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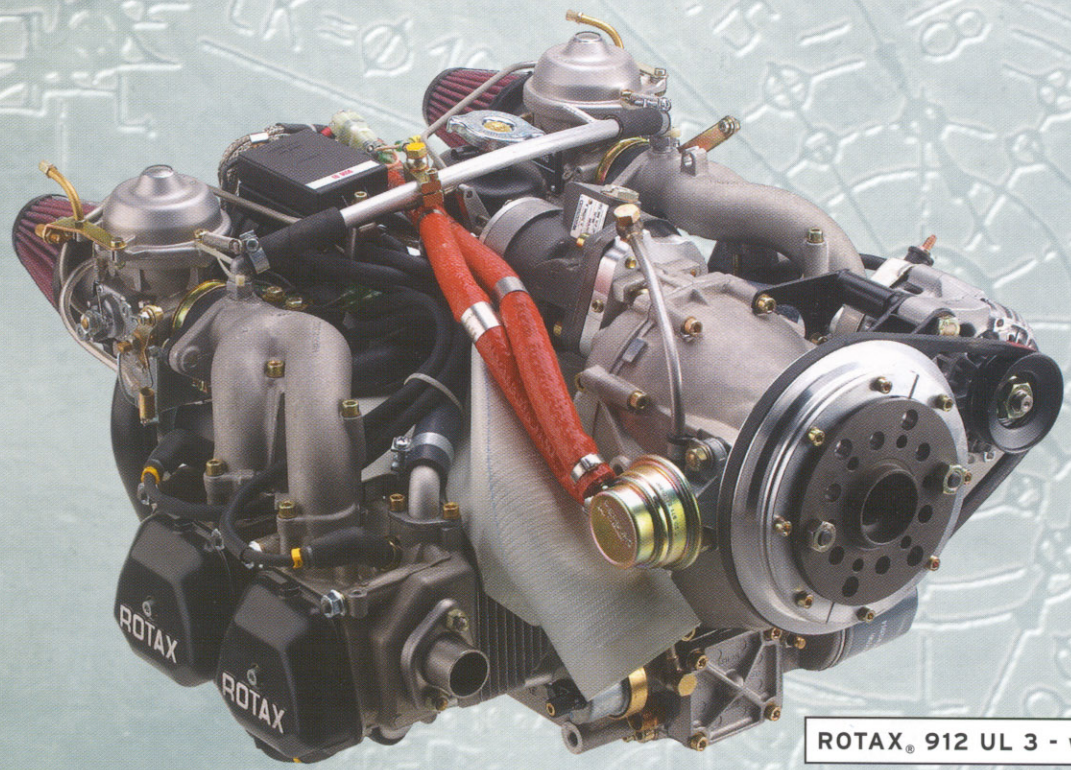
ROTAX®
AIRCRAFT ENGINES

Maintenance Manual
(Line Maintenance)
for
ROTAX® Engine Type 912 Series



ROTAX® 912 UL 3 - with options

⚠ WARNING

Before starting any maintenance work, please, read the Maintenance Manual completely as it contains important safety relevant information.

Approval of translation has been done to best knowledge and judgement - in any case the original text in German language is authoritative.

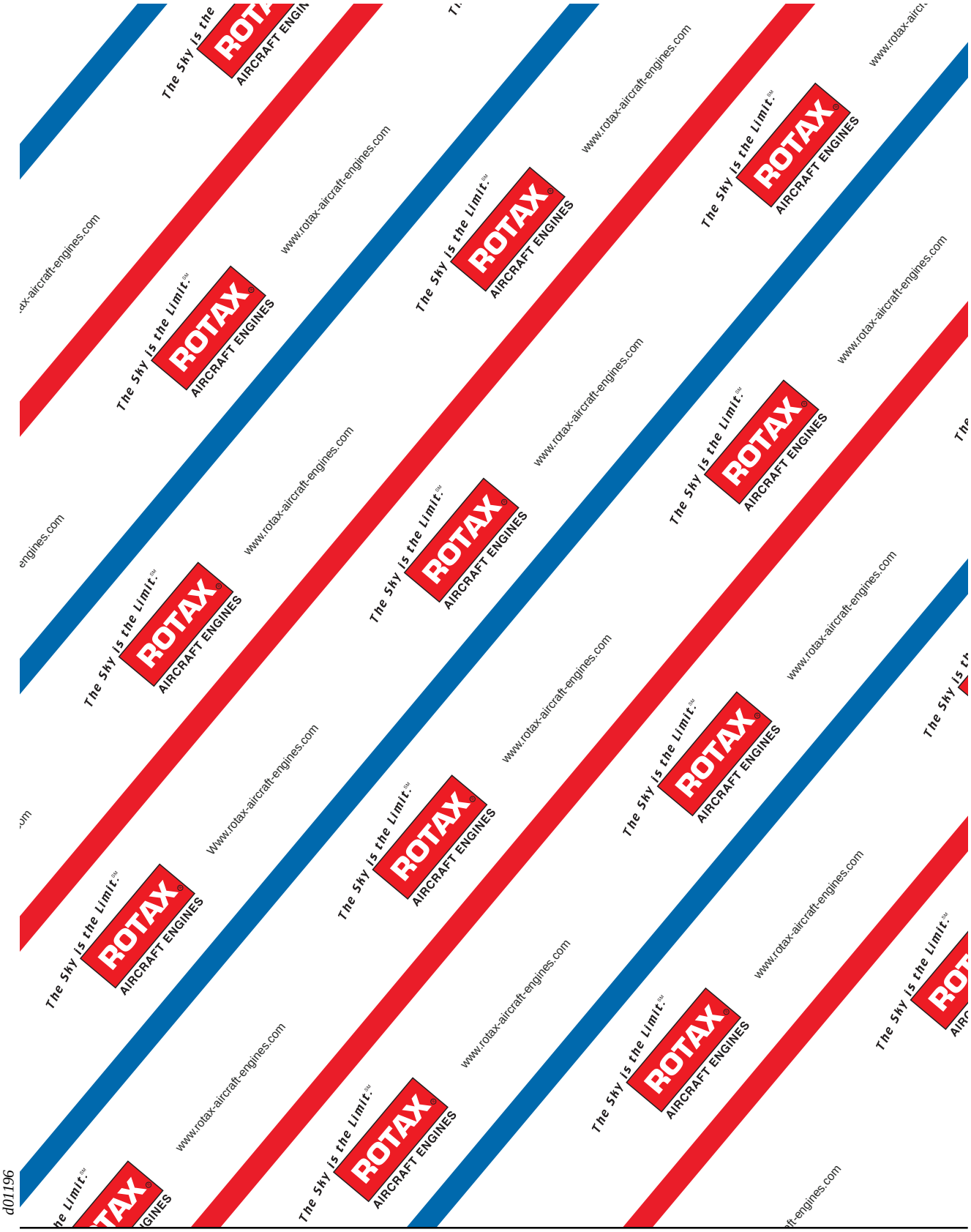
Edition: 0 of 1998 09 01

ROTAX® part no.: 899372

CHAPTER 00

INTRODUCTION

1) Table of contents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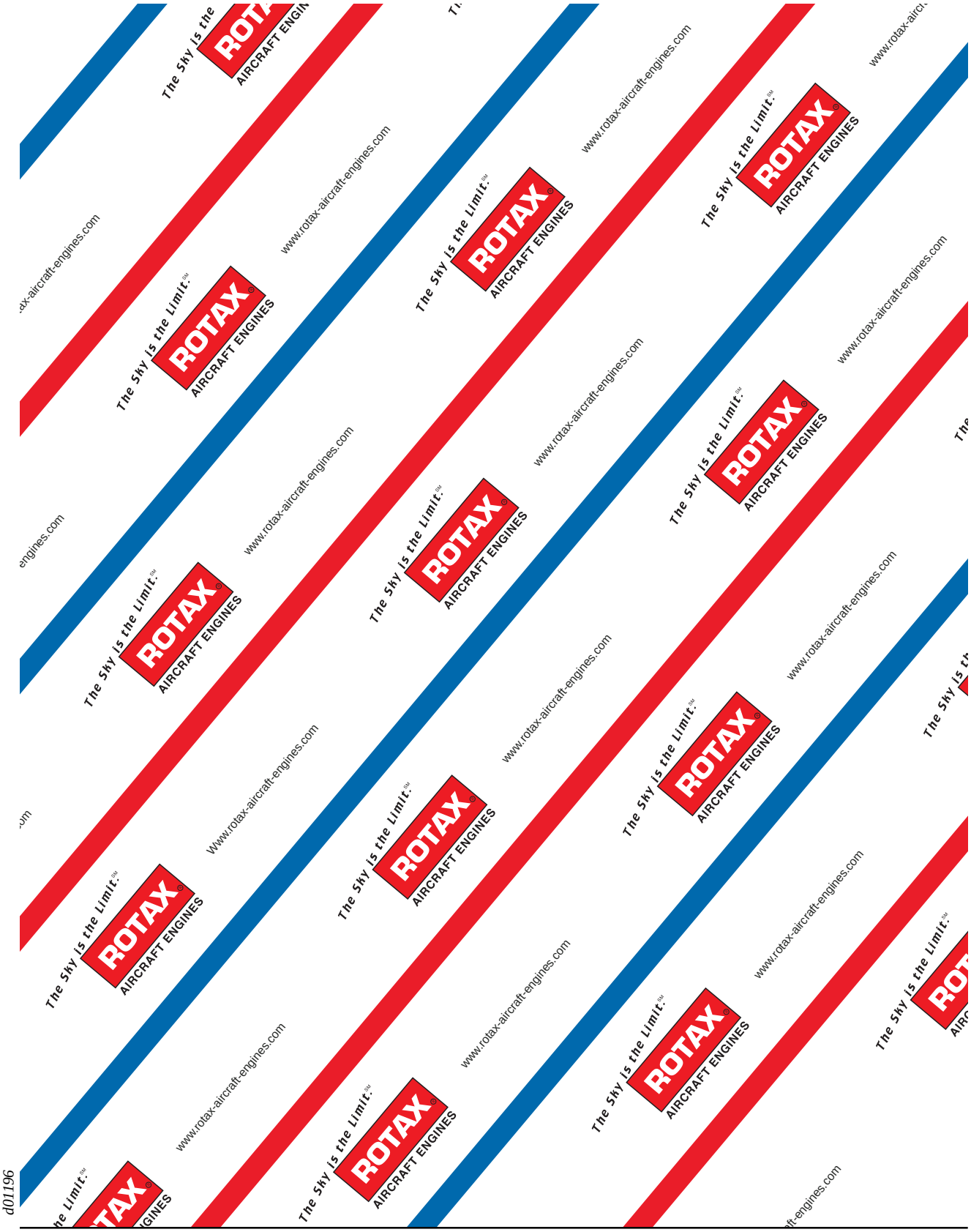
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3) Index

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4) Introduction

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

In this Manual the maintenance of engine type 912 Series is described.

◆ NOTE: 912 Series includes all types of 912 engines like 912 A, 912 F, 912 S, 912 UL, 912 ULS and 912 ULSFR.

Before carrying out maintenance work on the engine, carefully read the Maintenance Manual.

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. The engine serial number is on the top of the ignition housing, left side. See fig. 1.

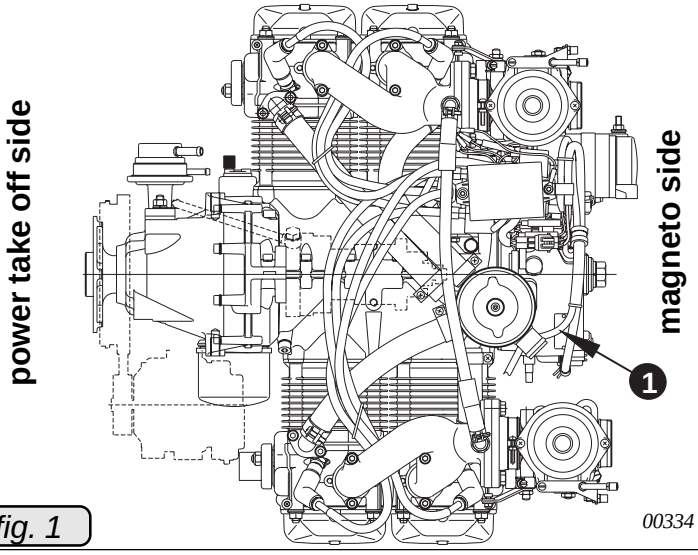

fig. 1

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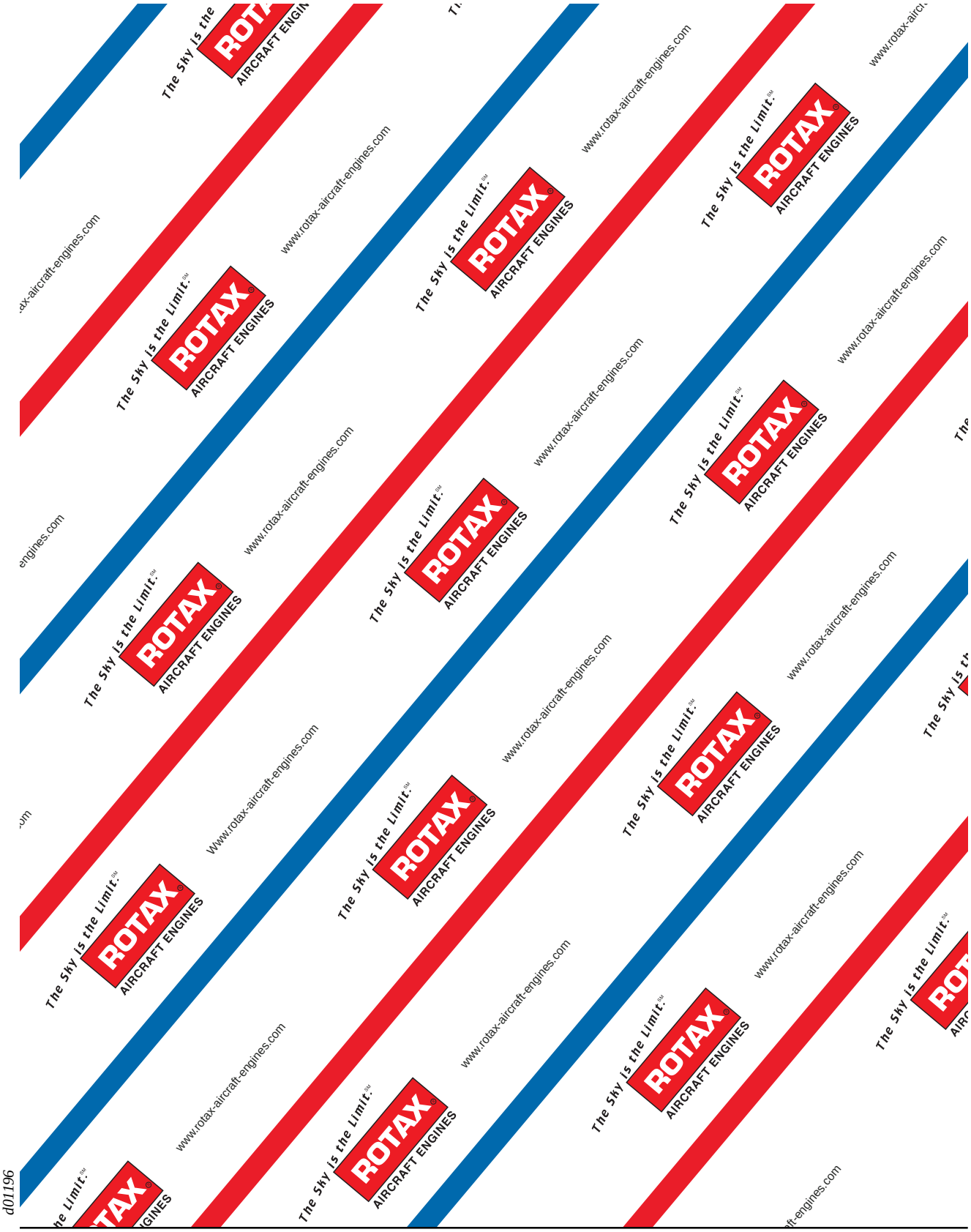
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4.3) Conversion table and abbreviations

Units of length:

1 mm = 0,03937 in

1 in = 25,4 mm

1 ft = 12 in
= 0,3048 m

Units of area:

1 cm^2 = 0,155 sq in (in^2)

1 sq in (in^2) = 6,4516 cm^2

Units of volume:

1 cm^3 = 0,06102 cu in (in^3)

1 cu in (in^3) = 16,3871 cm^3 (in^3)

1 dm^3 = 1 l

1 dm^3 = 0,21997 gal (UK)

1 gal (UK) = 4,5461 dm^3

1 dm^3 = 0,26417 gal (US)

1 gal (US) = 3,7854 dm^3

Units of mass:

1 kg = 2,2046 lb

1 lb = 0,45359 kg

Density:

1 g/cm^3 = 0,016018 lb/ft^3

1 lb/ft^3 = 62,43 g/cm^3

Units of force:

1 N = 0,224809 lbf

1 lbf = 4,4482 N

Units of pressure:

1 Pa = 1N/m^2

1 bar = 100 000 Pa (1000 hPa)

1 bar = 14,5037 lbf/in^2 (psi)

1 lbf/in^2 (psi) = 0,0689 bar

1 in HG = 33,8638 hPa

Units of power:

1 kW = 1,341 hp

1 hp = 0,7457 kW

1 kW = 1,3596 PS

1 PS = 0,7355 kW

Units of temperature:

K = °C - 273,15

°C = (°F - 32) / 1,8

°F = (°C x 1,8) + 32

Units of velocity:

1 m/s = 3,6 km/hr.

1 ft/min = 0,3048 m/min
= 18,288 m/sek

1 m/s = 0,0555 ft/min

1 kn = 1,852 km/hr.

1 km/hr. = 0,53996 kn

spec. fuel consumtion:

1 g/kWh = 0,001644 lb/hph

1 lb/hph = 608,277 g/kWh

Units of torque:

1 Nm = 0,737 ft lb
= 8,848 in lb

1 ft lb = 1,356 Nm

1 in lb = 0,113 Nm

Wire Gauge: AWG - mm^2

AWG	4	6	8	10	12	14	16	18	20
mm^2	21,2	13,3	8,35	5,27	3,31	2,08	1,31	0,82	0,519

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Abbreviations:

*	Reference to another section (only in the illustrated parts catalog)
@	at
	a drop indicates usage of sealing adhesive or lubrication compound. (only in the illustrated parts catalog)
	center of gravity
912 A	see OM (Type designation)
912 F	see OM (Type designation)
912 S	see OM (Type designation)
912 UL	see OM (Type designation)
912 ULS	see OM (Type designation)
912ULSFR	ROTAX® 912 ULS Version France
914 F	see OM (Type designation)
914 UL	see OM (Type designation)
A/C	Aircraft
ACG	Austro Control GesmbH
AD	Airworthiness Directives
A/F	across-flat dimension
ASB	Alert Service Bulletin
CCW	counter-clockwise
CW	clockwise
EGT	Exhaust gas temperature
EM	Engine Manual (Overhaul Manual)
FAA	Federal Aviation Administration
FAR	Federal Aviation Requirements
hr	hours
IM	Installation Manual
IPC	Illustrated Parts Catalog
ISA	International Standard Atmosphere
JAA	Joint Aviation Administration
JAR	Joint Aviation Requirements
MM	Maintenance Manual
MS	magneto side
N	newly introduced part (only in the illustrated parts catalog)
n.a.	not available
NB	as required (only in the illustrated parts catalog)
NDT	non-destructive test
OM	Operator's Manual
O/H	Overhaul
p/n	part number
PTO	power take off
Rev.	Revision
rpm	revolutions per minute
s.v.	still valid (only in the illustrated parts catalog)
S/N	Serial number
SB	Service Bulletin
SI	Service Instruction
SL	Service Letter
TC	Transport Canada
TSN	Time Since New
TSO	Time Since Overhaul
VFR	Visual Flight Rules
XXX	on illustrations this sign indicates the location of the current serial number or special part coding

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5) Safety notice

This manual has been prepared as a guide to correctly service and maintain all ROTAX® 912 aircraft engines.

This edition was primarily published to be used by aircraft mechanics who are already familiar with all service procedures relating to ROTAX® made aircraft engines.

Please note that the instructions will apply only if proper hand tools and special service tools are used.

This Manual uses technical terms which may be slightly different from the ones used in the Illustrated Parts Catalog.

It is understood that this manual may be translated into another language. In the event of any discrepancy the German version is prevail.

The content depicts parts and/or procedures applicable to the particular product at its time of manufacture. It does not include dealer modifications, whether authorized or not by ROTAX, after manufacturing the product.

In addition, the sole purpose of the illustrations throughout the manual, is to assist identification of the general configuration of the parts. They are not to be interpreted as technical drawings or exact replicas of the parts.

The use of ROTAX® parts is most strongly recommended when considering replacement of any component. Authorized ROTAX® distributor assistance should be sought in case of doubt.

The engines and the corresponding components identified in this document should not be utilized on product(s) other than those mentioned in this document.

Torque wrench tightening specifications must be strictly adhered to. Locking devices (ex.: locking tab, self-locking fasteners, etc.) must be installed or replaced with new ones, where specified. If the efficiency of a locking device is impaired, it must be renewed.

It is your responsibility to be completely familiar with the safety instructions including warnings and cautions described in this manual. These warnings and cautions advise of specific operating and servicing methods that, if not observed, can cause a serious engine malfunction or cause the engine to lose power in flight which can result in loss of life, injury or damage to equipment.

It is, however, important to understand that these warnings and cautions are not exhaustive. ROTAX® could not possibly know, evaluate and advise the user of all conceivable ways in which service might be done or of the possible hazardous consequences of each way. Consequently,

Although the mere reading of such information does not eliminate the hazard, your understanding of the information will promote its correct use. Always use common shop safety practice.

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This information relates to the preparation and use of ROTAX® aircraft engines and has been utilized safely and effectively by ROTAX®. However, ROTAX® disclaims liability for all damage and/or injuries resulting from the improper use of the contents. We strongly recommend that any service be carried out and/or verified by a highly skilled professional mechanic, see chapter 05-00-00, para 2.2.

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.

Because of our ongoing commitment to product quality and innovation. ROTAX® reserves the right at any time, and without incuring obligation, to remove, replace or discontinue any design, specification, feature or otherwise.

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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.

■ CAUTION: 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) Maintenance Concept

The maintenance functions detailed in this manual fall into two categories: Line Maintenance and Heavy Maintenance. Repairs beyond the levels details in this manual are not recommended as maintenance functions and should be done by an authorized overhaul facility.

- **Line Maintenance** (Chapter 00, 05 and 12):

  The scope of line maintenance consists of removal, installation and adjustment

  of engine components (including part wear). All procedures in this manual are to be considered line maintenance.

- **Heavy Maintenance** (separate Manual p/n 899 601):

  Heavy maintenance details removal, installation and repair of components or parts normally considered beyond the capabilities of the average line maintenance facility.

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5.3) Technical documentation

These documents form the instructions for continued airworthiness of ROTAX® aircraft engines:

- Installation Manual 912 F
- Installation Manual 912 A
- Installation Manual 912 UL
- Installation Manual 912 S
- Maintenance Manual 912 Series (Line+Heavy MM)
- Operators Manual 912 Series
- Illustrated Parts Catalogue 912 A / F / S / UL / ULS, 914 F / UL
- Overhaul Manual 912 A / F
- Alert Service Bulletins
- Service Bulletins
- Service Instructions
- Service Letters

Any reference to a document refers to the latest edition issued by ROTAX®, if not stated otherwise.

The rapid 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.
- The **current** documentation is available on SI-912-003 and on the official homepage **www.rotax-aircraft-engines.com**.
  Most of the necessary documents are also available as pdf-files. Download is free of charge.

◆ 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.

Return shipment:

If necessary to return an engine or components like gearbox ect. to an authorized overhaul or repair facility, all required documents (Log book, Maintenance log etc.) has to be included on that shipment.

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5.3.1) 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 aeronautical standards or regulatory 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. However these engines confirm to ROTAX® quality standards.

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.

▲ WARNING: **Never** run the engine without propeller, this inevitably causes engine damage and is an explosion hazard.

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5.3.2) Instruction

Engines require specific 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.

■ CAUTION: 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 IPC) or suitable equivalent in the manufactuer's opinion otherwise, any limited warranty by ROTAX® is null and void (see Warranty Conditions).

All Spare parts are available at the authorized ROTAX® Distribution- and Service centers.

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CHAPTER 05

TIME LIMITS / MAINTENANCE SCHEDULE

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CHAPTER 05-50
UNSCHEDULED MAINTENANCE CHECKS

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2) Maintenance

2.1) General note

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.

The procedures and limits in this manual constitute the manufacturer's official recommendation for engine operation.

2.2) Authorized personnel

It is a requirement that every organization or individual will possess the required special tooling, training or experience to perform all tasks outlined. Any task outlined herein may be performed if the organization or individual has met the following conditions:

- **Requisite knowledge of the task through:**

  Type specific authorization training for the applicable ROTAX® engine which is approved by the local Aviation Authority.

  "**OR**"

  - Experience in performing the task and
  - Formal instruction from a ROTAX® authorized training facility or

    "On-the-job" instruction by a ROTAX® or authorized ROTAX® Distributor representative.

  Including:

- Suitable work environment to prevent contamination or damage to engine parts or modules.
- Suitable tools and fixtures as outlined in the ROTAX® Maintenance Manual.
- Reasonable and prudent maintenance practices are utilized.
- And the Requirements of the applicable regulatory authority regarding maintenance procedures are met.

Maintenance organizations and individuals are encouraged to contact ROTAX® through its worldwide distribution network for information and guidance on any of the tasks outlined herein. Maintenance directories are available from the ROTAX® authorized distributor organization. See Chapter 00-00-00 para. 5.3.

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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.

■ CAUTION: The ignition is **switched on**, as long as the ground-cable (P lead) 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.

■ CAUTION: Generally, all metal parts are cleaned with a suitable cleaning agent.

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

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

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

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

▲ WARNING: If during disassembling/reassembling the removal of a safety item (e.g. safety wiring, selflocking fastener, etc.) should be necessary, it must be always replaced by a new one.

Once loosened, **always** replace 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, replace 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.

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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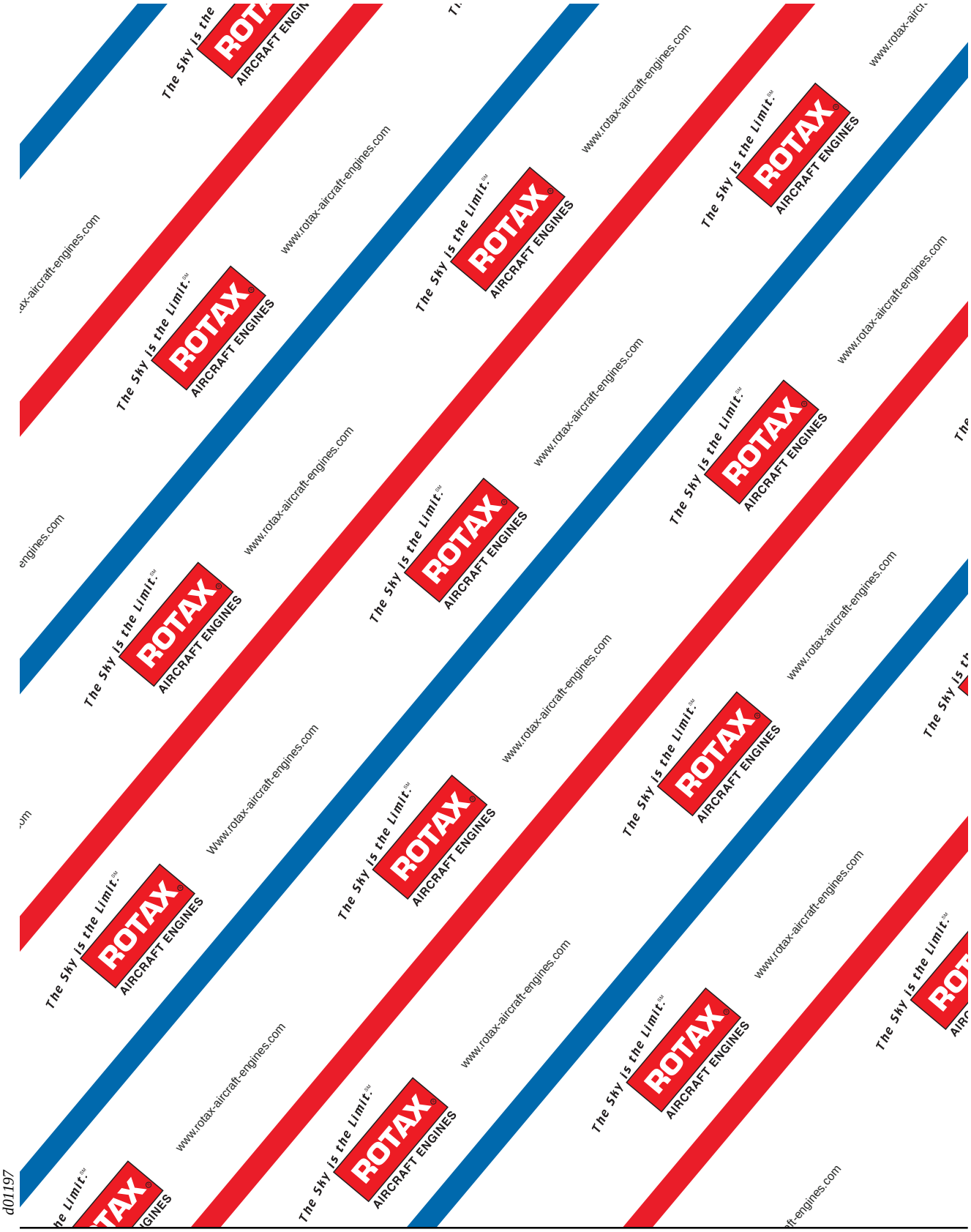
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2.5) Consumable materials

▲ WARNING: 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, including the expiry date and instruction.

No.	part no.	description, application ..... Qty.
1	297 431	**LOCTITE Anti-Seize,** to prevent fretting corrosion ..... 10 g 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.
2	899 788	**LOCTITE 648 green,** heavy-duty screw securing agent ..... 5 g 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).
3	899 789	**LOCTITE 603,** heavy-duty screw securing agent ..... 10 ml 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.
4	899 784	**LOCTITE 574 orange,** sealing compound ..... 50 cm^3 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.

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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.

5 899 785 LOCTITE 221 violet,
medium-duty screw securing agent ..... 10 cm^3

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 preventation of fretting corrosion. MOLYKOTE GN is applied to both components mated. Its use is specifically mentioned in the relevant 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.

d00195

9 897 870 K&N Filter oil 99 - 1131,
Bag ..... 58 ml

To optimize filtration and to protect against moisture.

10 297 368 SILASTIC 732
multi purpose, one component sealing compound on silicon base ..... 310 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.

d00195

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.

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.

d01197

2.6) Acceptable methods, techniques and practices

All general inspection, maintenance and repair has to be carried out in accordance with Advisory Circular AC 43.13 from FAA.

This advisory circular (AC) contains methods, techniques, and practices acceptable to the administrator for the inspection and repair of nonpressurized areas of civil aircraft, only when there are no manufacture repair or maintenance instructions.

2.6.1) 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.

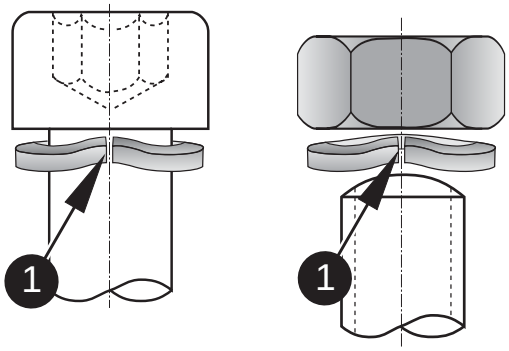

fig. 1

d01197

CHAPTER 05-10

TIME LIMITS

1) General note

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

d01198

2) Time limits for engine operation

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

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

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

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

Engine Type description	engines affected engine S/N	TBO Time Between Overhaul
912 A	up to and incl. 4,076.191	600 h or 10 years, whichever comes first (1
912 A	from 4,076.192 up to and incl. 4,410.065	1000 h or 10 years, whichever comes first (1
912 A	from 4,410.066	1200 h or 10 years, whichever comes first
912 F	up to and incl. 4,412.585	1000 h or 10 years, whichever comes first (1
912 F	from 4,412.586	1200 h or 10 years, whichever comes first
912 UL	up to and incl. 4,152.666	600 h or 10 years, whichever comes first (2
912 UL	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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For the TBO of the specific engine type/version refer to the table below.

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

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

d01198

The shipment to an authorized ROTAX® 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 generator, sensors, ignition unit, electric starter, oil tank, vacuum pump, hydraulic governor.
- Statement of total period of operation (TSN) and if applicable the period of operation after a conducted general overhaul (TSO)
- Data about the type of aircraft used
- Useful remarks and observations concerning the engine.

d01198

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
- all rubber hoses of the lubrication system which are part of the engine supply volume and if they are not in the maintenance schedule of aircraft builder.
- carburetor sockets
- diaphragm on both carburetors
- rubber hoses on compensating tube
- V-belt
- fuel pump with protective hoses assy. (not single fuel pump)

■ CAUTION: This time limit must be followed **independently** and **in addition** to the visual checks (chapter 05-20-00, para 2.2) of the respective component.

4) Time limit for the coolant

The coolant must be renewed every two years. See chapter 12-00-00, para 3.

5) Annual inspection

Perform a 100 hr. check at intervals of 100 hours of operation or once every 12 months, whichever comes first.See chapter 05-10-00, para 2.

CHAPTER 05-20

SCHEDULED MAINTENANCE CHECKS

1) General note

This Chapter lists the periodic inspections which must be carried out after a specified periods of operation.

Periodic inspections are those which must be performed at 50, 100, 200 and 600 hr. intervals in accordance with Chapter 05-20, para. 2.

This means for instance that **every 100 hr.** of operation or 1 year whichever comes first, a 100 hr. check must be carried out.

100h / 300h / 500h / 700h / 900h / 1100h	-> 100hr. inspection
200h / 400h / 800h /1000h	-> 200hr. inspection
600h	-> 600hr. inspection

Additionally, a 25 hr. inspection must be performed at 25 hours of operation of a new or overhauled engine.

◆ NOTE: This maintenance schedule contains a column for a 50 hr. check. This check is recommended by the manufacturer but not essential, with the exception of oil change when operating with leaded AVGAS.

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

- Inspect engine compartment cover for evidence of overheating, including cover for discoloration and warping.
- Inspect exhaust system for damage, including cylinder head for cracks and wear.
- Inspect fuel filter for contamination. Inspect for foreign particles including material of fuel lines, sealing components, slivers (risk of misfiring).
- Verify aircraft battery for charge, including gravity of electrolyte (risk of starting problems).
- Inspect oil contamination. Analyse the oil.
- Inspect radiator, oil cooler and hoses for damage, including for discoloration and cracks.
- Inspect propeller for damages and unbalance. Carry out dynamical balancing including verification of propeller track.

d01169

1.1) Maintenance schedule procedures

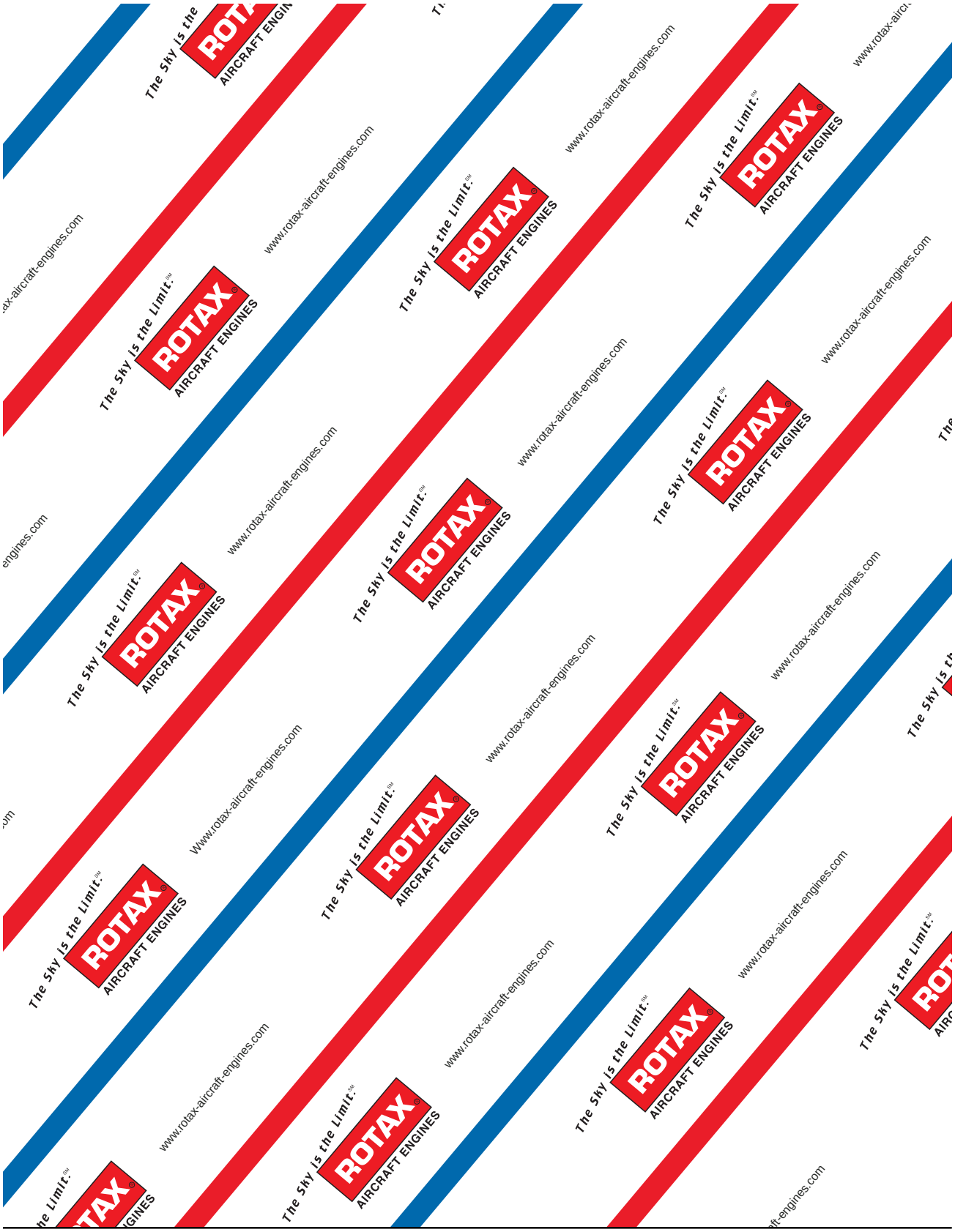
- All stated checks are visual inspections for damage and wear, unless otherwise stated.
- All listed work must be carried out within the specified period.
- For all the maintenance work an allowance of ± 10 hr. will be granted but these tolerances must not be exceeded. This means that if for instance 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 check is performed before the prescribed interval, the next check is to be done at the same interval (e.g. if first 100 hr. check is done at 87 hours, the next 100 hr. has to be done at 187 hours).
- Checks are carried out as per the maintenance schedule where type and volume of maintenance work is outlined in key words.

  The Inspection Sheet/Maintenance Schedule (Chapter 05-20-00, para. 2) 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 top 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 a report of findings to be generated und maintained by A/C owners
- Replacement of equipment (e.g. carburetor, fuel pump, hydraulic governor etc.) has to be entered into the engine Log book stating S/N, TSN and date.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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 _____

This check is applicable (circle one) 25h* 50h 100h 200h 600h

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

* shaded column first 25 hr. only (from new or O/H engines)

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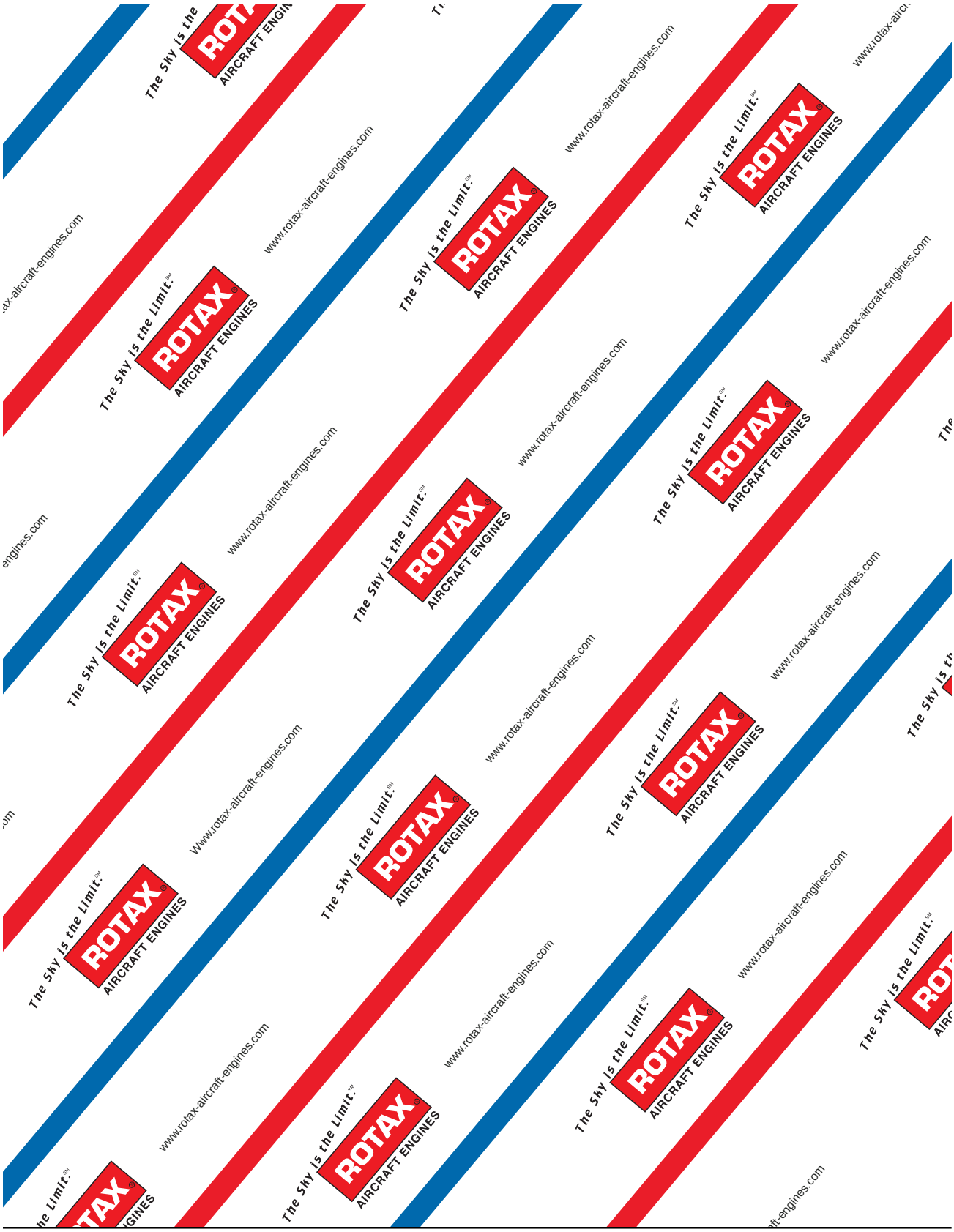
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2.2) Maintenance Schedule

Perform the following inspections tasks as the intervals shown.

Legend : X = do the task

blank = no task required

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
2.2.1) Engine cleaning						
a) Engine cleaning See Chapter 12-00-00, para 2.1	X	X	X	X	X	
2.2.2) Visual inspection of the engine						
a) General inspection of the engine for damage and abnormalities, including obstructions, cracks, wear and condition of cooling air ducts, baffling and cylinder cooling. Take note of changes caused by temperature.	X	X	X	X	X	
b) Inspection of temperature and oil pressure sensors. Inspect for tight fit and condition.	X	X	X	X	X	
c) Inspection of all coolant hoses for damage, including leakage, hardening from heat, porosity, loose connections and secure attachments. Verify routing for kinks and restrictions like restricted elbows. See Chapter 12-00-00, para 2.2	X	X	X	X	X	
d) Inspection of leakage bore at the base of the water pump for signs of leakage. See Chapter 12-00-00, para 2.2	X	X	X	X	X	
e) Inspection of the expansion tank for damage and abnormalities, including damage for heat, deformation, cracks. Verify coolant level, replenish as necessary. Inspect radiator cap. Inspect rubber plate on expansion tank base for secure fit. See Chapter 12-00-00, para 3.1	X	X	X	X	X	

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
f) Inspect the overflow bottle for damage and abnormalities, including Verify coolant level, replenish as necessary. Inspect line from expansion tank to overflow bottle for damage, leakage and clear passage. Inspect venting bore in cap of overflow bottle for clear passage. See Chapter 12-00-00, para 3.1	X	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 and restrictions including restricted elbows. See Chapter 12-00-00, para 2.2	X	X	X	X	X	
h) Inspect all fuel lines for damage, leakage, hardening from heat, porosity, secure connections and attachments. Verify routing for kinks and restrictions including restricted elbows. See Chapter 12-00-00, para 2.2	X	X	X	X	X	
i) Verify the complete electrical wiring system including tight fit of connnectors, damage and wear. See Chapter 12-00-00, para 6.1	X	X	X	X	X	

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
2.2.3) Verification of engine suspension						
a) Inspect engine mounts and fasteners for secure fit, including damage for heat, deformation, cracks. See Chapter 12-00-00, para 2.3	X	X	X	X	X	
2.2.4) Engine external parts						
a) Inspect attachment screws and nuts of all external parts for security and fit. Inspect safety wiring, replace as necessary.	X	X	X	X	X	
2.2.5) Check of propeller gear box						
a) Verification of the friction torque Actual friction torque _____ Nm (in.lbs.) See Chapter 12-00-00, para 7.1	X	X	X	X	X	
b) Gear box of engine configuration 3 (with slipper clutch) and using leaded fuel in access of 30 % of operation. Inspect overload clutch. See Chapter 05-50-00, para 2.2					X	
2.2.6) Oil level check						
a) Before inspect oil level, turn propeller over several times counter clockwise (locking from the front at the propeller) to ensure that oil in the crankcase 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. Inspect oil level. See Chapter 12-00-00, para 5.1	X	X	X	X	X	
b) Inspection of the magnetic plug See Chapter 12-00-00, para 5.4				X	X	

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
2.2.7) Oil change						
a) Remove oil drain screw from oil tank. Drain old oil and dispose as per environmental regulations. See Chapter 12-00-00, para 5.2	X	X(1	X	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 Chapter 12-00-00, para 5.3	X	X(1	X	X	X	
c) Cut oil filter housing without producing any metal chips and inspect filter mat. Findings: _____ _____ See Chapter 12-00-00, para 5.3	X	X(1	X	X	X	
d) Replace gasket ring of drain screw on oil tank. See Chapter 12-00-00, para 5.2	X	X(1	X	X	X	
e) Refill oil tank with approx. 3 litres of oil. For oil quality refer to OM and SI-18-1997 See Chapter 12-00-00, para 5.2	X	X(1	X	X	X	

(1 for engine operation with AVGAS and/or severe operating condition.
See SI-18-1997.

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
2.2.8) Cleaning of the cooling system						
a) Flushing of the cooling system. See Chapter 12-00-00, para 3.3				X	X	
2.2.9) Check of the air filter						
a) Inspection of the air filter. See Chapter 12-00-00, para 2.4	X	X	X	X	X	

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
2.2.10) Inspection of the carburetor sockets						
a) Inspect the carburetor sockets for damage and abnormalities, including obstructions, cracks, wear and condition. Take note of temperature influence. See Chapter 13 of Heavy MM, p/n 899 601				X	X	
2.2.11) Check of the carburetors						
a) Verification of the idle speed. See Chapter 12-00-00, para 4.2	X	X	X	X	X	
b) Verification of the float chamber venting. Inspect venting lines for condition and damage including for condition, secure attachment, clear passage routing without kinks and restrictions.	X	X	X	X	X	
c) Inspect free movement of the carburetor activation (throttle lever and starting carb). Inspect that the Bowden cable allows the full travel of the throttle lever. See Chapter 12-00-00, para 4.3	X	X	X	X	X	
d) Inspect the carburetors: Remove, disassemble, clean, inspect all components including jetting, leakage test of float needle valve, reassemble and reinstall the carburetors. See Chapter 13 of Heavy MM, p/n 899 601				X	X	
e) Inspect carburetor synchronization. Mechanical and pneumatic synchronization. See Chapter 12-00-00, para 4.1	X	X	X	X	X	

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
2.2.12) Verification of the V-belt tension						
a) On engines with an external alternator, inspect the attachment and the V-belt tension for damage and abnormalities, including obstructions, cracks, wear and condition. See Chapter 12-00-00, para 2.6	X	X	X	X	X	
2.2.13) Spark plugs						
a) Remove all spark plugs, verify heat range, clean the spark plugs. Inspect electrode gap and adjust as necessary. Replace as required. See Chapter 12-00-00, para 6.2		X(1	X		X	
b) Renewal of spark plugs. ■ CAUTION: Clean sparking plug thread and the sparking seat. Apply heat conduction compound on spark plug thread. See Chapter 12-00-00, para 6.2			X(1	X	X	
(1 applicable only on engine type 912 S / ULS / ULSFR						

2.2.14) Spark plug connectors						
a) Verify security of spark plug connectors. Minimum pull-off force is 30 N (7 lb).	X			X	X	
2.2.15) Check of compression						
a) Inspect compression by differential pressure method. Test pressure ___ hPa (psi) pressure drop cyl. 1 _____ cyl. 2 _____ (% or fraction) cyl. 3 _____ cyl. 4 _____ See Chapter 12-00-00, para 2.5				X	X	

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Inspection items	Check (hr.)					Signature
	25	50	100	200	600	
2.2.16) Engine test run						
a) Start the engine and run to operating temperature. Inspect of ignition circuits at 4000 rpm engine speed. Speed drop without ignition circuit: A _____ rpm B _____ rpm Inspect 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 Chapter 12-00-00, para 2.8	X	X	X	X	X	
2.2.17) General note						
a) All Service Instructions and Service Bulletins are complied with.	X	X	X	X	X	

Engine back to operation

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

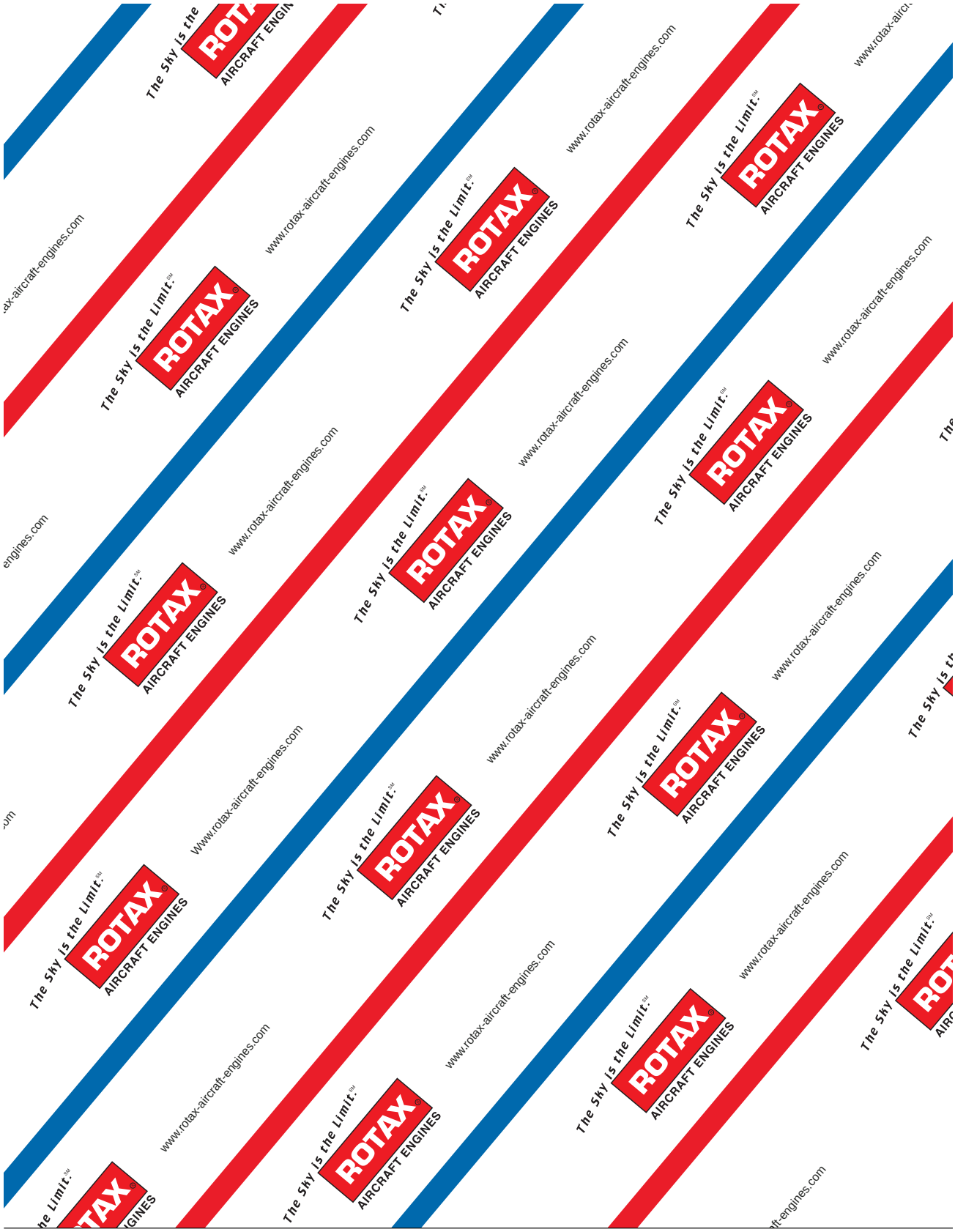
_____
(location) , (date)

_____
Test person

_____
(completed by)

_____
(certificate no. - if applicable)

d01169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d01199

CHAPTER 05-50

UNSCHEDULED MAINTENANCE CHECKS

1) General note

Special checks are required immediacy after occurrence of engine trouble which has an unfavourable influence on the airworthiness of the engine.

▲ 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 instructions.

2) Special checks

2.1) Checking of propeller gearbox / engine.

Engine check after propeller strike resulting in heavy propeller blade damage.

2.1.1) Propeller gearbox with integrated overload clutch

- Inspection of engine for damage.

  If any damage is detected, inspect, repair or overhaul the engine in accordance with the ROTAX® instructions for continued airworthiness.

  - The scope of work depends on the seriousness of the damage.
  - Inspect all systems for correct function.

- Inspect additional equipment (external alternator, hydraulic governor, ignition unit, coolant and oil hoses) for damage.
- Observe directives of the aircraft manufacturer.
- Inspect drive of the hydraulic governor (if fitted)
- Remove gearbox.

  The gearbox must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

  - Detailed inspection of all gearbox components.
  - NDT for cracks on gear cover, propeller shaft and gear set.

- Inspect the crankshaft for out-of-roundness. See Chapter 14.4.15 of Heavy MM, p/n 899 601.

2.1.2) Propeller gearbox without integrated overload clutch

- The whole engine must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

  - Detailed inspection of affected engine components.
  - NDT for cracks on crankcase, gear cover, flywheel hub, propeller shaft and gear set.
  - Crankshaft must be overhauled

- Inspect additional equipment (external alternator, hydraulic governor, ignition unit, coolant and oil hoses) for damage.
- Observe directives of the aircraft manufacturer.

d01200

2.2) Checking of the overload clutch

At suspicion of slipping or blocking, verification of the slipping torque (overload clutch) must be carried out.

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

- Lock the crankshaft. Refer to chapter 12-00-00, para 2.7.
- Remove the propeller as per instructions of the manufacturer.
- 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 x m = Nm).
- Remove the crankshaft locking screw. Refer to chapter 12-00-00, para 2.7.

Slipping of the clutch must occur between 600 and 800 Nm (440 and 590 ft.lb.).

▲ WARNING: Do not exceed 800 Nm (590 ft.lb.) otherwise internal damage can occur.

If the torque is below or above this value, inspect, repair or overhaul the propeller gearbox in accordance with the ROTAX® instructions for continued airworthiness.

- Detailed inspection of all gearbox components.

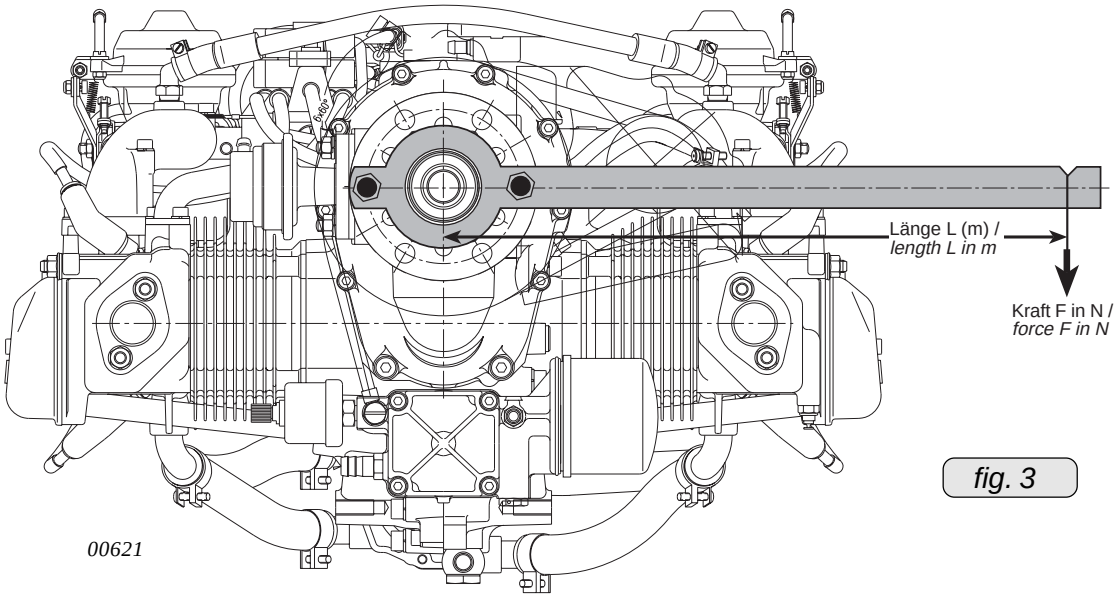
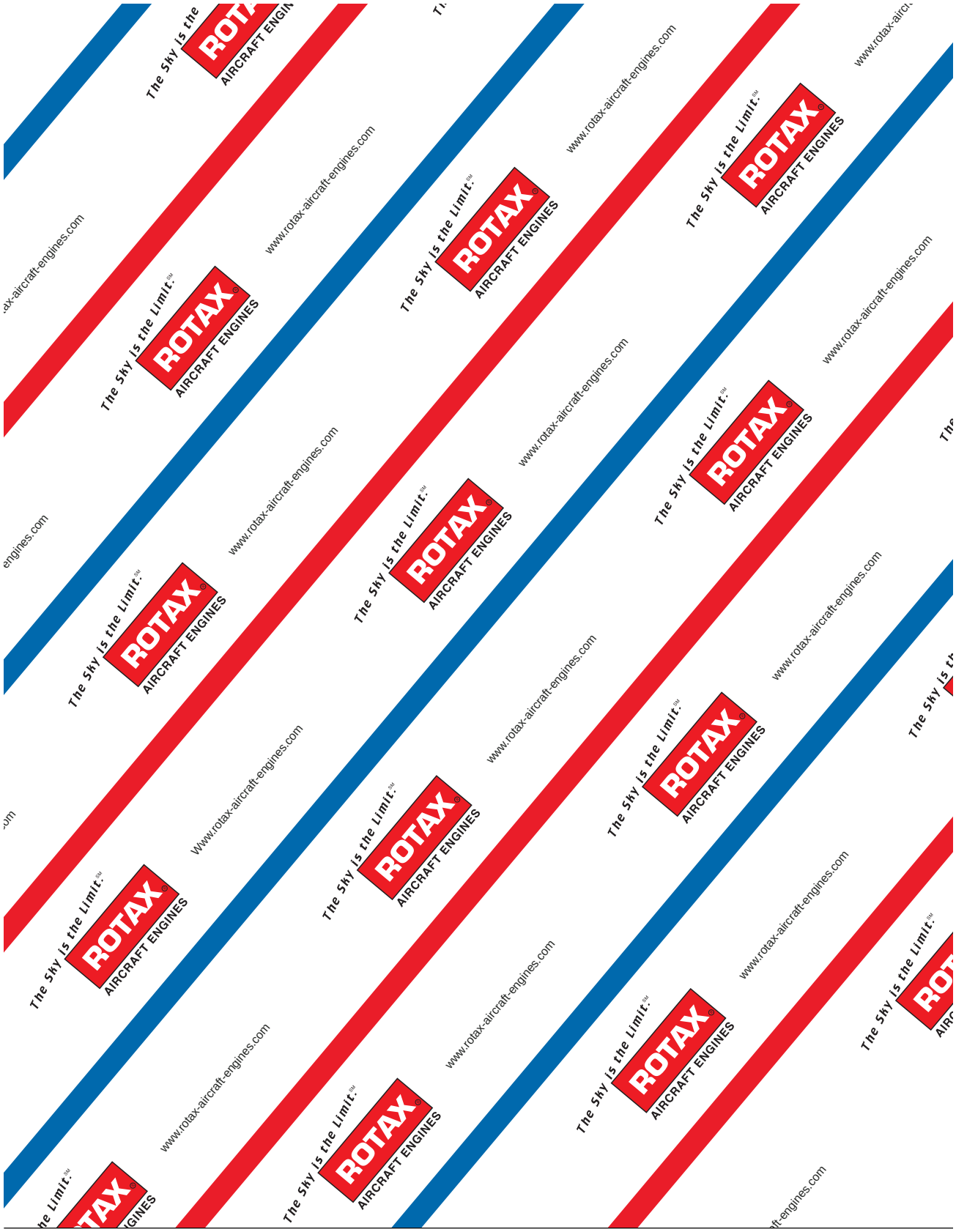


fig. 3

d01200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d01200

2.3) Examination after engine failure

After an engine failure find the cause of the failure by troubleshooting, using the following indicators. Also, observations on the aircraft and the engine mount can be of help.

Engine runs erratic and misfires

May be caused by a failure of the fuel system (fuel supply, vapour locks, 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, charging coil etc.). See details regarding fuel- and ignition system.

Engine running rough

May be caused by 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

May be caused by 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

May be caused by a failure in the lubricating system. 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.

The whole engine must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

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

▲ WARNING: If one of the above failures should arise even only for a short time, a detailed inspect is necessary. Localize trouble and rectify.

d01200

2.4) Engine back to operation after submerging in water

An engine having been submerged in water must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

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

■ CAUTION: The engine must be marked clearly with the note „Engine submerged in water".

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: Every 25 h 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 A/C manufacturer and authorized ROTAX® Distributor.

2.6) Exceeding of max. admissible engine RPM

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

- Exceeding for max. 1 minute up to 6200 rpm:
  - Inspect push rods for straightness.
- Exceeding for more than 1 minute:

  The whole engine must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.
  - Inspect push rods for straightness.
  - Inspect all systems for correct function.
  - Detailed inspection of affected engine components.
- Exceeding 6200 rpm:

  The whole engine must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.
  - Inspect push rods for straightness.
  - Inspect all systems for correct function.
  - Detailed inspection of affected engine components.

d01200

2.7) Exceeding of cylinder head temperature

◆ NOTE: Any exceeding of the max. admissible cylinder head temperature must be entered by the pilot into the Engine Log book, stating duration extent of excess temperature and pertinent detail.

- At short term exceeding of the cylinder head temperature of up to 180°C (360°F):

  The whole cooling system must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

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

- If a cylinder head temperature above 180°C (360°F) is noticed for longer than 30 minutes:

  The whole cooling system must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

  - Inspect the system for correct function.
  - Inspect compression by the differential pressure method is necessary.
  - Hardness test of the cylinder head. See Chapter 14.5.7 of Heavy MM, p/n 899 601.

d01200

2.8) Exceeding of the oil temperature

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

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

  The whole cooling system must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

  - Inspect the system for correct function.
  - Inspect oil level in the oil tank.
  - Inspect oil cooler for contamination and check oil circuit for operation. See SB-912-005.
  - Cut oil filter housing and inspect filter mat for foreign matter.
  - Carry out oil change.

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

  The whole engine must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

  - Inspect all systems for correct function.
  - Detailed inspection of affected engine components.
  - Cut oil filter housing and inspect filter mat for foreign matter.

2.9) Oil pressure below minimum value

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

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

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

◆ NOTE: Any oil pressure below 0,5 bar (7 psi) must be entered by the pilot in the Engine Log book stating duration extent of oil pressure below minimum and pertinent detail.

- Inspect all oil lines for restrictions and clear passage.
- Verify oil quantity.
- Inspect pressure sensor.
- Inspect indicating instrument to specifications of the manufacturer, replace 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, repair or overhaul the engine in accordance with the ROTAX® instructions for continued airworthiness.
  - Inspect all systems for correct function.
  - Detailed inspection of affected engine components.

■ CAUTION: Replaced the oil cooler inclusive oil lines and before the re-installation of the engine the complete lubrication system (inclusive oil tank) must be flushed.

d01200

2.10) Oil specification not respected

◆ NOTE: An entry by the pilot in the engine logbook of all pertinent details is required.

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

- Oil change.
- Remove the lowest positioned banjo bolt or plug screw (1) and drain the remaining oil from the crankcase. Screw in banjo bolt or plug screw. Tightening torque 35 Nm (310 in.lb).

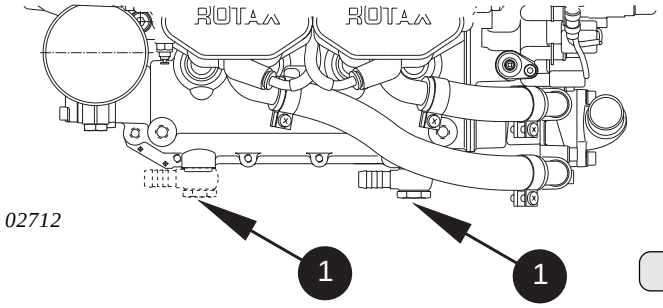


fig. 4

- 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 replace 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 the following work is required.

- Remove propeller gearbox.

  The gearbox must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

  - Detailed inspection of all gearbox components.

◆ NOTE: An entry by the pilot in the engine logbook of all pertinent details is required.

d01200

2.11) Spark plug not in accordance with specification

If by error any of the 8 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 borescope. If parts are damaged, repair or overhaul the engine in accordance with the ROTAX® instructions for continued airworthiness.

  - Inspect all systems for correct function.
  - Detailed inspection of affected engine components.
- Inspect spark plug thread for damage (especially at bad burn off).
- Inspect of pressure differential. Max. allowance, 10 % pressure loss since the last check.
- Change oil and oil filter.

d01200

CHAPTER 12-00

MAINTENANCE OF THE SYSTEMS

1) Table of contents

d01376

2) General note

The chapter „Maintenance of the systems“ is associated with other chapters. This chapter serves solely for supplement and detailed explanation of the Maintenance Schedule (Chapter 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.

d01376

2.1) Engine cleaning

Inspect engine for leaks prior to cleaning. Repair leaks as required. Clean engine as necessary.

Use of a commercially available cold cleaning agent is recommended.

■ CAUTION: 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 psi) to prevent current loss.

■ CAUTION: When cleaning the engine, the dissolved residues of fuel, oil and other environment-contaminating agents are rinsed off. Collect the cleaning water and dispose in avoidance with applicable environmental regulations.

2.2) Leakage check

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

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

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

Inspect fuel, water lines, their connections and screw plugs for tightness. Check surrounding area for leaks.

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

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

▲ WARNING: Avoid overstressing of fastening elements and secure till hand tight.

2.3) Check of the engine suspension

Verify the engine mount points on the crankcase for tight fit and damage including cracks.

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

Inspect engine isolating mounts including for heat damage, wear and cracks.

▲ WARNING: Adhere to specified tightening torques of screws and nuts without fail. Overtightening or too loose connection could cause serious engine damage.

d01376

2.4) Check of the air filter

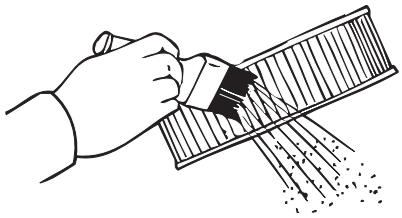
See fig. 1 and 2.

Inspect dry type air filter according to maintenance schedule. Clean dirty filter.

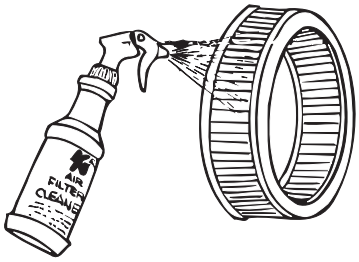
▲WARNING: When used in heavy dust condition, clean air filter at 25 h intervals accordingly. If filter mat is damaged, replace air filter.

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

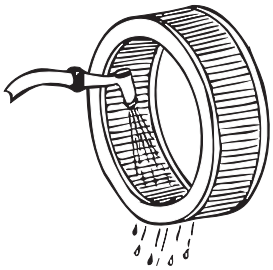
00182 *fig. 1*



Lightly tap and brush off surface dirt.



Spray K&N filter cleaner onto entire element and let soak for approx. 10 min.



Rinse filter with low pressure water from inside to outside and let element dry naturally.

Cleaning of dry air filter

■ CAUTION: Never use gasoline, steam, caustic liquids, detergents or high pressure cleaning during this step.

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.

d01376

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 by the uniform red colouring.

■ CAUTION: Never use gear oil, diesel or motor oil or others as they attract water.

▲ WARNING: In addition to clamp attachment of the filters, additionally wire-secure filter against loss. See chapter 05-00-00 para 2.6. 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.

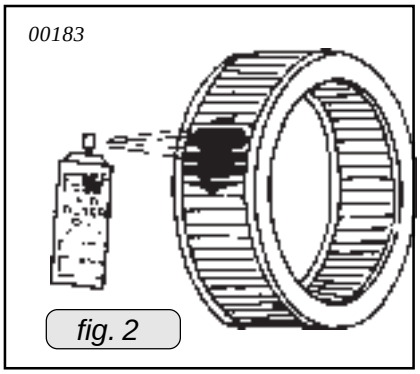


fig. 2

d01376

2.5) Check of compression

See fig. 3.

▲ WARNING: Ignition switch for both ignition circuit in „OFF“ position.

Differential pressure test procedure equipment.

■ CAUTION: In add to standard practical for this you will need the following equipment: Compressed air supply of approx. 6 bar (87 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. Remove respective spark plug and install adaptor (**1**) in spark plug hole and connect line with the two pressure gauges and intermediate orifice (**2**). Hold piston on TDC with propeller. Now put constant pressure of approx. 6 bar (approx. 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).

If compression is below the limit, the whole engine must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

- Detailed inspection of affected engine components. In the course of fault-tracing a compression check may be performed too:
  A compression tester is required to check compression. The compression should be between 9 and 12 bar (130 and 174 psi).

  PROCEDURE:
  Bring engine to operation temperature (engine oil temperature between 30 to 70°C (90 - 160°F)).

  Remove top spark plug and press compression tester against plug tap hole and set engine with open throttle into rotation by activating starter until maximum pressure is reached.

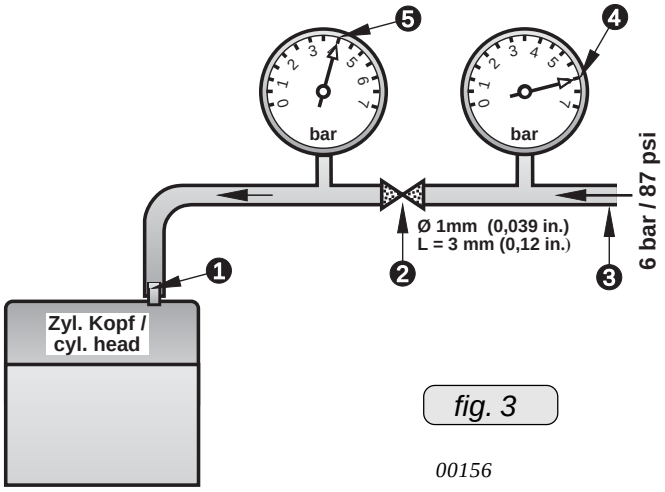


fig. 3

00156

Successively take readings on all four cylinders and compare results. Individual readings of the cylinders must not differ by more than 2 bar (29 psi).

If readings are below 6 bar (90 psi), the whole engine must be inspected, repaired or overhauled in accordance with the ROTAX® instructions for continued airworthiness.

- Detailed inspection of affected engine components.

d01376

2.6) Check of V-belt tension

See fig. 4 and 5.

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

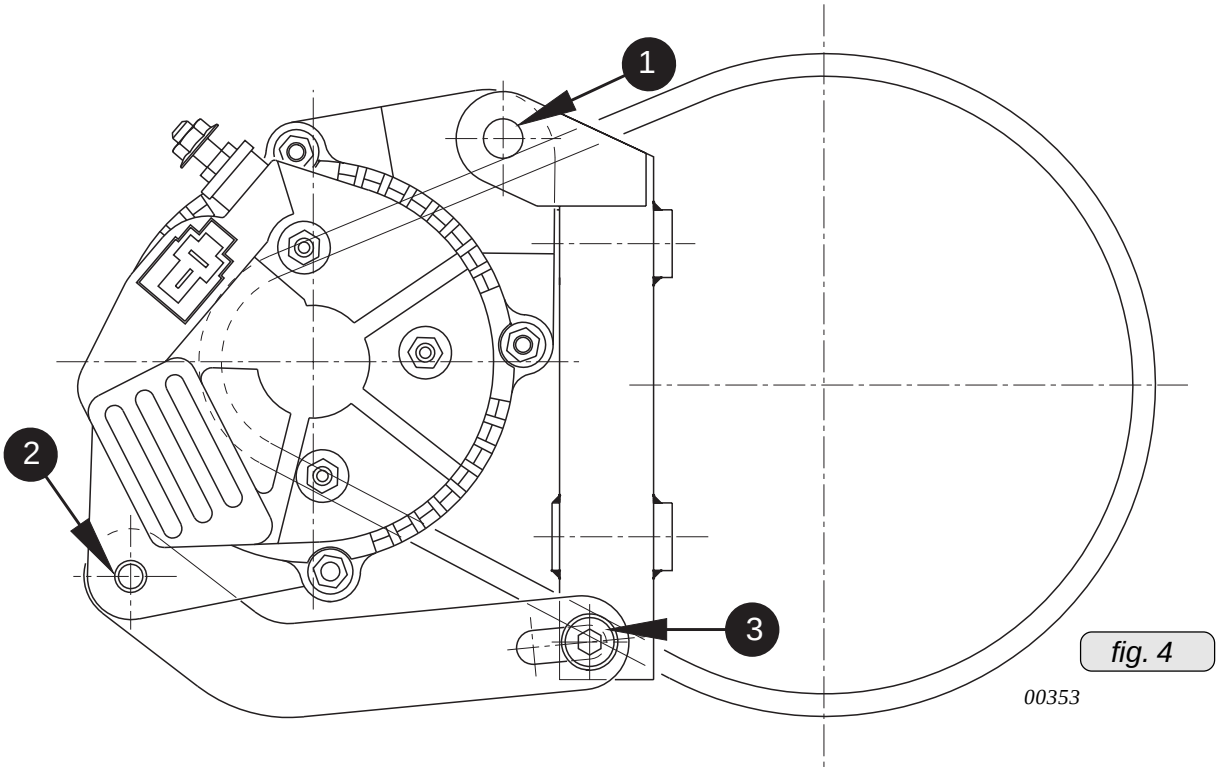


fig. 4

|| For adjustment of the V-belt tension, loosen the hex. screw M10 (1) and the two Allen screws M8 (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).

|| Inspect V-belt tension as per drawing below.

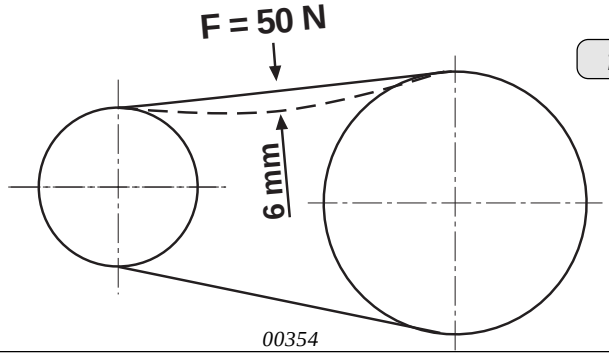


fig. 5

d01376

2.7) Locking of the crankshaft

See fig. 1 and 2

Remove the plug screw (1) M8x20 and sealing 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.

To facilitate finding of the correct crankshaft position, turn the crankshaft such that the flywheel hub is in the same position as mentioned on fig. 2.

The required recess (3) position of the crankshaft can be additionally verified by looking through the crankcase hole (4) with a flash light.

Turn-in crankshaft locking screw and rotate crankshaft slightly to-and-fro until the screw engages noticeably in the recess (3) of the crankshaft and tighten locking screw to 10 Nm (90 in. lb).

After completion of work/check:

Remove the crankshaft locking screw (2) and refit the plug screw M8x20 (1) along with a new sealing washer. Tighten the screw to 22 Nm (195 in.lb).

Verify free rotation of the crankshaft by turning the crankshaft with a wrench A/F 24 on the hex.screw (5) on the magneto side end.

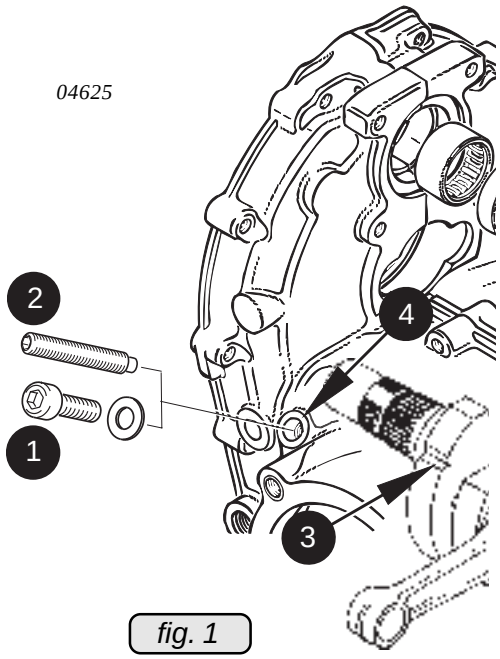


fig. 1

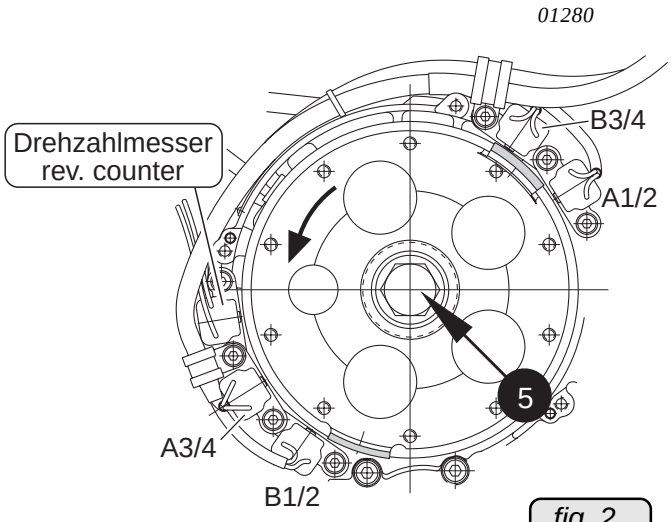


fig. 2

d01376

2.8) Test run of engine

- Ensure that all the operating fluids (engine oil, coolant, fuel) are replenished to the specified level.
- Make sure that no loose objects (e.g. tools) are scattered in the engine compartment.
- Inspect tight fit of propeller.
- Anchor the aircraft suitably to ground and fix wheel chocks. Ensure that the aircraft area is clear and safe, before starting the engine.

▲ WARNING: Always observe the engine while running from a secure place and verify that the cockpit is occupied.

In succession:

- establish fuel supply.
- activate choke.
- throttle to idle position.
- master 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. If no rise, immediately shut down and investigate.
- 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 temperature above 50°C and oil pressure above 2 bar (29 psi) engine speed may be increased.
- ignition inspect as per the current Operator’s Manual.
- conduct a short full throttle run and verify that the engine reaches the max. full power speed. Consult the Aircraft Manual for maximal 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.

d01376

- 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.

■ CAUTION: If the oil filter has been replaced, re-tighten by hand after the test run.

- Inspect engine for oil, fuel or coolant leaks and repair as necessary.

d01376

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. Inspect all connections on cylinder head top- and bottom side and on the water pump. Inspect expansion tank for damages. Inspect protection rubber at bottom of the tank for tight fit.

Inspect the gasket of the radiator cap and check the pressure release valve and return valve for proper operation. Refer to Chapter 12-00-00, para 3.4.

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

■ CAUTION: 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 burns.

▲ 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.

d01376

3.2) Renewal of the coolant

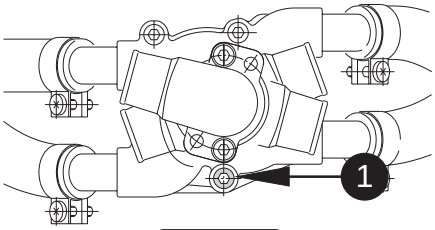
See fig. 6.

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 lowest positioned coolant 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.



00155

fig. 6

◆ NOTE: Run the engine for a minute and replenish with clean coolant as required. Ensure that all air is purged from system.

▲ 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 the engine for a minute and replenish coolant as required.

▲ 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.

d01376

3.4) Expansion tank, radiator cap

see fig. 6/1 to 6/3

Inspect the rubber seal (3) including for cracks, leaks. The pressure spring (4) and the two valves incorporated in the radiator cap. If required replace by a new original radiatorcap (6) with0,9 bar (13 psi) opening pressure.

Inspect sealing face (7) and tube connection (8) of the expansion tank. Inspect tank for damage and scuffing marks.

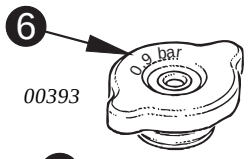


fig. 6/1

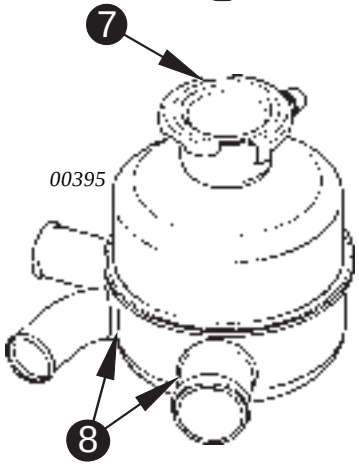


fig. 6/2

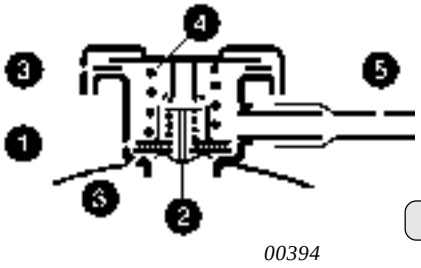


fig. 6/3

Legend:

1 pressure release valve
2 return valve
3 rubber seal
4 pressure spring
5 connection to overflow bottle
6 opening pressure of the radiator cap
7 sealing face
8 tube connections

d01376

3.5) Overflow bottle

See fig. 6/4

Inspect the bottle for damage. Verify venting bore (1) in cap. Inspect the lug (2) for safety wiring and the fitting (3) for hose connection.

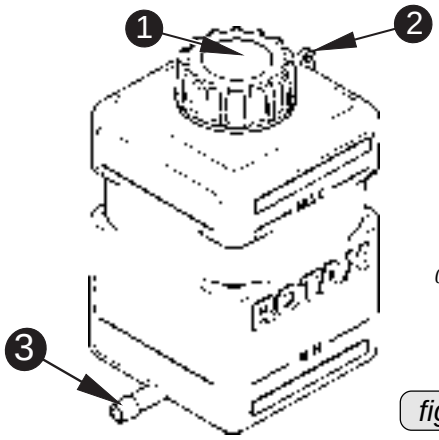


fig. 6/4

3.6) Equipment (including radiator, radiator hoses, hose clamps, cooling air guide).

■ CAUTION: Equipment is to be verified in accordance with the Maintenance Manual of the aircraft builder.

4) Fuel system

4.1) Carburetor synchronization

4.1.1) Verification of the synchronization at idle speed

See fig. 9

By detaching the hose (8) of the compensating tube (4) the two intake systems will be separated. At this condition no distinct difference in the engine run should be noticeable.

■ CAUTION: Don't damage the compensating hose or tube. Replace as required.

If necessary carry out synchronisation as per the following instructions.

4.1.2) 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 stop (3).

  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.

  From this point turn each idle speed adjustment screw (2) clockwise 1,5 turns.

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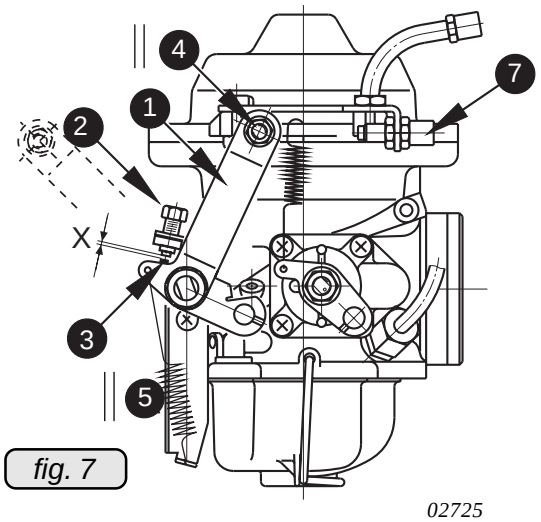

fig. 7

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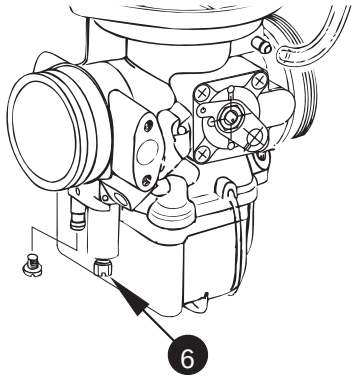

02726

fig. 7/1

- Gently turn each mixture screw (6) completely closed (clockwise) and then reopen by 1,5 turns anti-clockwise.
- 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.

Start the engine and verify the idle speed. If idle speed is too high or to low adjust accordingly with idle speed adjustment (2).

Ensure that each screw is turned the same amount.

Inspect smooth running of engine. If necessary correct it with mixture screw (6) . See Chapter 12-00-00, para 4.2.

■ CAUTION: An idle speed too low will result in gear box damage and with an idle speed too high the engine is harder to start.

d01376

4.1.3) Pneumatic synchronisation

See fig. 7, 8 and 9.

◆ NOTE: Mechanical synchronisation has already established.

With suitable vacuum gauges both carburetors are adjusted to equal flow rate at idling.

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 vacuum gauge (2).

Before proceeding any further secure the aircraft on the ground by chock blocks and ropes.

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

Start the engine and verify the idle speed. If necessary correct as per Chapter 12-00-00, para 4.1.2.

▲ 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 no satisfactory result can be achieved inspect the idle jet for contamination. Clean as required.

▲ WARNING: Inspect also for translucent, jelly-like contamination. Inspect for free passage.

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 vacuum gauges are registering the same readings. Use of dampening valves (8) may be required to smooth out needle movement. Slowly close valve until needles just stop fluctuating rapidly. If the same reading is not accomplished on both gauges, shut down engine and verify that carburetor linkages are effecting full travel and that starting carburetors (choke) 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 gauges settings. The gauges should be at the same reading for each carburetor, any discrepancies between the two readings must be rectified by the OFF IDLE adjustment (7), 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.

Final idle speed adjustment may be required by resetting the idle stop adjustment screws (2) accordingly. Equal adjustment must be made to each screw.

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.

■ CAUTION: Respect the indication of the instrument manufacturer.

Refit the slotted head screw M3,5x5 as required.

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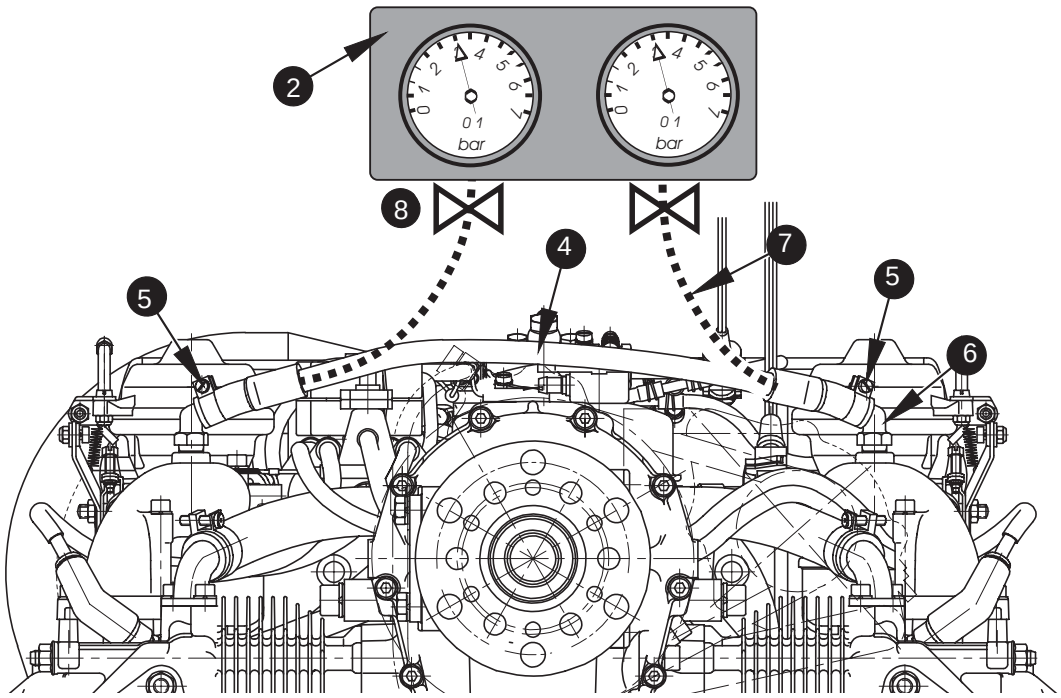

fig. 9

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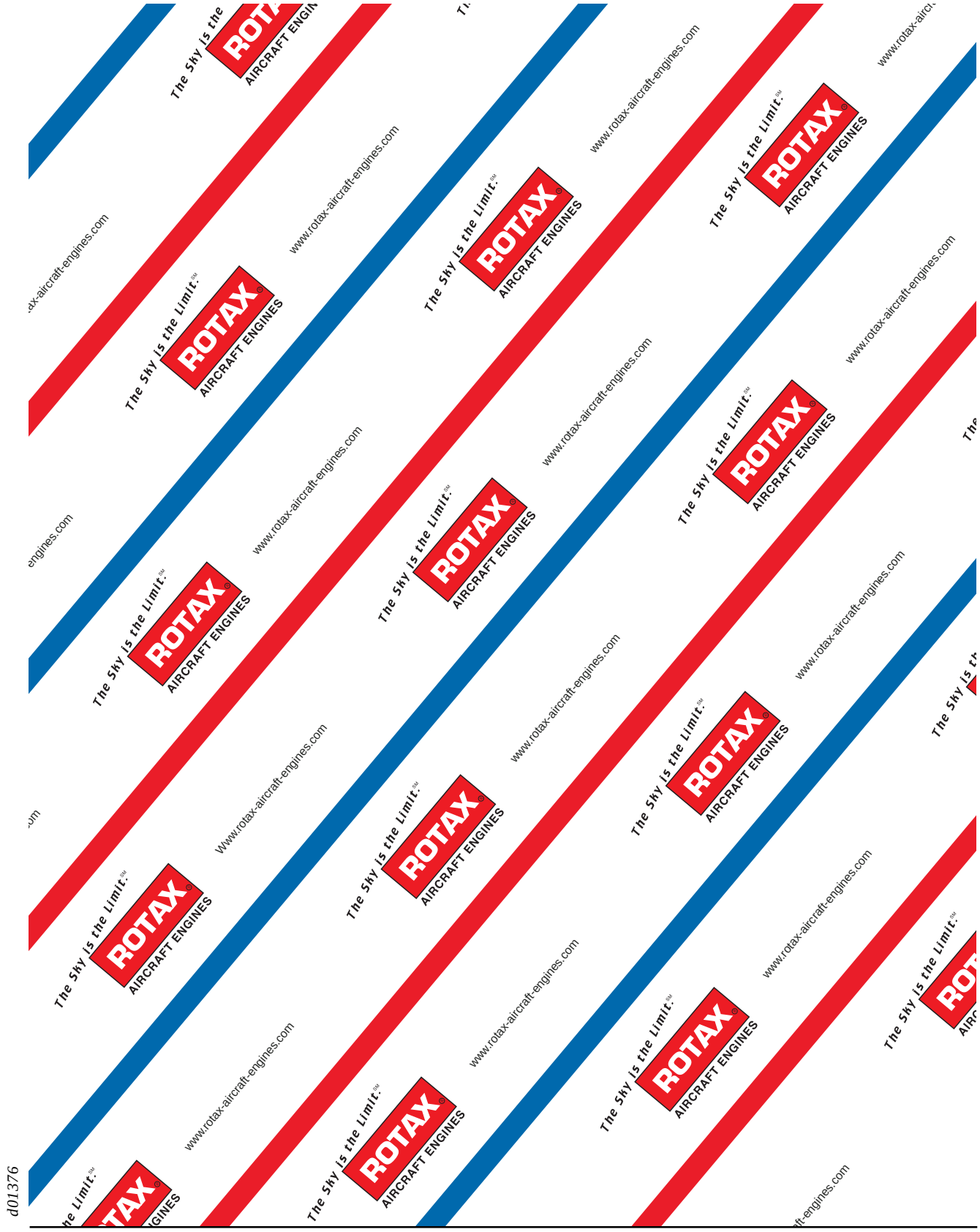
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4.2) Idle speed adjustment

See fig. 9/1 and 9/2

General note:

Always adjust idling on engine 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:

Necessary only if not taken care of at synchronization.

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.

■ CAUTION: If satisfactory engine idling can not be achieved, inspection of the idle jet or additional pneumatic synchronisation will be necessary.

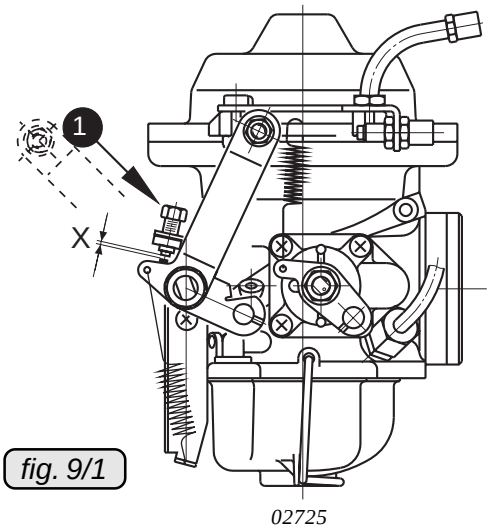

fig. 9/1

02725

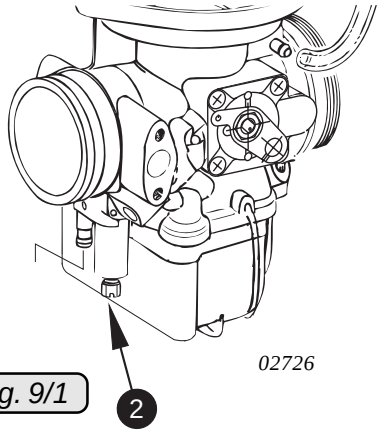

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fig. 9/1

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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.

|| Inspect 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.

|| Inspect 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.

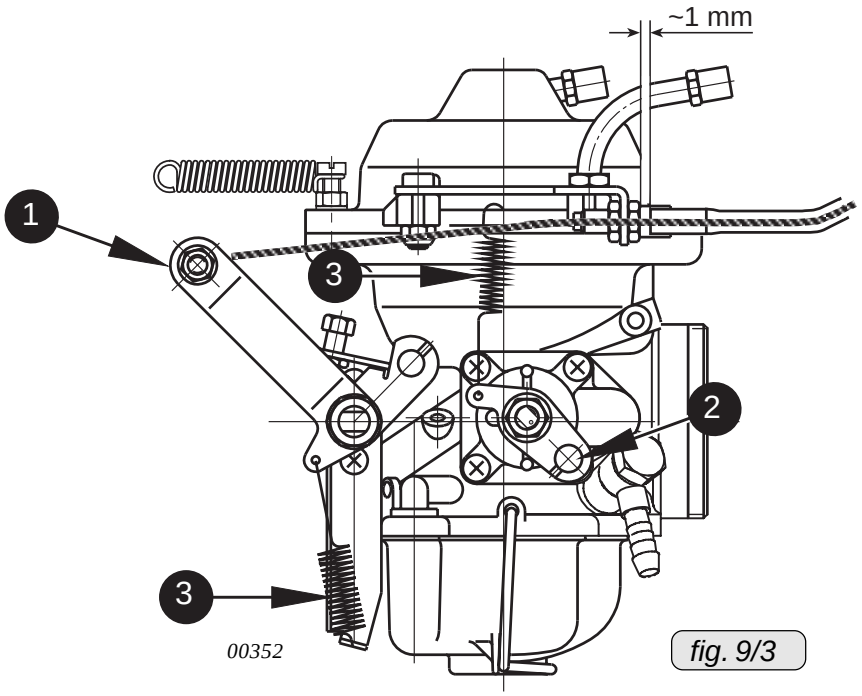

fig. 9/3

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5) Lubrication system

5.1) Oil level check

See fig. 15.

|| Before checking the oil level make sure that there is no oil in the crankcase.

▲ WARNING: Ignition „**OFF**“ and system grounded. Disconnect negative terminal of aircraft battery.

▲ 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.

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 dipstick, but must never fall below the min. mark.

Replenish oil as required:

At normal engine operation the oil level should be in the middle between max. and min. marks, as at higher oil level, oil will dissipate via the vent passage.

|| ■ CAUTION: 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).

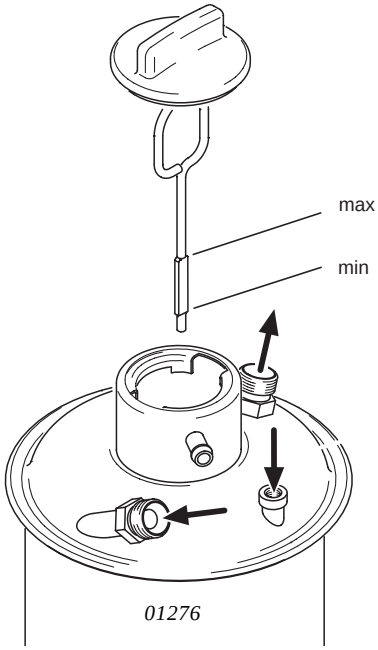

fig. 15

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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.

See chapter 05-00-00, para 2.6.

Crank the engine by hand to transfer the oil from the crankcase. See section Oil level check.

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

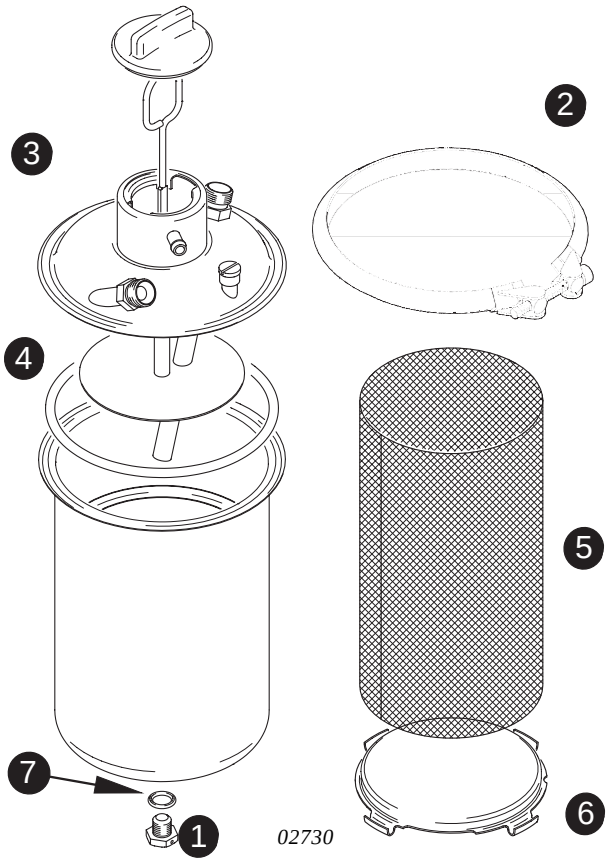
▲ WARNING: Careless draining of hot engine oil may cause scalds. Dispose of used oil and filters respecting the environmental regulations.

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

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

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

5.2.1) Cleaning of the oil tank



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In case of heavy 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

5.2.2) Venting of the lubrication system

See fig. 16/1.

■ CAUTION: Purging of the lubrication system is extremely important for operation and life of the engine and therefore it has to be followed meticulously.

Fill oil tank with motor oil.

▲ WARNING: Ignition „**OFF**“ and system grounded. Disconnect negative terminal of aircraft battery.

Disconnect suction hose (1) from oil tank and fill the oil hose with oil utilizing a suitable funnel. By cranking the engine with a few turns of the propeller oil will be sucked in by the oil pump.

◆ NOTE: As in the suction line of the oil pump an oil cooler is installed, this procedure will take a bit longer as the cooler has to be filled with oil first.

Reconnect oil suction line on tank and crank engine with starter but with **ignition 'OFF'** until steady min. oil pressure is indicated on oil pressure gauge.

Switch on ignition and start engine and observe oil pressure.

■ CAUTION: The oil pressure must rise within 10 seconds to at least 2 bar (30 psi). If not stop the engine instantly and purge the suction line between the oil tank and oil pump again as stated above.

After short idling, stop engine and replenish oil to max. mark on dip stick. Never overfill, otherwise oil would escape through the vent tube during operation. At oil level inspect, do not exceed the max. mark.

◆ NOTE: For further helpful information refer to SI-04-1997, Venting of the lubrication system, current issue.

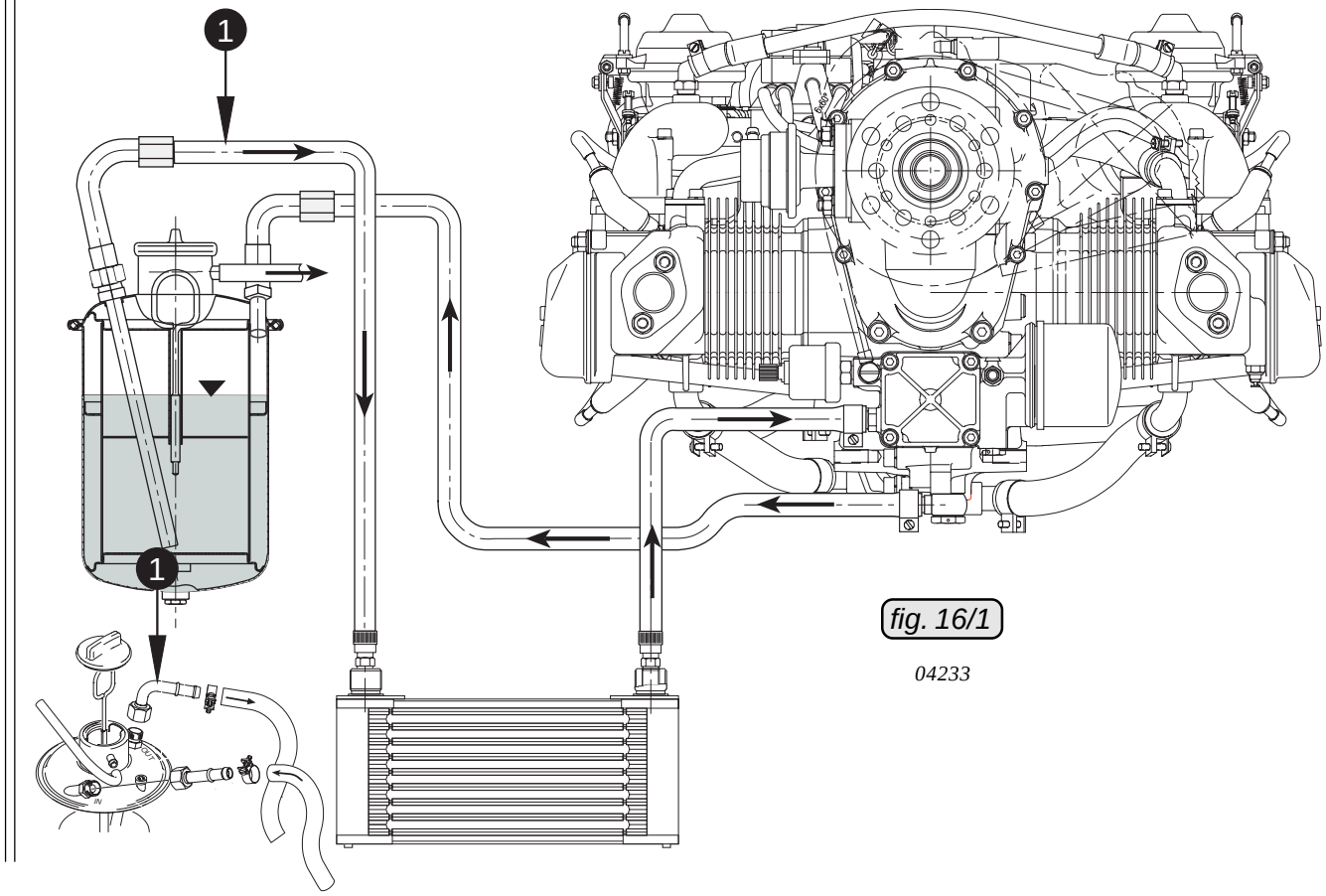

fig. 16/1

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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.

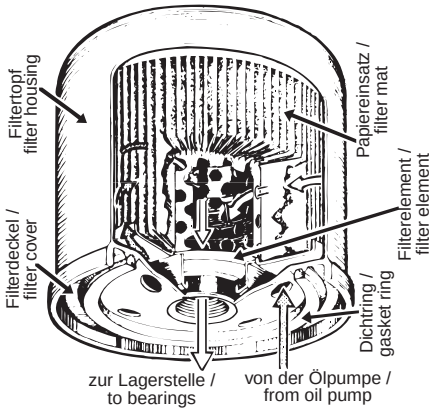

fig. 16

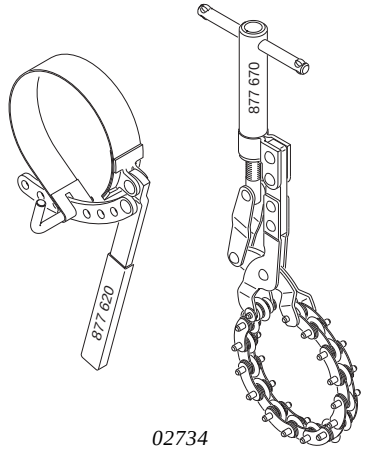

fig. 16/1

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

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

▲ 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.

* or equivalent

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■ CAUTION: It is absolutely necessary to inspect the filter mat carefully for metal chips.

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

At vagne findings, flush the lubrication circuit and fit a new oil filter. Afterwards conduct engine test run and inspect the oil filter once more.

If an increased amount of metal particles is found, like brass- or bronze chips or sliver from bearings, repair or overhaul the engine in accordance with the ROTAX® instructions for continued airworthiness.

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

■ CAUTION: If an increased amount of metal particles is found, replace the oil cooler and flush the lubrication circuit. Refer to Chapter 12-00-00, para 5.5.

Proper judgement needs years of experience in repair of piston engines.

If the filter mat is clogged by foreign matter, the lubricating oil flows unfiltered via the bypass incorporated in the oil filter, to points of lubrication.

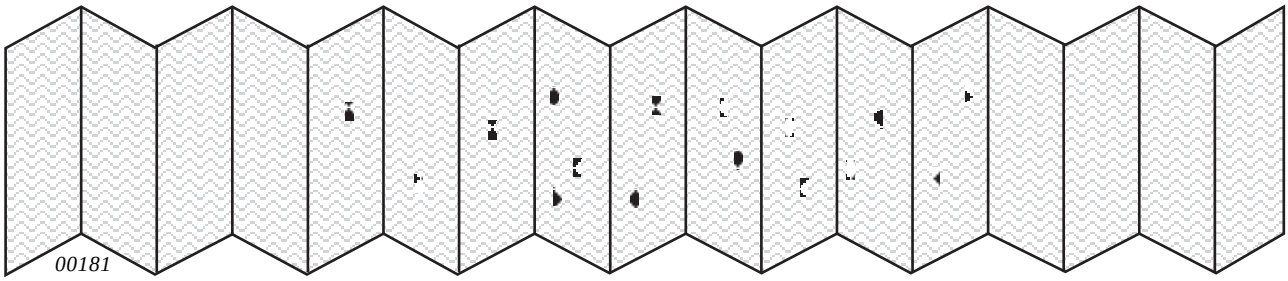
■ CAUTION: To warrant the function of the oil circuit and the forced flow lubrication, use genuine ROTAX® oil filter only or suitable equivalent. Only these filters assure correct pressure in the bypass valve operation.

Installation of the new oil filter

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

■ CAUTION: After the engine test run, re-tighten filter by hand.

fig.17



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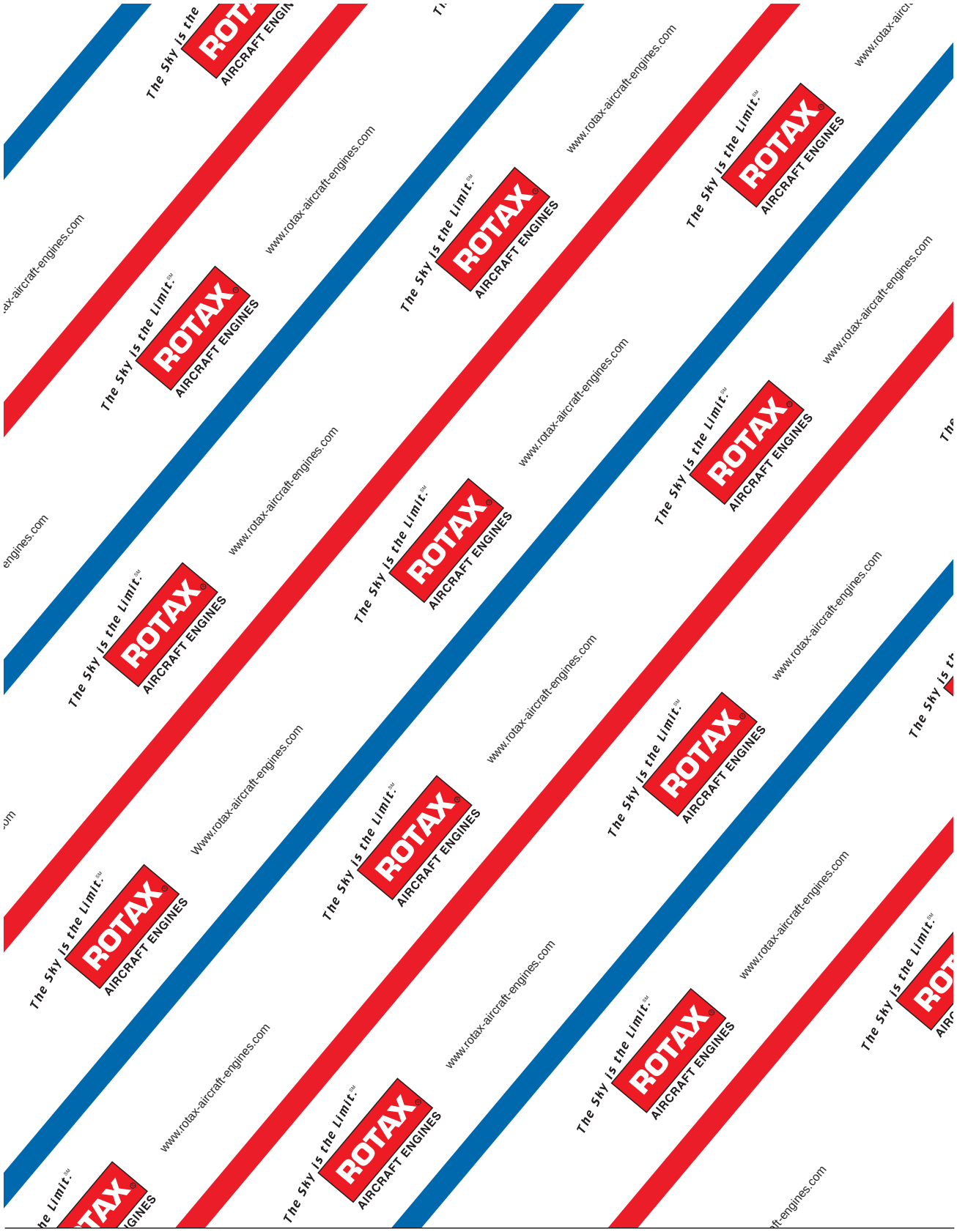
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5.4) Inspection of the magnetic plug

See fig. 17/1.

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

◆ NOTE: The magnetic plug (torx screw no. 40, old:allen key A/F 6 mm) is located on the crankcase between cylinder 2 and gearbox.

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

Steel chips in low numbers as depicted in fig. 17/1 can be tolerated if the accumulation is below 3 mm (1/8'').

At vagne findings, flush the lubrication circuit and fit a new oil filter. Afterwards conduct engine test run and inspect the oil filter once more.

Larger accumulation of chips on the magnetic plug requires repair or overhaul of the engine in accordance with the ROTAX® instructions for continued airworthiness.

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

■ CAUTION: If the lubrication circuit is contaminated by large accumulation, replace the oil cooler and flush the lubrication system. Refer to Chapter 12-00-00, para 5.5.

Trace the cause and remedy.

Clean the magnetic plug and refit it. Tightening torque 25 Nm (220 in.lb). Safety-wire the plug.

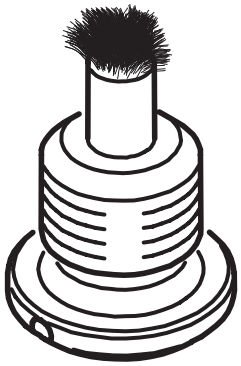

fig. 17/1

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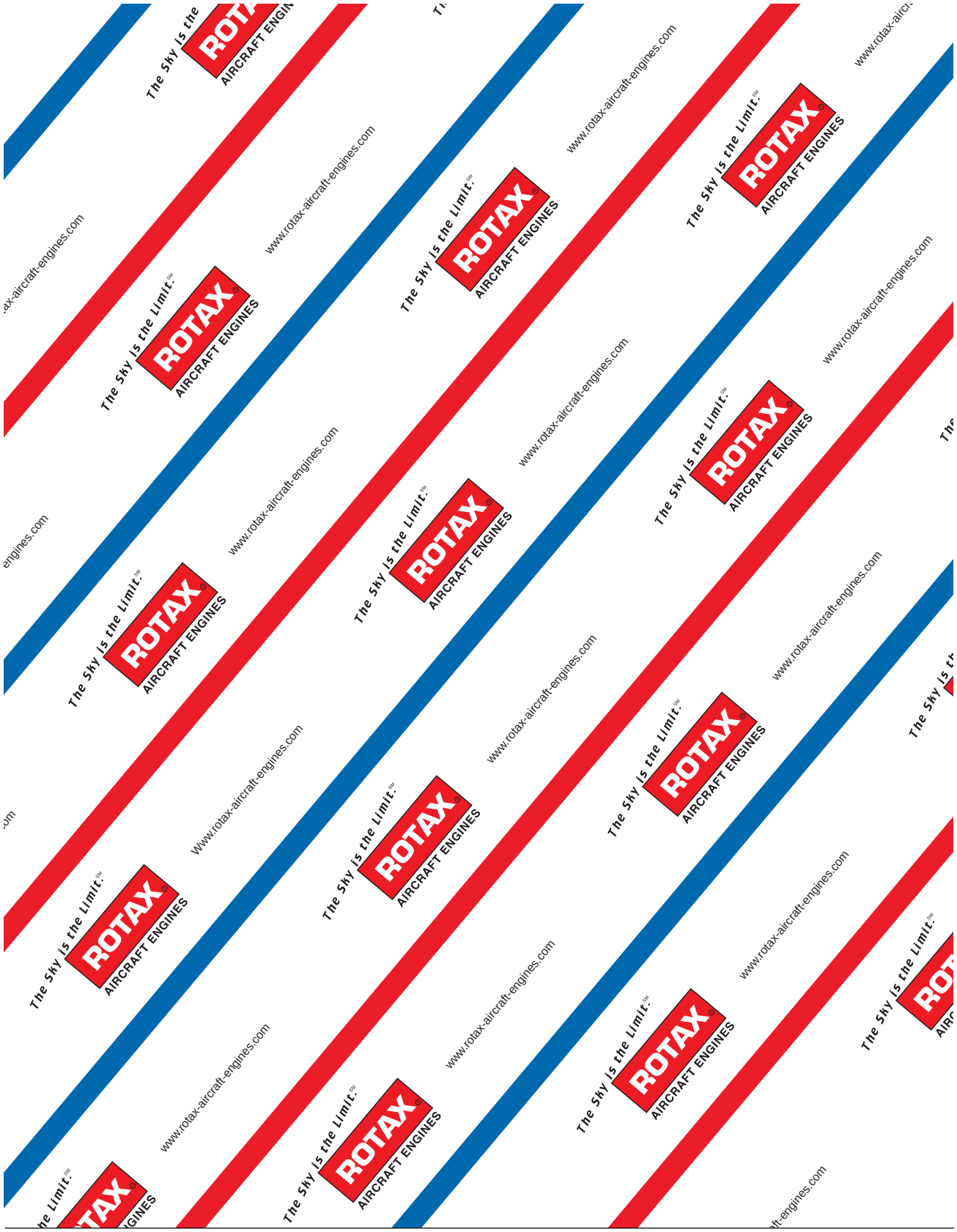
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5.5) Flushing of the lubrication circuit

- Dismantle oil lines as per instructions of the aircraft builder and flush the lines.
- Clean the oil tank.
- Install provisional oil lines (used for flushing) without connecting the oil cooler into the circuit and route the return oil line not back to the oil tank but to a separate, clean and open container.

◆ NOTE: Otherwise chips could collect in the oil cooler or oil tank during the flushing procedure.

- Fill the oil tank with approx. 2 litres motor oil.

▲ WARNING: Ignition "**OFF**''and system grounded. Disconnect negative terminal of aircraft battery.

- Crank the engine by hand on propeller to transfer the oil from the oil tank to the engine and back to the open container. This procedure is complete once the entire oil circuit including sump and oil tank are purged of oil.

  Carefully drain oil, capture in a clean open container and examine closely for chips as described previously. If unacceptable chips or slivers are found, repeat process until clear.
- Reinstall clean oil lines and new oil cooler according to instructions of the aircraft builder.
- Install new oil filter and fill the system with oil.
- Reconnect negative terminal of aircraft battery.

5.6) Equipment (including oil cooler, oil hoses, clamps etc.)

■ CAUTION: Inspect all the equipment in accordance with the Maintenance Manual of the aircraft builder.

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6) Electric system

6.1) Check of wiring

- Inspect all cable connectors for tight fit and good contact.
- Inspect all ground connections for corrosion and security, repair as required.
- Inspect plug connections between pick-up cable, electronic module, charging and shorting cables for corrosion and security, repair as required.
- Inspect 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.
- Inspect 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.

Inspect resistor plug connector for tight fit on spark plug. Repair or replace as necessary.

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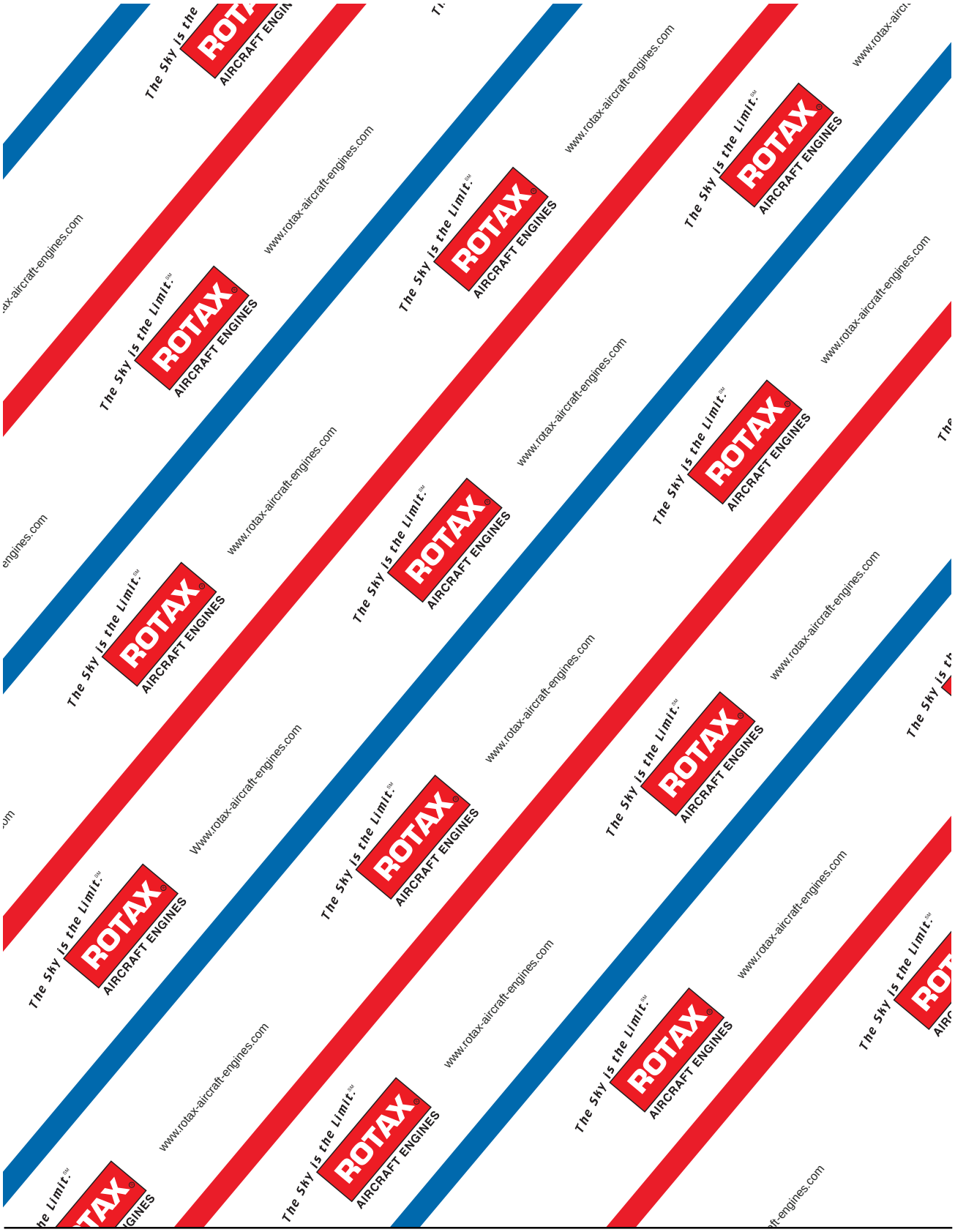
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6.2) Verification or replacement of spark plugs

■ CAUTION: 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: Use of incorrect spark plugs can result in ignition problems, pre-ignition and consequent engine damage.

Refer to Chapter 05-50-00, para 2.11.

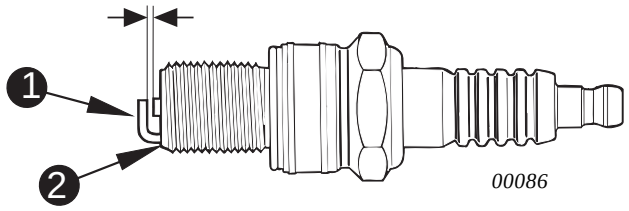
Ensure that the following spark plugs corresponding to engine type are employed and the correct spark plug socket is used.

Engine type	designation	size of socket
912 UL/A/F	DCPR 7E	16 mm
912 ULS/S	DCPR 8E	16 mm

Electrode gap: 0,7 - 0,8 mm (0,0276 - 0,0315 inch)

◆ NOTE: If cold start problems are encountered, the electrode gap may be reduced to 0,5 mm (0,0197 inch)

- inspect all spark plugs for physical damage.
- verify the heat range and the electrode gap of the spark plugs.



■ CAUTION: Heat conduction at the ground electrode (1) or for head area (2) can lead to ignition fault.

Before every installation is the sparking plug thread and the sparking plug seat at the zylinder head to clean (e.g. Rests of head contuction). 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 Chapter 05-00-00, para 2.5.

▲ WARNING: Flush with water in case of contact with eyes or skin. May be harmful if swallowed.

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

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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

◆ NOTE: Operation with leaded fuels (e.g. AVGAS 100LL) can result in increased wear of the spark plugs. Reduce renewal intervals accordingly.

7) Propeller gearbox

◆ NOTE: The following „friction torque check“ is 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 without backlash.

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

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7.1) Checking of the friction torque

See fig. 18.

- Fit the crankshaft locking pin. See Chapter 05-50-00, para 2.7.
- With the crankshaft locked, the propeller can be turned by hand 15 or 30 degrees depending on the profile of the dog gears installed.

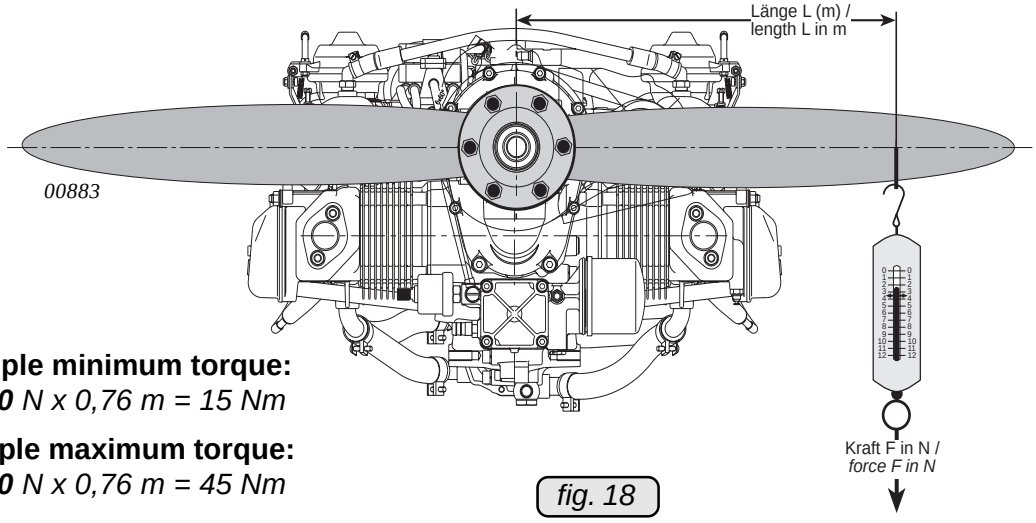
  This is the amount of movement allowed by the dog gears in the torsion load absorption unit.

▲ WARNING: Ignition "**OFF**" and system grounded. Disconnect negative terminal of aircraft battery.

- Turn the propeller by hand back and forth between ramps, taking into consideration the friction torque. No odd noises or irregular resistance must be noticeable during this moment.
- 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. See Chapter 12-00-00, para 2.7.
- Reconnect negative terminal of aircraft battery.

▲ WARNING: If the above mentioned friction torque is not achieved, ispect, repairor overhaul the gearbox in accordance with the ROTAX® instructions for continued airworthiness.

- Detailed inspection of all gearbox components.



For example minimum torque:
*F x N = **20** N x 0,76 m = 15 Nm*

For example maximum torque:
*F x N = **60** N x 0,76 m = 45 Nm*

fig. 18

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Motornummer
Engine serial no.

Flugzeugtype
Type of aircraft

Flugzeugkennzeichen
Aircraft registration no.

ROTAX® Vertriebspartner

ROTAX® authorized distributor