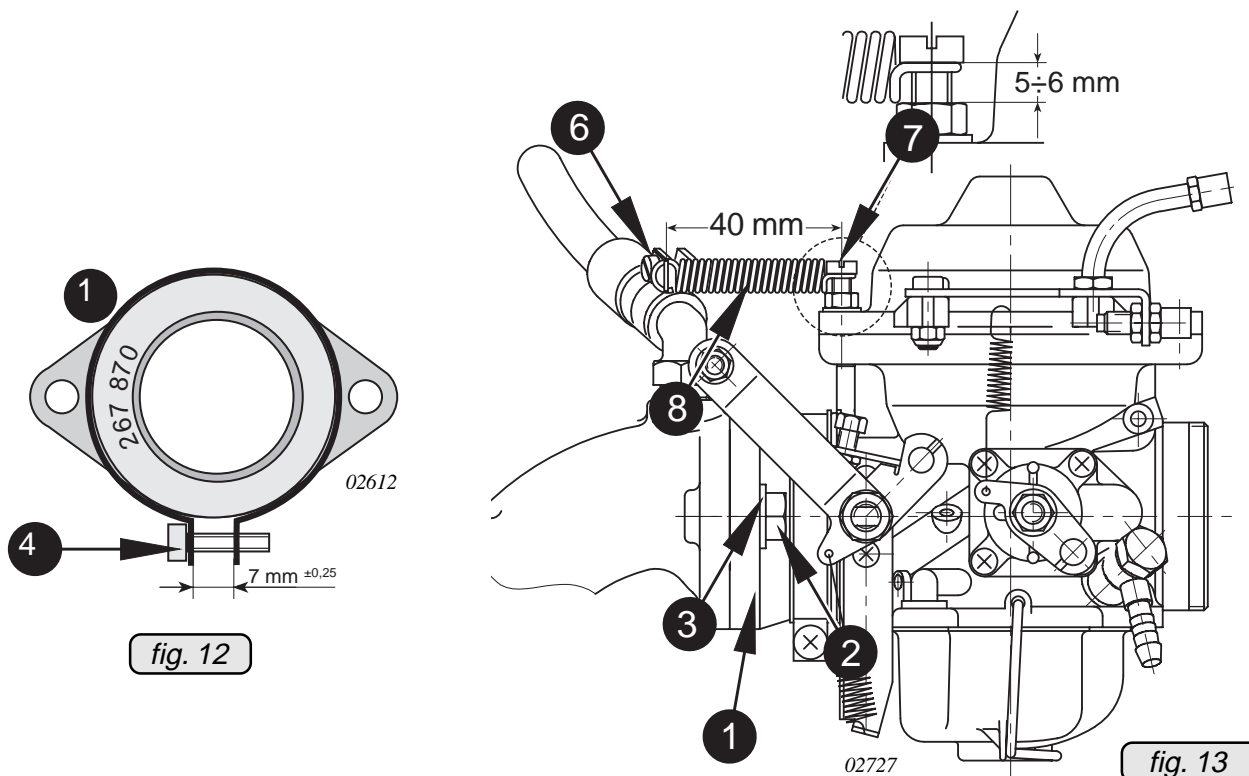
■ **ATTENTION:** Tighten the hose clamp only to an extent that a gap of 7 mm (.275 in.) remains between the lugs. See fig. 12.

From field experience, cases have shown where the hose clamp was tightened excessively. This may cause the socket to be scored at the inside by the carburetor rim possibly damaging it resulting in an intake leak.

Verify the 5-6 mm (0,2-0,24") distance on the cheese hd. screw as this distance is required to maintain flexibility of the tension spring (7).

Use suitable tool to engage spring on bracket (6).

■ **ATTENTION:** To warrant efficiency of the carburetor support, a distance of 40 mm (1,6") must be maintained between cheese - hd. screw (7) and support bracket (6).



4.7) Inspection of the carburetor flange socket

See fig. 14.

Compress carburetor socket in the area of the carburetor connection to allow easier detection of existing cracks (1) and (3) also check the area of the inner diameter (2). At suspicion of cracks renew the carburetor flange.

◆ NOTE: The carburetor socket is subject, apart from chemical strain due to fuel and UV radiation, to stress by vibration. Excessive tightening of the clamp may also damage it causing cracks resulting in intake leaks.

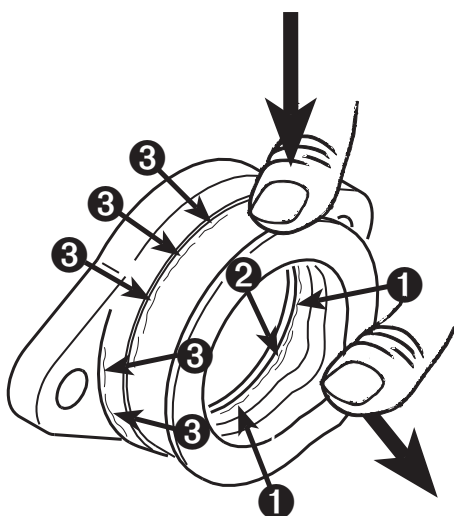


fig. 14

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5) Lubrication system

5.1) Oil level check

See fig. 15.

▲ **WARNING:** Ensure ignition system is grounded prior to turning propeller.

Prior to oil level check turn the propeller several times by hand to transfer all the oil from the engine to the oil tank.

This process will be finished when air flows back to the oil tank. This air flow can be perceived as murmur when the cover of the oil tank is removed.

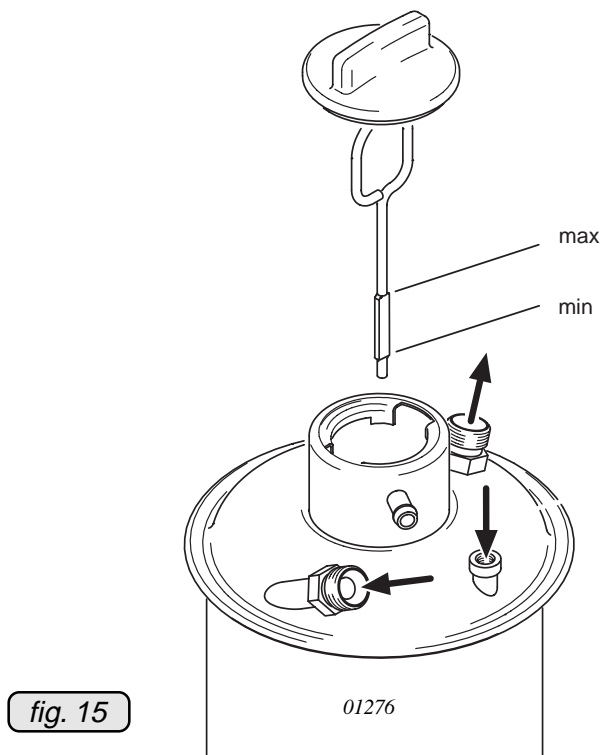
The oil level in the oil tank should be between the two marks (max./min.) on the dip-stick, but must never fall below the min. mark.

Replenish oil as required:

For normal engine operation maintain the oil level between the two marks as an excessive oil level will allow oil to escape via the venting line.

■ **ATTENTION:** For longer flights replenish oil to max. mark to warrant more oil reserve.

Difference between "max." and "min." - is = 0,75 l (1,6 liq.pt).



5.2) Oil change

See fig. 16.

◆ **NOTE:** It is advisable to check the oil level prior to an oil change as it informs about oil consumption.

Drain oil on warm engine only.

Cut safety wire and remove drain screw (1) from oil tank, drain oil and dispose of it as per environmental regulations.

▲ **WARNING:** Careless draining of hot engine oil may cause scalds. Dispose of used oil and filters respecting the environmental regulations.

◆ **NOTE:** Remove and replace oil filter at each oil change.

Refill with approx. 3 l (0,8 US gal.) of oil.

■ **ATTENTION:** Use only oil of registered brands according to the current Operator's Manual.

In case of any oil contamination, the oil tank must be removed, disassembled and cleaned.

Oil tank cleaning procedure:

Remove oil lines, clamp (2) and oil tank cover (3) with O-ring (4).

Remove internal parts of oil tank, like baffle insert (5) and partition (6).

Clean all parts and inspect for damage.

Re-assembly of the oil tank in reversed sequence of disassembly.

Fit drain screw (1) M12x12 with a new sealing ring (7) tighten to 25 Nm (220 in.lb) and safety wire.

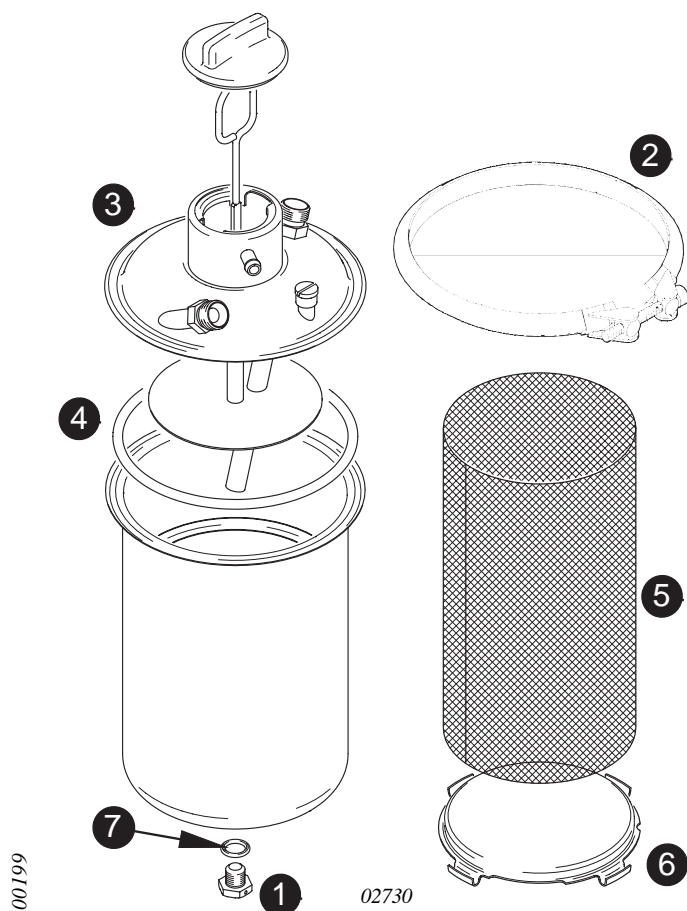


fig. 16

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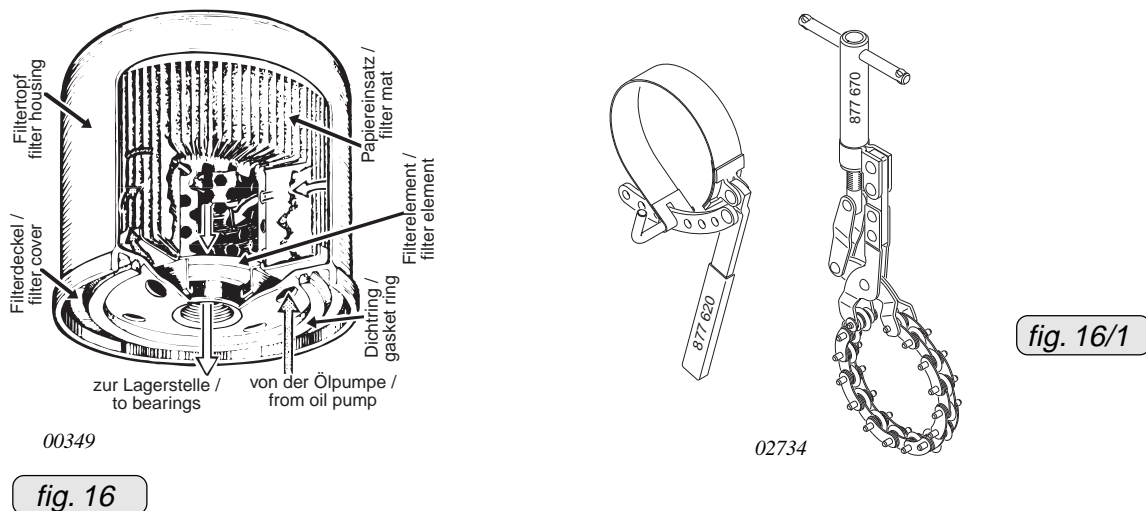
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5.3) Oil filter replacement and inspection

See fig. 16, 16/1 and 17.

Unscrew oil filter with filter wrench, part no. 877 620* .

At every oil change, replace the oil filter and open the old one with special tool, part no. 877 670* thus not producing chips.



Remove filter insert, cut top and bottom cover off the mat. Remove filter mat, unroll and check it for metal chips, foreign matter, contamination and abrasion.

This check is important as it allows conclusions regarding the condition of the engine and gives information about a possible cause of any failure.

* or equivalent

- **ATTENTION:**It is absolutely necessary to check the filter mat carefully for metal chips.

Possible foreign matter: Steel chips, bronze chips, aluminium chips, sliver of bearing material, remains of sealing compound.

- **ATTENTION:**If an increased amount of metal particles is found, like brass- or bronze chips or sliver from bearings, search for the cause and correct.

If the filter mat is clogged by foreign matter, the lubricating oil flows unfiltered back to the oil pump via the bypass valve in the oil filter. The unfiltered oil arrives at the parts to be lubricated.

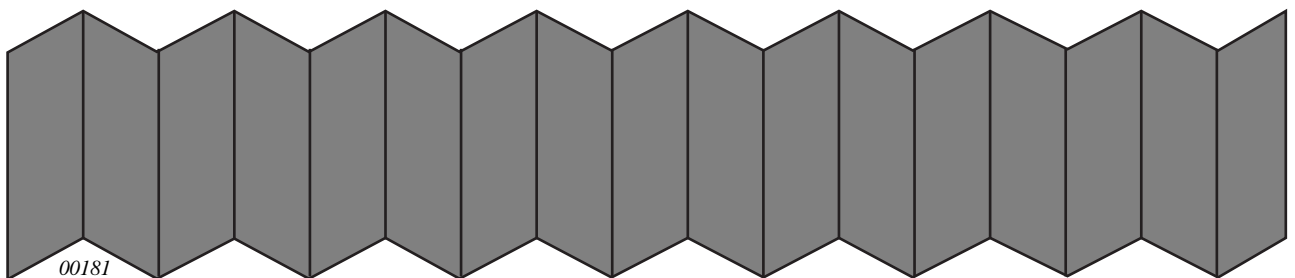
- **ATTENTION:**To warrant the function of the oil circuit and the forced flow lubrication, use genuine oil filter only. Only these filters assure correct pressure in the bypass valve operation.

Installation of the new oil filter

Slightly lubricate sealing ring of the new oil filter with engine oil and screw on filter by hand.

- **ATTENTION:**After the engine test run, re-tighten filter by hand.

fig.17



6) Electric system

6.1) Check of wiring

- Check all cable connectors for tight fit and good contact.
- Inspect all ground connections for corrosion and security, repair as required.
- Check plug connections between pick-up cable, electronic module, charging and shorting cables for corrosion and security, repair as required.
- Check plug connections between electronic module and ignition coils for security, wear and corrosion.
- Verify plug connections of generator cables with rectifier-regulator and connections of all cables on rectifier-regulator for good contact, tight fit and corrosion, repair as required.
- Check grounding cables for tight fit and corrosion, repair as required.
- Verify shielding of cable assemblies for damage, for ground contact and security.
- Inspect all 8 ignition cables to spark plug connector for damage and tight fit. Check resistor plug connector for tight fit on spark plug. Repair or replace as necessary.



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6.2) Verification or renewal of spark plugs

- **ATTENTION:** Observe the different maintenance intervals corresponding to engine type.

Because of the differing thermal load, particular spark plugs have been specified for each engine type.

In numerous tests the best possible heat range has been determined to make sure that the spark plug will burn off deposits but will not overheat.

- ▲ **WARNING:** Employment of incorrect spark plugs can result in ignition problems, pre ignition and consequent engine damage.

Refer to special checks 05-50-00, section 11

Ensure that the following spark plugs corresponding to engine type are employed and the correct spark plug spanner is used.

Engine type	part no.	designation	A/F of spanner
912 UL/A/F	897 255	DCPR 7E	16 mm
912 ULS/S	297 940	DCPR 8E	16 mm

- **ATTENTION:** Apply heat conduction compound on spark plug thread and tighten spark plug to 20 Nm (177 in.lb) on the **cold** engine.
Heat conduction compound, see 05-00-00 section 2.5

Always renew both spark plugs of a cylinder and do not interchange spark plugs between cylinders.



Remove the spark plugs and put them aside coordinated to cylinder and position. Plug face appearance out of an engine reveals the following:

light coloured to brown:

plug and calibration are correct

velvet black:

Indicates the following:

- mixture too rich
- insufficient air intake (clogged air filter)
- operating temperature too low.

oily, glossy coating:

Indicates the following:

- misfiring
- too much oil in combustion chamber
- worn cylinder and piston rings

white with melt droplets:

Indicates the following:

- mixture too lean
- leaking valves

7) Propeller gearbox

- ◆ **NOTE:** The following checks „checking of the backlash“ and „friction torque check“ are necessary only on certified engines and on engines with the overload clutch as optional extra.

Engines without the overload clutch (slipper clutch) still incorporate the torsional shock absorption. This design is similar to the one in connection with the overload clutch but with a different profile of the dogs (smaller backlash).

For this reason the friction torque method cannot be applied on engines without combination of overload clutch / torsional shock absorption.

7.1) Checking of the backlash

With engine at standstill, the propeller can be turned by hand for approx. 30° taking into consideration a slight friction torque. No odd noises or irregular resistance must be noticeable during this moment.

Otherwise repair is necessary.

- **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.

7.2) Checking of the friction torque

See fig. 18.

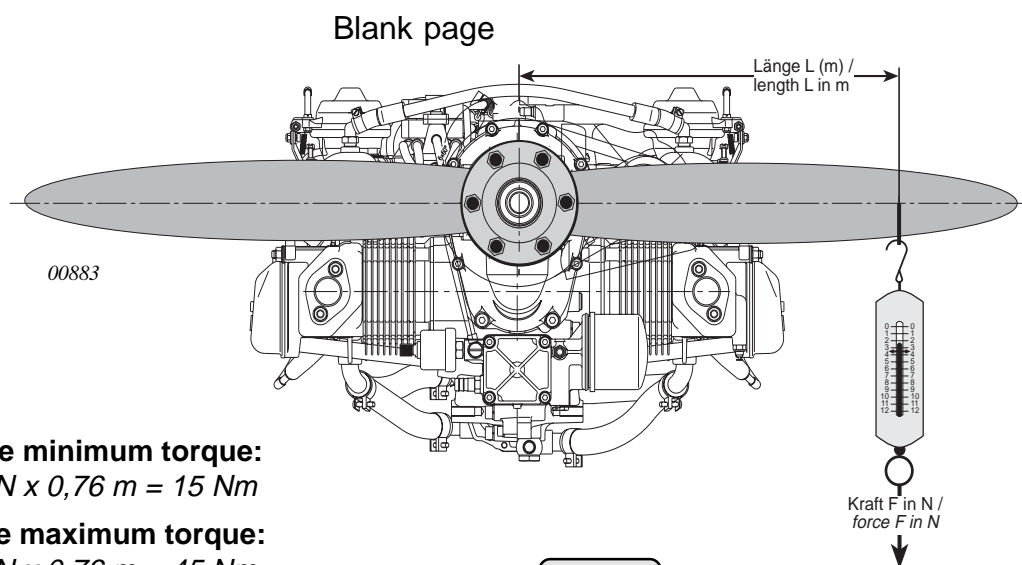
- Install the crankshaft locking pin. Refer to 05-50-00, section 2.2.
- With the crankshaft locked, the propeller can be turned by hand 15 or 30 degrees depending on the profile of the dog gears installed.

This is the amount of movement allowed by the dog gears in the torsion load absorption unit.

- 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 rotation. (See Fig. 3)
- 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 15 Nm to 45 Nm (130 to 400 in. lb). See calculation example.
- Remove crankshaft locking pin.

◆ **NOTE:** Within the backlash the torque by friction is 15 to 45 Nm (130 to 400 in.lb). This value is calculated by the indication of the spring scale multiplied by length of lever arm ($N \times m = Nm$). If the above mentioned friction torque is not achieved, remove gearbox and inspect it.

■ **ATTENTION:** Only qualified technicians (authorized by Aviation Authority and after successful attendance of the relevant ROTAX® training course) are authorized to perform this work as per the ICR Manual.



For example minimum torque:

$$F \times N = 20 \text{ N} \times 0,76 \text{ m} = 15 \text{ Nm}$$

For example maximum torque:

$$F \times N = 60 \text{ N} \times 0,76 \text{ m} = 45 \text{ Nm}$$



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