ROTAX®

SERVICE INSTRUCTION

Selection of suitable operating fluids for ROTAX® Engine Type 916 i (Series), 915 i (Series), 912 i (Series), 912 and 914 (Series)

ATA System: 12-10-00 Operating fluids

1) Planning information

To obtain satisfactory results, procedures specified in this publication must be accomplished with accepted methods and prevailing legal regulations.
BRP-Rotax GmbH & Co KG cannot accept any responsibility for the quality of work performed in accomplishing the requirements of this publication.

1.1) Applicability

All versions of ROTAX® engine types:

Engine type	Serial number
916 i (Series)	all
915 i (Series)	all
912 i (Series)	all
912 (Series)	all
914 (Series)	all

1.2) Concurrent ASB/SB/SI and SL

In addition to this Service Instruction the following documents must be observed and complied with:

- in general all relevant Alert Service Bulletins (ASB), Service Bulletins (SB), Service Instructions (SI), Service Letters (SL), Service Instruction - Parts and Accessories (SI-PAC).

1.3) Reason

Adaptions/revisions in the tables for the released fuels according to local standards.

1.4) Subject

Selection of suitable operating fluids for ROTAX® engine type 916 iSc B, 915 i A/B (Series), 912 i (Series), 912 and 914 (Series).

1.5) Compliance

Corresponding Maintenance Manual of engine type ROTAX® 916 iSc B, 915 i, 912 i, 912 and 914 (Series), current issue.

⚠ WARNING Non-compliance with these instructions could result in engine damages, personal injuries or death.

1.6) Approval

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

3) Lubricant

3.1) General

Foreign particles formed during combustion are suspended in the engine oil. Together with oil components that are not sufficiently resistant to heat, these foreign particles can cause parts such as pistons, piston rings, exhaust valves, etc., to seize and lead to problems.
On turbocharged engines, failing to ensure an adequate cool-down period prior to shut-off may lead to particle deposits and cause damage to bearings and seals. Hard oil residues can obstruct parts of the oil system and lead to damage.

- In addition to insufficient cool-down periods, the use of unsuitable oils and not obeying oil change intervals can especially cause such damage.
- Long-term operation with an engine that is too cold and/or operating too long with an overly rich fuel mixture can cause water and fuel contamination in the oil, reducing its lubrication capacity.
- Furthermore, long down times with oil that contains water and contaminants can cause corrosion damage, especially on the bearings, with serious consequential damage.

The criteria for correct engine oil selection are:

- Correct oil viscosity for cold starts and sufficient oil pressure at high temperatures.
- Good gear wear protection.
- Avoidance of clutch slipping due to use of additives.
- Insufficient oil flow capability causes too much volume to remain in the engine, leading to low oil level in the external oil tank. This can only be detected during testing with an oil level indicator installed on the oil tank.
- Ability to withstand combustion products containing lead, which enter the oil during AVGAS operation.
- High oil temperature durability. This is especially important for the turbo engine due to the risk of oil carbon buildup on the bearing and sealing seats of the turbocharger. The oil carbon build-up (coking) can also flake off and block/restrict the oil return passage.

Conclusions

- If possible, operate the listed engine types using unleaded or low-lead fuel. (AVGAS 100 LL is not considered low leaded in this context.).
- Only use engine oils tested and released according to the ROTAX® standard (RON 424), see section 3.2.
- Due to high stresses in the reduction gears, oils with gear additives such as AeroShell Oil Sport Plus 4 are highly recommended.
- Because of the incorporated friction clutch, oils with friction modifier additives are unsuitable because this could result in clutch slipping during standard operation.
- Avoid oils strictly specified for use in Diesel engines. These may not be suitable due to insufficient high temperature properties and additives that may affect the operation of the slipper clutch in the gear box.
- On turbocharged engines, always conduct a cool-down run before shutting down in accordance with the relevant Operators Manual (OM).
- Pay special attention to engine operation tips (see section 6).

3.3) Operation with leaded AVGAS fuels

Perform maintenance checks according to the latest Maintenance Manual.

More frequent oil changes will assure timely removal of residues and oil sludge thus avoiding increased wear or operating troubles.

Engine oils tested according to RON 424* for use with our ROTAX® engine types 916 iSc B, 915 i A/B Series, 912 i Series, 912 and 914 Series (use of leaded AVGAS):

Brand	Description	Specification	Viscosity
SHELL®	AeroShell Oil Sport Plus 4 [1) 2)]	RON 424*	SAE 10 W-40

[1)] with new formulation

[2)] in red bottle

* **RON 424**: The ROTAX® Norm 424 (RON 424) is a BRP-Rotax internal standard, which describes the specification, performance parameters and testing methods of lubricants specifically designed to be used with ROTAX® Aircraft Engines. It is only available on special request via the ROTAX® Authorized Distributor and will not be disclosed to third parties without prior consent.

NOTE: The previous formulation of AeroShell Oil Sport Plus 4 can still be used until its expiration date.

NOTE: The coefficient of viscosity indicates the tendency of oil to flow but it is not necessarily a quality code. Country specific deviations of the viscosity are possible.

Brand	Description
SHELL®	DEX-COOL
SHELL®	Antifreeze Concentrate
TEXACO®	Havoline Extended Life Antifreeze
VELVANA®	FRIDEX G49
YACCO®	LR-35

4.3) Waterless coolant for engine types 912/914 Series

NOTICE Waterless coolant is not permitted for engine types 916 iSc B, 915 i A/B Series, 912 i Series or for 912/914 Series with cylinder head version Suffix - 01.

NOTICE The certification and determination of the correct coolant type must be conducted by the aircraft manufacturer. As each aircraft type has different characteristics, testing must be done to determine the most suitable coolant and instrumentation for each aircraft type.

The coolant suppliers guidelines must be adhered to when filling or re-filling coolant.

NOTE: EVANS® Cooling Systems, Inc. offers its NPG+C coolant worldwide under several names. For some recent examples, see also the next table. For any naming, specification or successor products contact your local EVANS® Cooling Systems, Inc. Official Partner.

NOTICE EVANS® coolants are fully operational to -40 °C (-40 °F). It will not freeze and expand like conventional coolant.

Brand	Description	
EVANS®	Aero Cool 180°	Europe/Middle East
	NPG+C	China
	Evans High Performance Coolant	USA and rest of the world

4.3.1) Warnings for operating with waterless coolant

- Water or coolant containing water **must never** be added to the cooling system!
- The max. water content must not exceed 3.6 %; it can be tested using a Brix refractometer
- Any water present in the cooling system is separated out as vapor. This can cause the cooling system to fail due to insufficient coolant quantity
- If EVANS® coolant is not available locally for servicing the cooling system, a conventional coolant based on pure 100% ethylene glycol can be used temporarily. However, the coolant must be replaced again with EVANS® within the next 15 days.

NOTICE As some conventional coolants are available in a pre-mixed formula (water added) be sure to add only 100% pure ethylene glycol if EVANS® coolant is not available.

5) Fuel

NOTICE

The aircraft manufacturer has to show compliance to the relevant requirements and standards on aircraft level for the suitability of any fuels in their product (by make and model). Using aircraft manufacturer approved fuels at critical temperature in all approved operating conditions (also including departures with a heat-soaked engine) is essential regarding being free from vapor lock as this issue is strongly dependent on the aircraft fuel system design. Aircraft operating limits can be different than the relevant ROTAX® aircraft engine operating limits.

For ROTAX® aircraft engines different fuel types are available. See Operators Manual (OM) of the relevant engine type and/or the table in chapter 5.3. This service instruction shows approved fuels for ROTAX® aircraft engines based on the various engine operating limits.

NOTE: If none of the fuels mentioned in chapter 5.3 is available, consult the corresponding European Standard EN228 as a reference. The fuel to be assessed, has to be equal or better.

NOTICE

Any mixture of unapproved fuels and/or additives that cause lower than the specified octane rating can cause engine damage like e.g. detonation.

5.1) Automotive fuels

In addition to AVGAS, various automotive fuel types with different quality are available. Due to various environmental, economic and political reasons a number of fuel types with different amounts of ethanol blend are available. Therefore the maximum amount of ethanol blend is defined as follows:

5.1.1) E10 (Unleaded gasoline blended with 10% ethanol)

In addition to AVGAS and unleaded automotive fuel (MOGAS) the ROTAX® 912/914 Series of engines are now approved for use with E10. Fuels that contain more than 10% ethanol blend have not been tested by BRP-Rotax and are not permitted for use.

5.1.2) Suitability of fuel system components of airframe

BRP-Rotax urges owners to confirm with their airframe manufacturer that ethanol blended fuels of up to 10% (E10) are compatible with all fuel system components.

It is the responsibility of the aircraft manufacturer to test their fuel system components and supply any further information on techniques, procedures and limitations of using ethanol blended fuel.

BRP-Rotax recommends that aircraft manufacturer and owner/operators read the following:

- FAA Advisory Circular Letter AC 23.1521-2
- FAA Advisory Circular Letter AC 33.91-1
- FAA Special Airworthiness Information Bulletin CE-07-06
- EASA Safety Information Bulletin – SIB 2009-02

These contain details regarding the use of ethanol (alcohol) blended fuels and the type certificate requirements.

It is strongly recommended that non-certified aircraft also conform to the information given in the above documents.

5.2) AVGAS fuel additives

Additives under the names of Decalin® and Alcor®, which aid the scavenging of lead deposits have not been tested by BRP-Rotax. Field experience shows that these products significantly

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	Usage/Description	
	912 A/F/UL Min. RON 90	**912 S/ULS - 914 F/UL** Min. RON 95
Ukrainian standard (date: 2007)	DSTU 4839:2007	DSTU 4839:2007
	A-92-Euro	
	A-95-Euro	A-95-Euro
	A-98-Euro	A-98-Euro
Indian standard (date: 2008)	IS 2796:2008	IS 2796:2008
	MG 91	
	MG 95	MG 95
Japanese standard (date: 2012)	JIS K 2202 Motor Gasoline no.1 min. 96 JIS K 2202 Motor Gasoline no.1 (E) min. 96	JIS K 2202 Motor Gasoline no.1 min. 96 JIS K 2202 Motor Gasoline no.1 (E) min. 96
New Zealand standard (date: 2011)	(SR 2011/352) Regular Grade min. 91	(SR 2011/352) Premium Grade min. 95
South Korean standard (date: 2020)	South Korea Gasoline Regular 91	
	South Korea Gasoline Premium 94	
Chinese standard (date: 2016)	China 92 V/VIA/VIB* E10 China 92 V/VIA/VIB* China 95 V/VIA/VIB* E10 China 95 V/VIA/VIB* China 98 V/VIA/VIB* E10 China 98 V/VIA/VIB*	China 95 V/VIA/VIB* E10 China 95 V/VIA/VIB* China 98 V/VIA/VIB* E10 China 98 V/VIA/VIB*

* According to National Standard of the People's Republic of China GB17930-2016/GB18351-2017; 95# China is unleaded fuel; No E95 #, because E95# is Ethanol-blended fuel, can damage engine

AVGAS		
leaded	AVGAS 100 LL ASTM D910	AVGAS 100 LL ASTM D910
unleaded	UL91/UL94 ASTM D7547	UL91/UL94 ASTM D7547

	Usage/Description	
	912 iSc/iS Sport Min. RON 95	**915 iSc/iS A - 915 iSc B** Min. RON 95
AVGAS		
leaded	AVGAS 100 LL ASTM D910	AVGAS 100 LL ASTM D910

Engine Type 916 iSc B

	916 iSc B Min. RON 98
MOGAS	
Reference standard	
European standard (date: 2017)	EN 228 Super
	EN 228 Super plus
Chinese standard (date: 2016)	China 98 V/VIA/VIB* E10 China 98 V/VIA/VIB*
Ukrainian standard (date: 2007)	DSTU 4839:2007
	A-98-Euro
AVGAS	
leaded	AVGAS 100 LL ASTM D910

* According to National Standard of the People's Republic of China GB17930-2016/GB18351-2017; 95# China is unleaded fuel; No E95 #, because E95# is Ethanol-blended fuel, can damage engine.

NOTE: The above tables list national fuel standards, but no brand names - as this would go beyond the scope of this document.

Furthermore all listed standards have been assessed with the version noted in brackets. BRP-Rotax will not pro-actively monitor the further development of those individual standards. In case of any uncertainties BRP-Rotax reserves the right to reference only to the listed version of a standard. Also contact the aircraft manufacturer in case of doubts regarding the aircraft manufacturer approved fuels.

NOTE: The Anti Knock Index (AKI) is valid for fuels according to ASTM D4814, and for fuels which are defined by AKI instead of RON. The AKI is a simple mean or average of the RON and the MON.

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7) Summary

These instructions (section 3) have to be followed in accordance with the deadlines specified in section 1.5.

The execution of the Service Instruction must be confirmed in the logbook.

| A revision bar outside of the page margin indicates a change to text or graphic.

Translation into other languages might be performed in the course of language localization but does not lie within ROTAX® scope of responsibility.

In any case the original text in English language and the metric units are authoritative.

8) Inquiries

Inquiries regarding this Service Instruction should be sent to the ROTAX® Authorized Distributor of your area.
A list of all ROTAX® Authorized Distributors or their independent Service Centers is provided on is provided on www.flyrotax.com.