

ROTAX®

AIRCRAFT ENGINES

Operator's Manual

for all versions of

ROTAX 912

Engine serial no: _____

Type of aircraft: _____

Aircraft registration no: _____

WARNING

Before starting the engine, read the Operator's Manual. Failure to do so may result in **personal injuries including death**.

Consult the original equipment manufacturer's handbook for additional instructions!

The manual must remain with the engine / original equipment in case of sale.

Edition: 0 of 1998 07 01

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Recommended price : ATS 100,--
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1)	Table of contents	1 - 2
2)	Index	2 - 1
3)	Introduction	3 - 1
	3.1) Remarks	3 - 1
	3.2) Engine serial number	3 - 1
4)	Safety	4 - 1
	4.1) Repeating symbols	4 - 1
	4.2) Safety information	4 - 2
	4.3) Technical documentation	4 - 5
5)	Index of pages	5 - 1
6)	List of amendments	6 - 1
7)	Description of design	7 - 1
	7.1) Type description	7 - 2
	7.2) Denomination of cylinders:	7 - 3
8)	Technical data	8 - 1
	8.1) Dimensions	8 - 1
	8.2) Weights	8 - 1
	8.3) Fuel consumption	8 - 2
	8.4) Direction of rotation	8 - 2
9)	Description of systems	9 - 1
	9.1) Cooling system	9 - 1
	9.2) Fuel system	9 - 2
	9.3) Lubrication system	9 - 3
	9.4) Electric system	9 - 4
	9.5) Propeller gearbox	9 - 5
	9.5.1) Hydr. governor for const. speed propeller, vacuum pump	9 - 6
10)	Operating instructions	10 - 1
	10.1) General limits of operation	10 - 1
	10.1.1) Operating speeds and limits (912 UL / A / F).....	10 - 1
	10.1.1.1) Performance graphs for stand. conditions (ISA)	10 - 3
	10.1.1.2) Performance graph for non-standard conditions	10 - 4
	10.1.2) Operating speeds and limits (912 ULS / S)	10 - 5
	10.1.2.1) Performance graphs for stand. conditions (ISA)	10 - 7
	10.1.2.2) Performance graph for non-standard conditions	10 - 8
	10.2) Operating media	10 - 9
	10.2.1) Coolant	10 - 9
	10.2.2) Fuel	10 - 10
	10.2.3) Lubricants	10 - 11

10.3) Standard operation	10 - 14
10.3.1) Daily checks	10 - 14
10.3.2) Before engine start	10 - 15
10.3.3) Pre-flight checks	10 - 15
10.3.4) Engine start	10 - 16
10.3.5) Prior to take-off	10 - 17
10.3.6) Take-off	10 - 18
10.3.7) Cruising	10 - 18
10.3.8) Engine shut-off	10 - 18
10.3.9) Cold weather operation	10 - 19
10.4) Abnormal operation	10 - 21
10.4.1) Engine stop - Start during flight	10 - 21
10.4.2) Exceeding of max. admissible engine speed	10 - 21
10.4.3) Exceeding of max. admissible cyl. head temperature ..	10 - 21
10.4.4) Exceeding of max. admissible oil temperature	10 - 21
10.4.5) Oil pressure below minimum - during flight	10 - 21
10.4.6) Oil pressure below minimum - on ground	10 - 21
11) Checks	11 - 1
11.1) Engine preservation	11 - 1
12) Trouble shooting	12 - 1
13) Appendix to Aircraft Manual	13 - 1
13.1) Fuel according to DOT	13 - 1
13.2) Fuel according to FAA	13 - 2
14) ROTAX® authorized Distributors	14 - 1
15) Warranty	15 - 1
15.1) Warranty Conditions / Warranty Card (912 A / F / S)	15 - 1
15.2) Warranty Conditions / Warranty Card (912 UL / ULS)	15 - 5

blank page

2) Index

A

Abnormal operation 10 - 21
Acceleration (912 UL / A / F) 10 - 1
Acceleration (912 ULS / S) 10 - 5
AVGAS 100 LL 10 - 10

C

Carburetor 10 - 14
Certification 7 - 2
Check of hydraulic propeller
governor 10 - 17
Cold start 10 - 19
Cold weather operation 10 - 19
Configuration 7 - 2
Consumer assistance 15 - 2
Coolant 10 - 9
Cooling system 9 - 1
Cruising 10 - 18
Cylinder head temperature (912 UL / A /
F) 10 - 1
Cylinder head temperature (912 ULS /
S) 10 - 5

D

Daily checks 10 - 14
Denomination of cylinders 7 - 3
Description of design 7 - 1
Description of systems 9 - 1
Direction of rotation 8 - 2
Documentation (technical) 4 - 5

E

Electric system 9 - 4
Engine preservation 11 - 1
Engine serial number 3 - 1
Engine shut-off 10 - 18
Engine start 10 - 16
Engine start, operating temperature (912
UL / A / 10 - 1
Engine start, operating temperature (912
ULS / S) 10 - 5
Equipment 8 - 1
Exceeding of max. admissible cyl. head
temperature 10 - 21
Exceeding of max. admissible engine
speed 10 - 21

Exceeding of max. admissible oil
temperature 10 - 21
Exhaust system 10 - 14

F

Fuel 10 - 10
Fuel according to DOT 13 - 1
Fuel according to FAA 13 - 2
Fuel consumption 8 - 2
Fuel pressure (912 UL / A / F) 10 - 1
Fuel pressure (912 ULS / S) 10 - 5
Fuel system 9 - 2

H

Hydr. governor for const. speed
propeller 9 - 6

I

Ignition check 10 - 17
Ignition unit 9 - 4
Index of pages 5 - 1
Introduction 3 - 1

L

List of amendments 6 - 1
Lubricants 10 - 11
Lubrication system 9 - 3

M

magneto side 7 - 3

N

Note of approval 6 - 1

O

Oil capacity 10 - 12
Oil consumption 10 - 12
Oil pressure (912 UL / A / F) 10 - 1
Oil pressure (912 ULS / S) 10 - 5
Oil pressure below minimum - during
flight 10 - 21
Oil pressure below minimum - on
ground 10 - 21
Oil specification 10 - 11
Oil temperature (912 UL / A / F) 10 - 1

Oil temperature (912 ULS / S) 10 - 5
Oil viscosity 10 - 12
Operating media 10 - 9, 10 - 15
Operating speeds and limits (912 UL / A / F) 10 - 1
Operating speeds and limits (912 ULS / S) 10 - 5
Overload clutch 9 - 5

P

Performance (ISA) (912 UL / A / F) 10 - 1
Performance (ISA) (912 ULS / S) 10 - 5
Performance data 10 - 4, 10 - 8
Performance graphs for stand. conditions (ISA) 10 - 3, 10 - 7
power take-off side 7 - 3
Pre-flight checks 10 - 15
Propeller gearbox 9 - 5
Propeller governor 9 - 6

R

Remarks 3 - 1
Repeating symbols 4 - 1
ROTAX® authorized Distributors 14 - 1

S

Safety 4 - 1
Safety information 4 - 2
Speed (912 UL / A / F) 10 - 1
Speed (912 ULS / S) 10 - 5
Symbols 4 - 1

T

Table of lubricants 10 - 12
Take-off 10 - 18
Technical data 8 - 1
Technical documentation 4 - 5
Throttle response 10 - 17
Trouble shooting 12 - 1
Type 7 - 2
Type description 7 - 2

V

Vacuum pump 9 - 6

W

Warming up period 10 - 17
Warranty 15 - 1
Weights 8 - 1
Work performance 15 - 1

3) Introduction

Congratulations on your decision to purchase a ROTAX[®] aircraft engine.

Before operating the engine, carefully read this Operator's Manual. The Manual provides you with basic information on the safe operation of the engine.

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

We wish you much pleasure and satisfaction flying your aircraft with this ROTAX[®] engine.

3.1) Remarks

The purpose of this Operator's Manual is provided to familiarize the owner/user of this aircraft engine with basic operating instructions and safety information.

For more detailed maintenance, safety and flight information, consult the documentation provided by the aircraft manufacturer and dealer.

For further information on maintenance and spare parts service, contact the nearest ROTAX[®] distribution Center (see Chapter 14).

3.2) Engine serial number

On all enquiries or parts orders, always indicate the engine serial number, as the manufacturer makes modifications to the engine for product improvement. The engine serial number should always be used when ordering parts to ensure correct part selection prior to shipment.

The engine serial number is located on the top of the crankcase, magneto side. See ill. 6.

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4) Safety

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

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

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

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

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

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

4.1) Repeating symbols

This Manual uses the following symbols to emphasize particular information:

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

4.2) Safety information

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

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

- This engine is not suitable for acrobatics (inverted flight, etc.).
- This engine shall not be used on rotor wing aircraft (helicopters, gyrocopters, etc.) or any similar aircraft.
- It should be clearly understood that the choice, selection and use of *this* particular engine on any aircraft is at the sole discretion and responsibility of the aircraft manufacturer, assembler and owner/user.
- Due to the varying designs, equipment and types of aircraft, ROTAX® grants no warranty or representation on the suitability of its engine's use on any particular aircraft. Further, ROTAX® grants no warranty or representation of this engine's suitability with any other part, component or system which may be selected by the aircraft manufacturer, assembler or user for aircraft application.
- Whether you are a qualified pilot or a novice, complete knowledge of the aircraft, its controls and operation is mandatory before venturing solo. Flying any type of aircraft involves a certain amount of risk. Be informed and prepared for any situation or hazard associated with flying.

A recognized training program and continued education for piloting an aircraft is absolutely necessary for all aircraft pilots. Make sure you also obtain as much information as possible about your aircraft, its maintenance and operation from your dealer.

- You should be aware that any engine may seize or stall at any time. This could lead to a crash landing and possible severe injury or death. For this reason, we recommend strict compliance with the maintenance and operation and any additional information which may be given to you by your dealer.
- Respect all government or local rules pertaining to flight operation in your flying area. Fly only when and where conditions, topography, and airspeeds are safest.
- Select and use proper aircraft instrumentation. This instrumentation is not included with the ROTAX® engine package. Only approved instrumentation may be installed.

- Before flight, ensure that all engine controls are operative. Make sure all controls can be easily reached in case of an emergency.
- Unless in a run up area, never run the engine with the propeller turning while on the ground. Do not operate engine if bystanders are close.
- In the interest of safety, the aircraft must not be left unattended while the engine is running.
- Keep an engine log and respect engine and aircraft maintenance schedules. Keep the engine in top operating condition at all times. Do not operate any aircraft which is not properly maintained or has engine operating irregularities which have not been corrected.

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

- To eliminate possible injury or damage, ensure any loose equipment or tools are properly secured before starting the engine.
- When in storage protect the engine and fuel system from contamination and exposure.
- Certain areas, altitudes and conditions present greater risk than others. The engine may require carburetor recalibration or humidity or dust/sand preventative equipment, or additional maintenance may be required.

Consult your aircraft dealer or manufacturer and obtain the necessary information, especially before flying in new areas.

- Never operate the engine and gearbox without sufficient quantities of lubricating oil.
- Periodically verify level of coolant.
- Never exceed maximum rated r.p.m.
Allow the engine to cool at idle for several minutes before turning off the engine.
- This engine may be equipped with an Airborne vacuum pump. The safety warning accompanying the vacuum pump must be given to the owner/operator of the aircraft into which the vacuum pump is installed.

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4.3) Technical documentation

The information given in the

- ☞ Installation Manual
- ☞ Operator's Manual
- ☞ Collective Manual
- ☞ Maintenance Manual
- ☞ ICR-Manual (Inspection, Clean and Repair Manual)
- ☞ Overhaul Manual
- ☞ Illustrated Parts Catalog
- ☞ Technical Bulletins
- ☞ Service Information

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

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

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

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

◆ **NOTE:** The Illustrations in this Operator's Manual are stored in a graphic data file and are provided with a consecutive irrelevant number.

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

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5) Index of pages

00522

Chapter	Page	Date	Chapter	Page	Date
1	cover page	1 - 1	10	ACG-approv. 10 - 1	98 07 01
		1 - 2		ACG-approv. 10 - 2	98 07 01
		1 - 3		ACG-approv. 10 - 3	98 07 01
		1 - 4		ACG-approv. 10 - 4	98 07 01
2		2 - 1	ACG-approv. 10 - 5	98 07 01	
		2 - 2	ACG-approv. 10 - 6	98 07 01	
3		3 - 1	ACG-approv. 10 - 7	98 07 01	
		3 - 2	ACG-approv. 10 - 8	98 07 01	
4		4 - 1	ACG-approv. 10 - 9	98 07 01	
		4 - 2	ACG-approv. 10 - 10	98 07 01	
		4 - 3	ACG-approv. 10 - 11	98 07 01	
		4 - 4	ACG-approv. 10 - 12	98 07 01	
		4 - 5	blank 10 - 13	98 07 01	
		4 - 6	ACG-approv. 10 - 14	98 07 01	
5		5 - 1	ACG-approv. 10 - 15	98 07 01	
		5 - 2	ACG-approv. 10 - 16	98 07 01	
6	ACG-approv. blank	6 - 1	ACG-approv. 10 - 17	98 07 01	
		6 - 2	ACG-approv. 10 - 18	98 07 01	
7		7 - 1	ACG-approv. 10 - 19	98 07 01	
		7 - 2	ACG-approv. 10 - 20	98 07 01	
		7 - 3	ACG-approv. 10 - 21	98 07 01	
		7 - 4	ACG-approv. 10 - 22	98 07 01	
8		8 - 1	blank 10 - 22	98 07 01	
		8 - 2			
9		9 - 1	11	11 - 1	98 07 01
		9 - 2		11 - 2	98 07 01
		9 - 3	12	12 - 1	98 07 01
		9 - 4		12 - 2	98 07 01
		9 - 5	13	DOT-approv. 13 - 1	98 07 01
		9 - 6		FAA-approv. 13 - 2	98 07 01
			14	14 - 1	98 07 01
				14 - 2	98 07 01
				14 - 3	98 07 01
				14 - 4	98 07 01

Chapter	Page	Date	Chapter	Page	Date
15	15 - 1	98 07 01			
	15 - 2	98 07 01			
	15 - 3	98 07 01			
	15 - 4	98 07 01			
	15 - 5	98 07 01			
	15 - 6	98 07 01			
	15 - 7	98 07 01			
	15 - 8	98 07 01			
	15 - 9	98 07 01			
	15 - 10	98 07 01			

6) List of amendments

00521

Currt. no.	Chapter	Pages	Date of modifikation	Note of approval	Date of approval by authority	Date of insertion	Marks / Signature
0	1÷5 7÷9 11÷15	all all all	98 07 01	not required		98 07 01	AA/HeC
0	6,10	all*	98 07 01	english version not required	german version 1.7.1998	98 07 01	AA/HeC

* The note of approval of the Aviation Authority refers only to the certified engines of the Type 912 A (TW 8/89), 912 F / S (TW9 - ACG).

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7) Description of design

4-stroke, 4 cylinder horizontally opposed, spark ignition engine, one central camshaft - push-rods - OHV

Liquid cooled cylinder heads

Ram air cooled cylinders

Dry sump forced lubrication

Dual breakerless capacitor discharge ignition

2 constant depression carburetors

mechanical fuel pump

Prop drive via reduction gear with integrated shock absorber and overload clutch

◆ NOTE: The overload clutch is installed on all **serial production** aircraft engines which are certified and on non-certified aircraft engines of the configuration 3.

Electric starter (12V 0,6 kW)

Integrated AC generator with external rectifier-regulator (12V 20A DC)

External alternator (12V 40A DC), **optional**

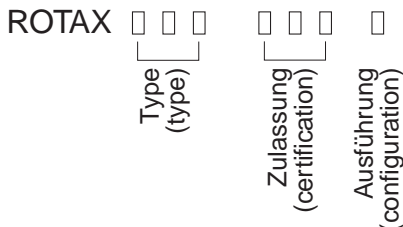
Vacuum pump: (only for A1, A2 and A4 possible), **optional**

Hydraulic constant speed propeller governor: (for A3 only), **optional**

7.1) Type description

e.g. ROTAX 912 A 2

◆ NOTE: The type designation is of the following composition.



02091

Type: 912 4-cyl. horizontale opposed, normal aspirated engine

Certification: A certified to JAR 22 (TW 8/89)

F, S certified to FAR 33 (TW9 - ACG)

UL, ULS . non-certified aircraft engines

Configuration: 1 Prop shaft with flange for fixed pitch prop, P.C.D. 100 mm.

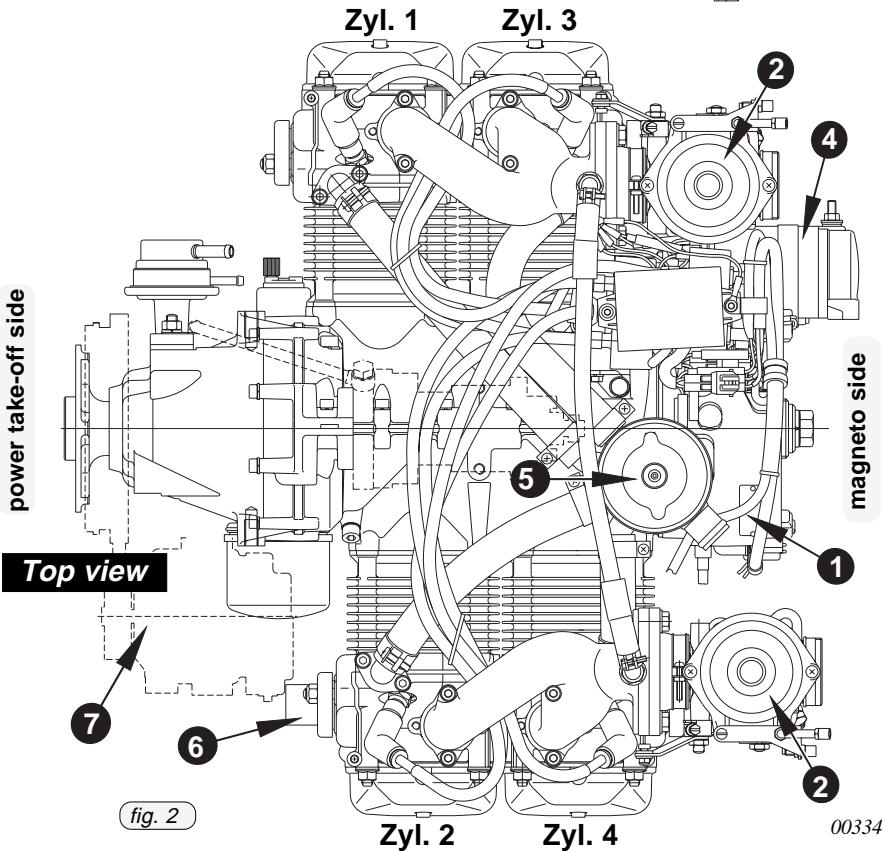
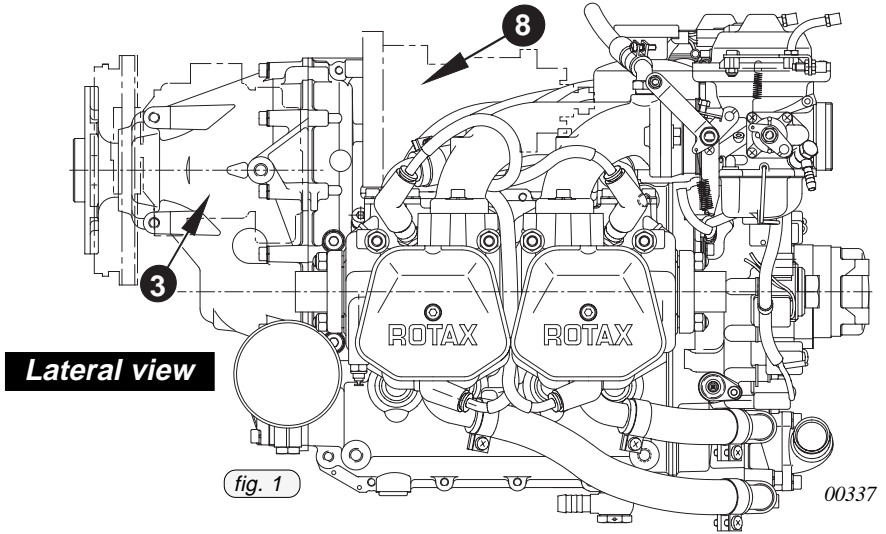
◆ NOTE: This configuration is not available any longer and will be replaced by configuration 2.

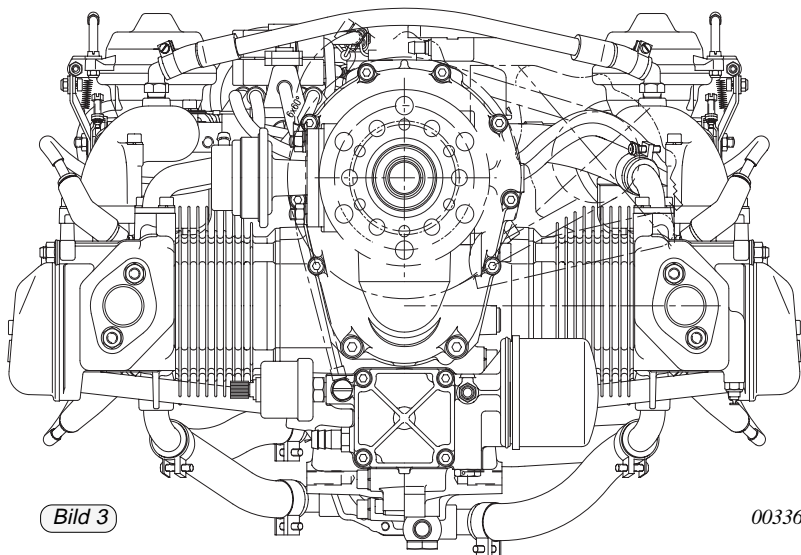
2 Prop shaft with flange for fixed pitch prop, P.C.D. 75 mm, P.C.D. 80 mm and 4" P.C.D.

3 Prop shaft with flange for constant speed propeller P.C.D. 75 mm, P.C.D. 80 mm, P.C.D. 4" and drive for hydraulic governor for constant speed propeller.

4 Prop flange for fixed pitch propeller P.C.D. 75 mm, P.C.D. 80 mm, P.C.D. 4" and prepared for retrofit of a hydraulic governor for constant speed propeller.

7.2) Denomination of cylinders:





front view

- | | |
|---|--|
| (1) engine serial number | (6) exhaust flange |
| (2) CD carburetor | (7) external alternator |
| (3) propeller gearbox | (8) vacuum pump or hydraulic governor for constant speed propeller |
| (4) electric starter | |
| (5) expansion tank with excess pressure valve | |

8) Technical data

8.1) Dimensions

Description	912 UL / A / F	912 ULS / S
Bore	79,5 mm (3,13 in)	84 mm (3,31 in)
Stroke	61 mm (2,40 in)	61 mm (2,4 in)
Displacement	1211 cm ³ (13,9 in ³)	1352 cm ³ (82,5 in ³)
Compression ratio.	9,0 : 1	10,5 : 1

02715

8.2) Weights

◆ NOTE: The stated weights are dry weights (without operating fluids)

with: electric starter, carburetors, internal generator, ignition unit and oil tank

without: exhaust system, radiator, airbox

Weight in kg (lb)	912 UL	912 A	912 F	912 ULS	912 S
Configuration 2/4	57,1 (126) with overload clutch	57,1 (126)	57,1 (126)	58,3 (128) with overload clutch	58,3 (128)
	55,4 (122) without clutch			56,6 (125) without clutch	
Configuration 3	59,8 (132)			61 (134)	

Equipment:

External alternator: 3,0 kg

Vacuum pump: 0,8 kg

Overload clutch: 1,7 kg.

◆ NOTE: The overload clutch is installed on all certified aircraft engines and on non-certified aircraft engines of the configuration 3.

02716

8.3) Fuel consumption

Fuel consumption in l/h (USgal/h)	912 UL / A / F	912 ULS / S
at take-off performance	24,0 (6,3)	27,0 (7,1)
at max. continuous performance	22,6 (5,6)	25,0 (6,6)
at 75 % continuous performance	16,2 (4,3)	18,5 (4,9)
specific consumption at max. continuous performance	285 g/kWh (0,47 lb/hph)	285 g/kWh (0,47 lb/hph)

02717

8.4) Direction of rotation

Direction of rotation on propeller shaft: counter-clockwise,
looking at p.t.o. side of
engine.

9) Description of systems

9.1) Cooling system

See fig. 8.

The cooling system of the ROTAX 912 A is designed for liquid cooling of the cylinder heads and ram-air cooling of the cylinders. The cooling system of the cylinder heads is a **closed** circuit with an expansion tank.

The coolant flow is forced by a water pump, driven from the camshaft, from the radiator to the cylinder heads. From the top of the cylinder heads the coolant passes on to the expansion tank (1). Since the standard location of the radiator (2) is below engine level, the expansion tank located on top of the engine allows for coolant expansion.

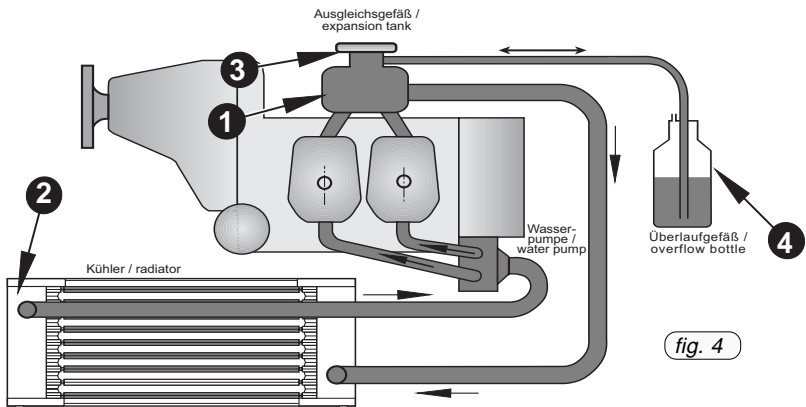
The expansion tank is closed by a pressure cap (3) (with excess pressure valve and return valve). At temperature rise of the coolant the excess pressure valve opens and the coolant will flow via a hose at atmospheric pressure to the transparent overflow bottle (4). When cooling down, the coolant will be sucked back into the cooling circuit.

◆ NOTE: A direct reading of the coolant temperature is not taken.

Coolant temperatures are measured by means of temperature probes installed in cylinder heads 2 and 3. This system allows for accurate measurement of engine temperature, even in the event of fluid loss.

◆ NOTE: Readings are taken on measuring point of the hottest cylinder head, depending on engine installation.

Coolant, see Chapter 10.2.1).



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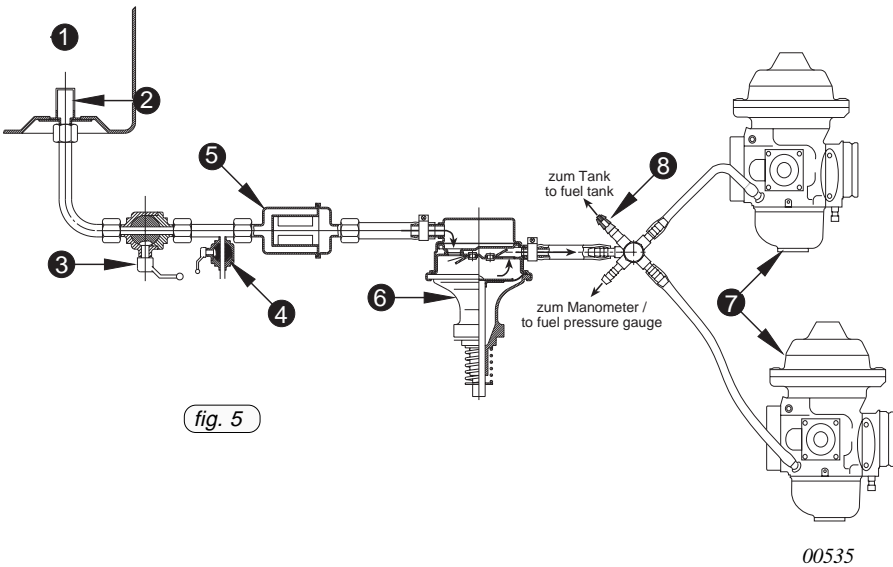
9.2) Fuel system

See fig. 9.

The fuel flows from the tank (1) via a coarse filter (2) the safety cock (3), water drain cock (4) and fine filter (5) to the mechanical fuel pump (6). From the pump fuel passes on to the two carburetors (7).

Via the return line (8) surplus fuel flows back to the fuel tank and suction side of fuel system.

◆ **NOTE:** The return line serves to avoid formation of vapour lock.
Fuel, see Chapter 10.2.2), 13.1) and 13.2).



9.3) Lubrication system

See fig. 10.

The ROTAX 912 A engine is provided with a dry sump forced lubrication system with a main oil pump with integrated pressure regulator (1) and oil pressure sensor (2).

◆ NOTE: The oil pump is driven by the camshaft.

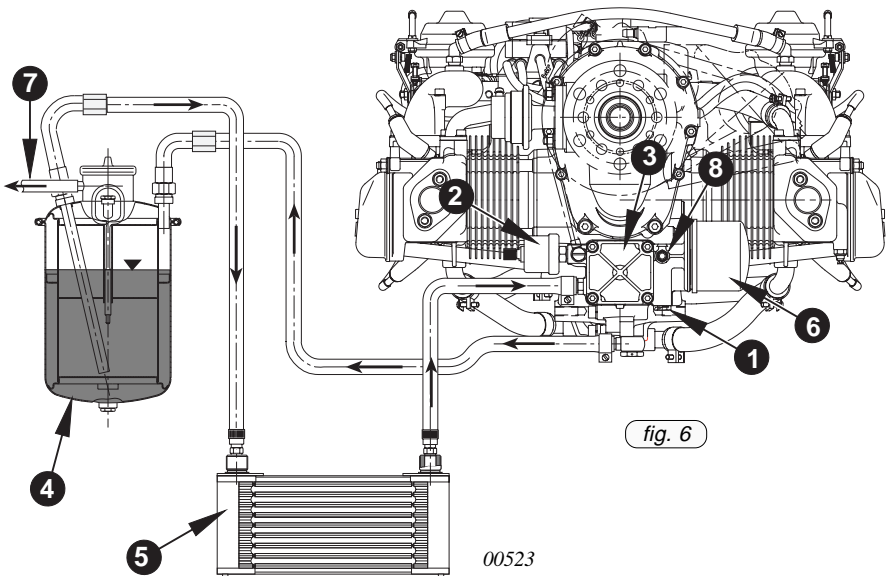
The oil pump (3) sucks the motor oil from the oil tank (4) via the oil cooler (5) and forces it through the oil filter (6) to the points of lubrication in the engine.

The surplus oil emerging from the points of lubrication accumulates on the bottom of crankcase and is forced back to the oil tank by the blow-by gases.

◆ NOTE: The oil circuit is vented via bore (7) on the oil tank.

◆ NOTE: The oil temperature sensor (8) for reading of the oil inlet temperature is located on the oil pump housing.

Lubricants, see Chapter 10.2.3).



9.4) Electric system

See fig. 11.

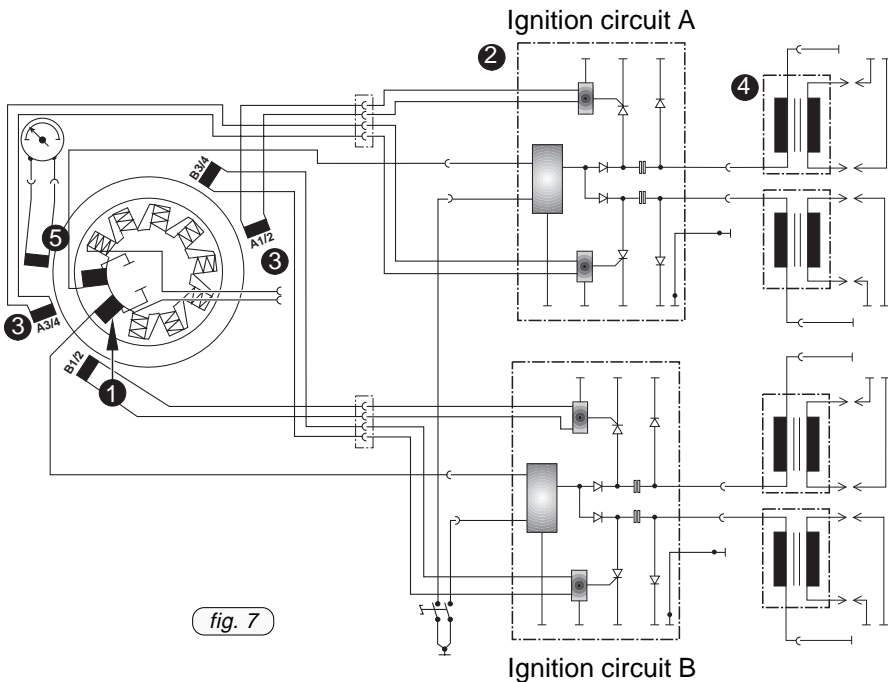
The ROTAX 912 A engine is equipped with a dual ignition unit of a breakerless, capacitor discharge design, with an integrated generator.

The ignition unit is completely free of maintenance and needs no external power supply.

Two independent charging coils (1) located on the generator stator supply one ignition circuit each. The energy is stored in capacitors of the electronic modules (2). At the moment of ignition 2 each of the 4 external trigger coils (3) actuate the discharge of the capacitors via the primary circuit of the dual ignition coils (4).

Firing order: 1-4-2-3.

◆ NOTE: The 5th trigger coil (5) is planned for rev. counter signal.



9.5) Propeller gearbox

See fig. 8.

For the engine type 912 two reduction ratios are available.

reduction ratio	912 UL / A / F	912 ULS / S
crankshaft : propeller shaft	2,27 : 1	2,43 : 1
	2,43 : 1 (optional)	

02719

Depending on engine type, certification and configuration the propeller gearbox is supplied with or without an overload clutch.

- ◆ **NOTE:** The overload clutch is installed on **serial** production on all certified aircraft engines and on the non-certified aircraft engines of configuration 3.

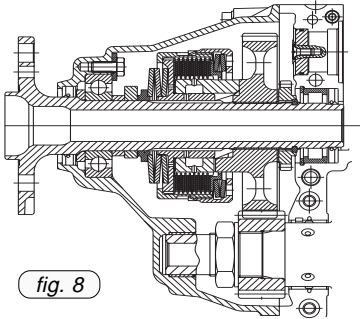


fig. 8

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- ◆ **NOTE:** Fig. 8 shows a propeller gearbox of configuration 2 with the integrated overload clutch.

The design incorporates a torsional shock absorber. The shock absorbing is based on progressive torsional cushioning due to axial spring load acting on a dog hub.

On the gearbox version with overload clutch the design incorporates a friction damped free play at the dogs to warrant proper engine idling. Due to this backlash at the dogs a distinct torsional impact arises at start, stop and at sudden load changes, but due to the built-in overload clutch it will remain harmless.

- ◆ **NOTE:** This overload clutch will also prevent any undue load to the crankshaft in case of ground contact of the propeller.

Alternatively **either** a vacuum pump **or** a hydraulic governor for constant speed propeller can be used. The drive is in each case via the propeller reduction gear.

9.5.1) Hydr. governor for const. speed propeller, vacuum pump:

Alternatively **either** a vacuum pump **or** a hydraulic governor for constant speed propeller can be used. The drive is in each case via the propeller reduction gear.

Gear ratio:

gear ratio			
	crankshaft : propeller shaft	2,27 : 1	2,43 : 1
	propeller shaft : hydraulic governor/vacuum pump	0,758 : 1	
02720	crankshaft : hydraulic governor/vacuum pump	1,724 : 1	1,842 : 1

- ◆ NOTE: Transmission ratio between crankshaft and hydraulic governor or vacuum pump is either 1,842 or 1,724 i.e. the speed of the hydraulic governor or vacuum pump is either 0,54 or 0,58 of engine speed.

10) Operating instructions

The data of the certified engines are based on type certificate of type 912 A (TW 8/89), 912 F / S (TW9 - ACG).

10.1) General limits of operation

10.1.1) Operating speeds and limits (912 UL / A / F)

1. Speed:

Take-off speed 5800 1/min (5 min.)
Max. continuous speed 5500 1/min
Idle speed ca. 1400 1/min

2. Performance (ISA): (International Standard Atmosphere)

Take-off performance 59,6 kW at 5800 1/min
Max. continuous performance ... 58 kW at 5500 1/min

3. Acceleration:

Limit of engine operation at zero gravity and in **negative "g"** conditions

max. 5 seconds at max. -0,5 g

4. Oil pressure:

max. 7 bar

■ **ATTENTION:** For a short period admissible at cold start.

min. 0,8 bar (12 psi) (below 3500 rpm)
normal 2,0 ÷ 5,0 bar (29 ÷ 73 psi) (above 3500 rpm)

5. Oil temperature:

max. 140° C (285° F)
min. 50° C (120° F)
normal operating temperature ... ca. 90 ÷ 110° C ... (190÷230° F)

6. Cylinder head temperature:

max. 150°C (300° F)
reading at observation point of the hotter cylinder head, either no. 2 or no.3.

7. Engine start, operating temperature:

max. 50° C (120° F)
min. -25° C (- 13° F)

8. Fuel pressure:

max. 0,4 bar (5,8 psi)
min. 0,15 bar (2,2 psi)

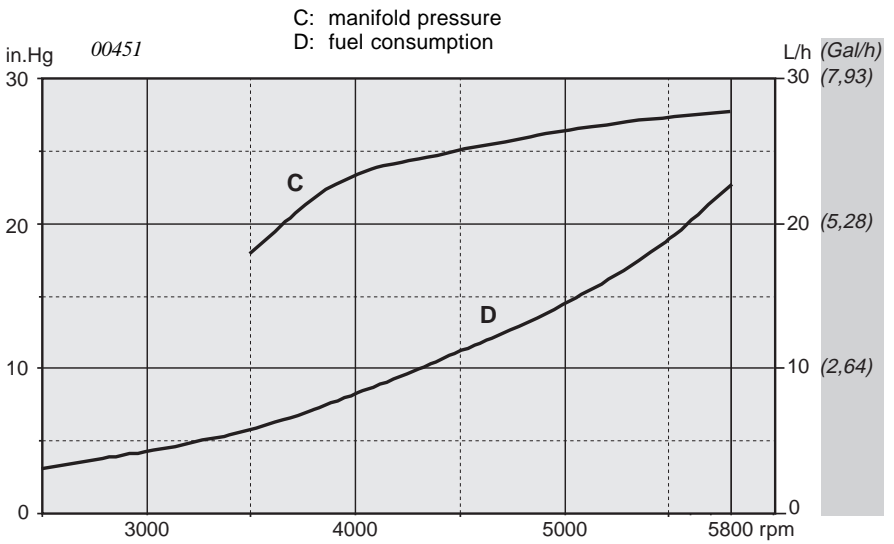
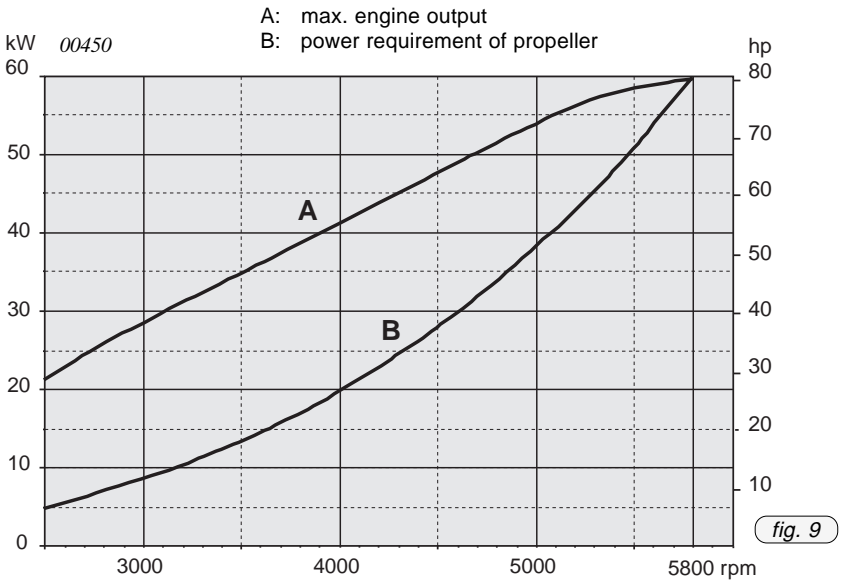
◆ **NOTE:** Exceeding the max. admissible fuel pressure will override the float valve of the carburetor.

The delivery pressure of an additional backing pump (e.g. electric standby pump) must not exceed 0,3 bar (4.4 psi) in order not to override the float valve.

- 9. **Power consumption of the hydraulic propeller governor:**
max. 600 W
- 10. **Power consumption of the vacuum pump:**
max. 300 W
- 11. **Power consumption of the external alternator:**
max. 1200 W
- 12. **Deviation from bank angle**
max. 40°

◆ **NOTE:** Up to this value the dry sump lubrication system warrants lubrication in every flight situation.

10.1.1.1) Performance graphs for stand. conditions (ISA)



Values along propeller curve

fig. 10

Performance data for variable pitch propeller:

Engine operation is permitted without restriction between full throttle performance and power requirement of propeller, providing engine speed over 5500 r.p.m. is restricted to 5 minutes.

However, for economic reasons it is recommended to run the engine in accordance with the following table:

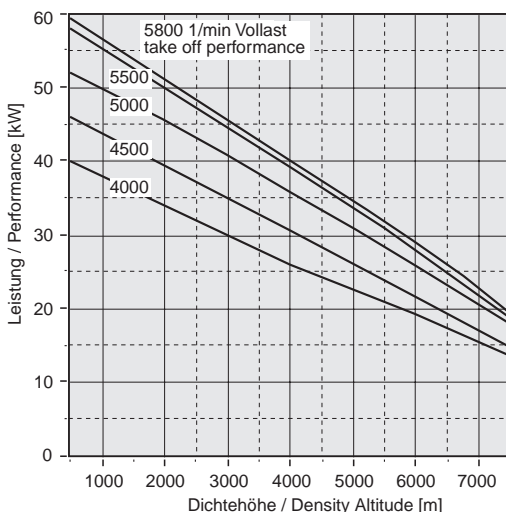
Engine Power-Setting	Engine speed [rpm]	Performance (kW)	Torque [Nm]	Manifold pres. [in.HG]
Take-off perform.	5800	59,6	98,1	full throttle
cruising power	5500	58,0	100,7	full throttle
75%	5000	43,5	83,1	27,2
65%	4800	37,7	75,0	26,5
55%	4300	31,9	70,8	26,3

02721

10.1.1.2) Performance graph for non-standard conditions

The following graph shows the performance drop with increasing flight altitude. The curves show the performance at 5800, 5500, 5000, 4500 and 4000 r.p.m., at full throttle.

The engine allows operation with fully open throttle valve over the whole r.p.m. range, without limitation. But full throttle performance above 5500 r.p.m. is limited to 5 minutes.



At deviation of temperature conditions from standard atmosphere conditions the engine performance to be expected can be calculated from the performance indicated, multiplied by standard temperature, divided by actual temperature in °K.

$$P_{act.} = P_{stand.} \frac{T_{standard}}{T_{actual}}$$

$$T [K] = t [^{\circ}C] + 273$$

(fig. 11)

00452

10.1.2) Operating speeds and limits (912 ULS / S)

1. Speed:

Take-off speed 5800 1/min (5 min.)
Max. continuous speed 5500 1/min
Idle speed ca. 1400 1/min

2. Performance (ISA): (International Standard Atmosphere)

Take-off performance 73,5 kW at 5800 1/min
Max. continuous performance ... 69 kW at 5500 1/min

3. Acceleration:

Limit of engine operation at zero gravity and in **negative "g"** conditions

max. 5 seconds at max. -0,5 g

4. Oil pressure:

max. 7 bar

■ **ATTENTION:** For a short period admissible at cold start.

min. 0,8 bar (12 psi) (below 3500 rpm)
normal 2,0 ÷ 5,0 bar (29 ÷ 73 psi) (above 3500 rpm)

5. Oil temperature:

max. 130° C (266° F)
min. 50° C (120° F)
normal operating temperature ... ca. 90 ÷ 110° C ... (190÷230° F)

6. Cylinder head temperature:

max. 135°C (284° F)
reading at observation point of the hotter cylinder head, either no. 2 or no.3.

7. Engine start, operating temperature:

max. 50° C (120° F)
min. -25° C (- 13° F)

8. Fuel pressure:

max. 0,4 bar (5,8 psi)
min. 0,15 bar (2,2 psi)

◆ **NOTE:** Exceeding the max. admissible fuel pressure will override the float valve of the carburetor.

The delivery pressure of an additional backing pump (e.g. electric standby pump) must not exceed 0,3 bar (4.4 psi) in order not to override the float valve.

- 9. **Power consumption of the hydraulic propeller governor:**
max. 600 W
 - 10. **Power consumption of the vacuum pump:**
max. 300 W
 - 11. **Power consumption of the external alternator:**
max. 1200 W
 - 12. **Deviation from bank angle**
max. 40°
- ◆ **NOTE:** Up to this value the dry sump lubrication system warrants lubrication in every flight situation.

10.1.2.1) Performance graphs for stand. conditions (ISA)

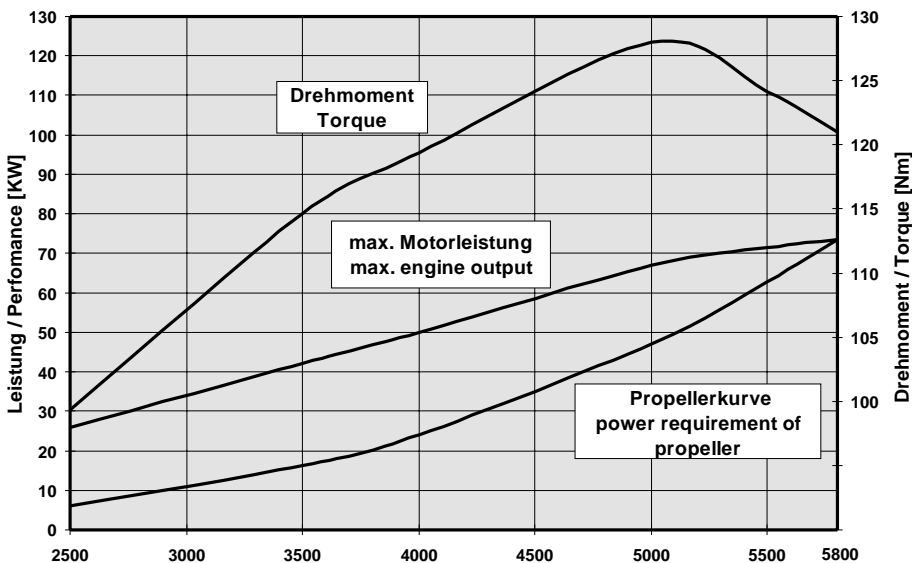


fig. 12

02001

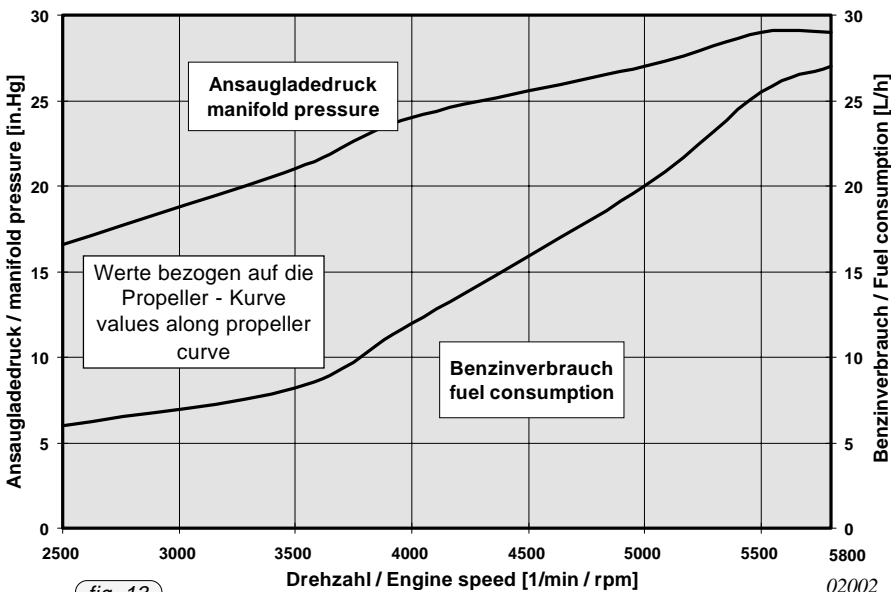


fig. 13

02002

d00127

Performance data for variable pitch propeller:

Engine operation is permitted without restriction between full throttle performance and power requirement of propeller, providing engine speed over 5500 r.p.m. is restricted to 5 minutes.

However, for economic reasons it is recommended to run the engine in accordance with the following table:

Engine Power-Setting	Engine speed [rpm]	Performance (kW)	Torque [Nm]	Manifold pres. [in.HG]
Take-off perform.	5800	73,5	121,0	27,5
cruising power	5500	69,0	119,8	27
75%	5000	51,0	97,4	26
65%	4800	44,6	88,7	26
55%	4300	38,0	84,3	24

02723

10.1.2.2) Performance graph for non-standard conditions

The following graph shows the performance drop with increasing flight altitude. The curves show the performance at 5800, 5500, 5000, 4500 and 4000 r.p.m., at full throttle.

The engine allows operation with fully open throttle valve over the whole r.p.m. range, without limitation. But full throttle performance above 5500 r.p.m. is limited to 5 minutes.

At deviation of temperature conditions from standard atmosphere conditions the engine performance to be expected can be calculated from the performance indicated, multiplied by standard temperature, divided by actual temperature in °K.

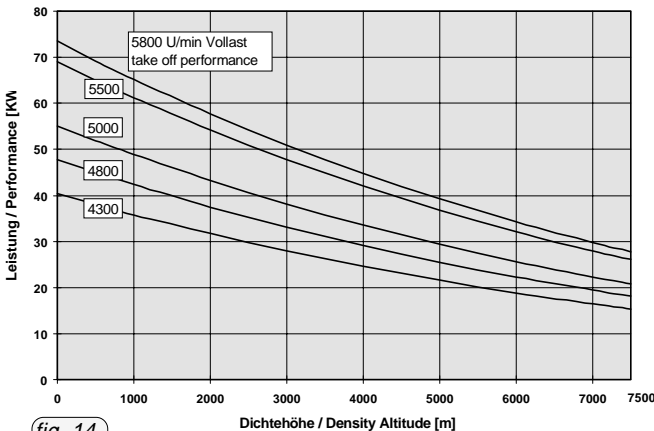


fig. 14

$$P_{act.} = P_{stand.} \frac{T_{standard}}{T_{actual}}$$

$$T [K] = t [^{\circ}C] + 273$$

02000

10.2) Operating media

10.2.1) Coolant

Mixing ratio antifreeze / water

50 % antifreeze concentrate with additives against corrosion and 50 % pure water, or use of an equivalent premixed coolant.

■ ATTENTION: Take note of the specification from the antifreeze producer.

Satisfactory results were achieved with "BASF Glysantin Anticorrosion". Use this or an equivalent coolant.

◆ NOTE: If problems are encountered with boiling after engine stop increase percentage of antifreeze gradually.

In all cases, antifreeze to water ratios should not exceed the antifreeze manufacturer's recommendations. Exceeding the antifreeze manufacturers recommended ratios can lead to the formation of particulates in the coolant solution or inadequate protection against freezing.

■ ATTENTION: Particulate formation may be harmful to cooling system components and may restrict coolant flow to and from overflow bottle.

◆ NOTE: At verification of the coolant level replenish water in expansion tank. The coolant level in the overflow bottle should be between min. and max. mark.

10.2.2) Fuel

The following fuels* can be used.

912 UL / A / F	912 ULS / S
min. RON 90	min. RON 95
EN 228 Regular	
EN 228 Premium	EN 228 Premium
EN 228 Premium plus	EN 228 Premium plus
AVGAS 100 LL	AVGAS 100 LL

02724

Due to the higher lead content in AVGAS, the wear of the valve seats, the deposits in combustion chamber and lead sediments in the lubrication system will increase. Therefore, use AVGAS only if you encounter problems with vapour lock or if the other fuel types are not available.

- **ATTENTION:** Use only fuel suitable for the respective climatic zone.
- ◆ **NOTE:** Risk of vapour formation if using winter fuel for summer operation.

* See also section 13) fuels FAA / DOT.

10.2.3) Lubricants

Oil: **Motorcycle oil of a registered brand with gear additives.** If using aircraft engine oil; than only blonded one.

- **ATTENTION:** At the selection of suitable lubricants refer to the additional information in the Service Information 18 UL 97.

Oil specification

- Use only oil with API classification "**SF**" or "**SG**"!
- Due to the high stresses in the reduction gears, oils with gear additives such as high performance motor cycle oils are required.
- Because of the incorporated friction clutch, oils with friction modifier additives are unsuitable as this could result in a slipping clutch during normal operation.
- Heavy dury 4-stroke motor cycle oils meet all the requirements. These oils are normally no mineral oils but semi- or full synthetic oils.
- Oils primarity for Diesel engines are due to **insufficient high temperature properties and additives which favour clutch slipping, generally unsuitable.**
 - **ATTENTION:** If the engine is mainly run on AVGAS **more frequent** oil changes will be required. See Service Information 18 UL 97.

Oil capacity: 3 l (min. 2 l) (6.4 liq pt, min. 4.2 liq pt)

Oil consumption: max 0,1 l/h (0.2 liq pt/h)

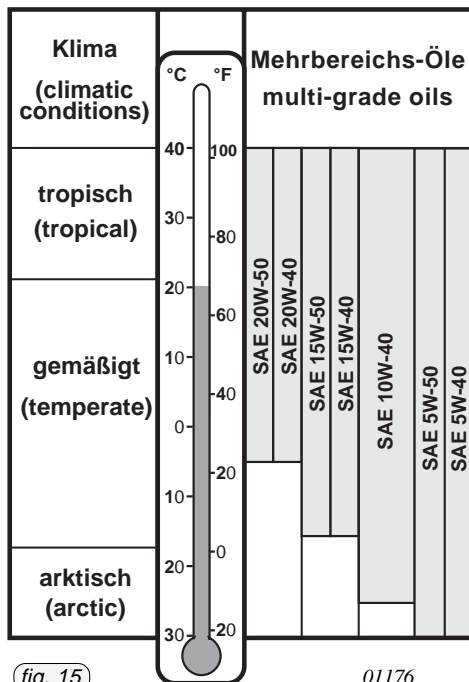
Oil viscosity:

Use of multi-grade oils is recommended.

- ◆ **NOTE:** Multi-viscosity grade oils are less sensitive to temperature variations than single grade oils. They are suitable for use throughout the seasons, ensure rapid lubrication of all engine components at cold start and get less fluid at higher temperatures.

Table of lubricants (See fig. 15)

Since the temperature range of neighbouring SAE grades overlap, there is no need for change of oil viscosity at short duration of ambient temperature fluctuations.



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10.3) Standard operation

To warrant reliability and efficiency of the engine, meet and carefully observe all the operating and maintenance instructions.

10.3.1) Daily checks

- ▲ **WARNING:** **Risk of burnings and scalds!**
Conduct checks on the cold engine only!
- ▲ **WARNING:** **Ignition "OFF".** Before cranking the propeller switch off both ignition circuits and anchor the aircraft. Have the cockpit occupied by a competent person.

Coolant level:

Verify coolant level in the expansion tank, replenish as required up to max. 2/3 in expansion tank.

- ◆ **NOTE:** The level in the overflow bottle should be between max. and min. mark.

Check of mechanical components:

Turn propeller by hand several times and observe engine for odd noises or excessive resistance and normal compression.

Gear box:

— **Version without overload clutch:**

No further checks are necessary.

— **Version with overload clutch:**

The propeller can be turned by hand approx. 15° to 30° against slight friction, without noticing any odd noises or resistance.

If the propeller can be turned between the dogs with practically **no friction** at all (less than 15 Nm = 135 in.lb) further investigation is necessary.

- **ATTENTION:** Do not release the engine into service before rectification.

Carburetor:

- Verify free movement of throttle cable and starting carburetor over the complete range. Check from the cockpit.

Exhaust system:

- Inspect for damages, leakage and general condition.

10.3.2) Before engine start

Carry out pre-flight checks.

10.3.3) Pre-flight checks

▲ **WARNING:** **Ignition "OFF"** Before cranking the propeller switch off both ignition circuits and anchor the aircraft. Have the cockpit occupied by a competent person.

Operating media:

▲ **WARNING:** Carry out pre-flight checks on the cold or luke warm engine only! **Risk of burning and scalds.**

— Check for any oil-, coolant- and fuel leaks.

If leaks are evident, rectify before flight.

— Check coolant level in the overflow bottle.

◆ **NOTE:** The level in the overflow bottle should be between min. and max. mark.

— Check oil level and replenish as required.

Prior to oil check, turn the propeller by hand several times to pump oil from the engine into the oil tank, or let the engine idle for 1 minute.

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.

◆ **NOTE:** Oil level should be between max. and min. mark of the oil level gauge but must never be below min. mark. Before longer periods of operation ensure that oil level is at least up to mid-position.

Difference between max.- and min.- mark = 0,75 litre (1.6 liq pt)

10.3.4) Engine start

▲ **WARNING!** Do not take the engine into operation if any person is near the aircraft.

Fuel cock open

Starting carb. activated

◆ **NOTE:** If the engine is already in operating temperature, start the engine without choke.

Throttle lever set to idle position

Master switch on

Ignition both circuits switched on

Starter button actuate

■ **ATTENTION:** Activate starter for max. 10 sec. only (without interruption), followed by a cooling period of 2 minutes!

As soon as engine runs, adjust throttle to achieve smooth running at approx. 2500 r.p.m.

Check if oil pressure has risen within 10 seconds and monitor oil pressure. Increase of engine speed is only permitted at steady oil pressure readings above 2 bar (30 psi).

At an engine start with low oil temperature, continue to observe the oil pressure as it could drop again due to the increased flow resistance in the suction line.

De-activate starting carb.

■ **ATTENTION:** Since the engine comprises a reduction gear with shock absorber, take special care of the following:

To prevent impact load, start with throttle lever in idle position or at the most up to 10% open. For the same reason, wait for around 3 sec. after throttling back to partial load to reach constant speed before re-acceleration.

For checking the two ignition circuits, only one circuit may be switched off and on at times.

■ **ATTENTION:** Do not actuate starter button (switch) as long as the engine is running. Wait until complete stop of engine!

10.3.5) Prior to take-off

Warming up period:

Start warming up period at 2000 r.p.m. for approx. 2 minutes, continue at 2500 r.p.m., duration depending on ambient temperature, until oil temperature reaches 50° C (120° F).

— Check temperatures and pressures.

Throttle response:

— Short full throttle ground test (consult Aircraft Operator's Manual since engine speed depends on the propeller used).

■ **ATTENTION:** After a full-load ground test allow a short cooling run to prevent vapour formation in the cylinder head.

Ignition check:

Check the two ignition circuits at **4000 r.p.m.** (approx. 1700 r.p.m. propeller).

— Speed drop with only one ignition circuit must not exceed **300 r.p.m.** (approx. 130 r.p.m. propeller).

— **120 r.p.m.** (approx. 50 r.p.m. propeller) max. difference of speed by use of either circuit, A or B.

◆ **NOTE:** The propeller speed depends on the actual reduction ratio.

Check of hydraulic propeller governor:

Check control of the hydraulic propeller governor to specifications of the manufacturer.

10.3.6) Take-off

Climbing with engine running at take-off performance is permissible (max. 5 minutes). See Chapter 10.1), 10.1.1) and 10.1.2).

▲ **WARNING:** Monitor oil temperature, cylinder head temperature and oil pressure. Limits must not be exceeded! See Chapter 10.1) Operating Limits.

■ **ATTENTION:** Respect "cold weather operation" recommendations, see Chapter 10.3.9).

10.3.7) Cruising

Set performance as per performance specifications and respect operating limits as per Chapter 10.1), 10.1.1) and 10.1.2).

Avoid operation below normal operation oil temperature (90 ÷ 110 °C / 194 ÷ 230 °F), as possible formation of condensation water in the lubrication system badly influences the oil quality.

To evaporate possibly accumulated condensation water, at least once a day 100° C (212°F) oil temperature must be reached.

10.3.8) Engine shut-off

Normally the cooling down of the engine during descending and taxiing will be sufficient to allow the engine to be shut off as soon as the aircraft is stopped.

At increased operating temperatures continue to idle until temperature will drop to "normal operation level", see Chapter 10.1).

10.3.9) Cold weather operation

Generally, an engine service should be carried out before the start of the cold season.

Coolant:

For selection of coolant and mixing ratio, see "Coolant", Chapter 10.2.1).

Lubricant:

For selection of oil, see Table of Lubricants (Chapter 10.2.3).

Cold start:

- With throttle closed and choke activated (open throttle renders starting carb ineffective).
- Be aware, no spark below crankshaft speed of 220 rpm. (propeller speed of 90 rpm.).
- As performance of electric starter is greatly reduced when hot, limit starting to periods not much longer than 10 sec. With a well charged battery, adding a second battery will not improve cold starts.

Remedy:

- Use of multigrade oil with the low end viscosity code of 5 or 10.
- Gap electrode on spark plug to the minimum or fit new spark plugs.
- Preheat engine using hot air.

Beyond that observe following advices for operation at extremely low temperatures:

- ◆ **NOTE:** Distinguish between two kinds of carb icing:
 - 1) Icing due to water in fuel
 - 2) Icing because of high air humidity

Addendum to note 1)

Water in fuel will accumulate at the lower parts of the fuel system and leads to freezing of fuel lines, filters or jets.

Remedy:

- Use non-contaminated fuel (filtered through suède)
 - Generously sized water separators
 - Fuel lines routing inclined
 - Prevent condensation of humidity, i.e. avoid temperature differences between aircraft and fuel.
- ▲ **WARNING:** Fuels containing alcohol always carry a small amount of water in solution. In case of temperature changes or increase of alcohol content, water or a mixture of alcohol and water may settle and could cause troubles.

Addendum to note 2)

Carburetor icing due to humidity may occur on the venturi and on the throttle valve due to fuel evaporation and leads to performance loss and change in mixture. Intake air pre-heating is the only effective remedy.

10.4) Abnormal operation

▲ **WARNING:** At unusual engine behaviour conduct checks as per Chapter 10.4.1) through 10.4.13) below, and as per Maintenance Manual, Chapter 05) before the next flight.

◆ **NOTE:** Further checks - see Maintenance Manual.

10.4.1) Engine stop - Start during flight

Starting procedure same as on ground, however, on a warm engine without choke.

10.4.2) Exceeding of max. admissible engine speed

Reduce engine speed. Any exceeding of the max. admissible engine speed has to be entered by the pilot into the logbook, stating duration and extent of overspeed.

10.4.3) Exceeding of max. admissible cyl. head temperature

▲ **WARNING:** Reduce engine power setting to the minimum necessary and carry out precautionary landing.

Any exceeding of the max. admissible cylinder head temperature has to be entered by the pilot into the logbook, stating duration and extent of over-temperature condition.

10.4.4) Exceeding of max. admissible oil temperature

▲ **WARNING:** Reduce engine power setting to the minimum necessary and carry out precautionary landing.

Any exceeding of the max. oil temperature must be entered by the pilot in the logbook, stating duration and extent of over-temperature condition.

10.4.5) Oil pressure below minimum - during flight

▲ **WARNING:** Reduce engine power setting to the minimum necessary and carry out precautionary landing.

Check oil system.

10.4.6) Oil pressure below minimum - on ground

Immediately stop the engine and check for reason. Check oil system.

— Check oil quantity in oil tank.

— Check oil quality (see section 10.2.3).

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11) Checks

All checks to be carried out as specified in the current Maintenance Manual (last revision).

- ▲ **WARNING:** **Only qualified staff (authorized by the Aviation Authorities) trained on this particular engine, is allowed to carry out maintenance and repair work.**
- **ATTENTION:** Carry out all directives of Technical Bulletins, according to their **priority.**

11.1) Engine preservation

Due to the special material of the cylinder wall, there is no need for extra protection against corrosion. At extreme climatic conditions and for long out of service periods we recommend the following to protect the valve guides against corrosion:

- Let engine run until warm, then change oil.
- Remove the air intake filters and insert approx. 30 cm³ (1 fl oz) of corrosion inhibiting oil into the carburetor throat with the engine running at increased idle speed. Shut off engine.
- Drain carburetor float chamber.
- Apply oil to all joints on carburetors.
- Close **all** openings on the cold engine, such as exhaust end pipe, venting tube, air filter etc. against entry of dirt and humidity.
- Spray all steel external engine parts with corrosion inhibiting oil.

Engine back to operation

- Remove all plugs and fasteners.
- Clean spark plugs with plastic brush and solvent.
- If preservation including oil change took place within a year of storage, oil renewal will not be necessary. For longer storage periods repeat preservation annually.

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12) Trouble shooting

▲ WARNING: Only qualified staff (authorized by the Aviation Authorities) trained on this particular engine, is allowed to carry out maintenance and repair work.

If the following hints regarding remedy do not solve the problem, contact an authorized workshop. The engine must not be operated until the problem is rectified.

Engine does not start

POSSIBLE CAUSE:

- a - ignition off
- b - closed fuel tap or clogged filter
- c - no fuel in tank
- d - starting speed too low, faulty or discharged battery
- e - starting speed too low, start problems on cold engine

REMEDY:

- switch on.
- open tap, clean or renew filter, check fuel system for leaks.
- refuel.
- fit fully charged battery.
- use top quality, low friction oil; allow for sufficient cooling period to counter for performance drop on hot starter; pre-heat engine.

Engine idles rough after warm-up period, smoky exhaust emission

POSSIBLE CAUSE:

- a - starting carb activated

REMEDY:

- close starting carb.

Low oil pressure

POSSIBLE CAUSE:

- a - not enough oil in oil tank

REMEDY:

- check oil return line for free passage, renew oil seal.

Engine keeps running with ignition off

POSSIBLE CAUSE:

a - overheating of engine

REMEDY:

let engine cool down at idling at approx. 2000 r.p.m.

Oil level is increasing

POSSIBLE CAUSE:

a - oil too cold during engine operation

REMEDY:

cover oil cooler surface, maintain the oil temperature prescribed.

Knocking under load

POSSIBLE CAUSE:

a - Octane rating of fuel too low

REMEDY:

use fuel with higher octane rating.

Engine hard to start at low temperature

POSSIBLE CAUSE:

a - starting speed too low

b - low charge battery

c - high oil pressure

d - oil pressure too low after cold start

REMEDY:

preheat engine.

fit fully charged battery.

at cold start a pressure reading of up to around 7 bar (102 psi) does not indicate a malfunction.

too much resistance in the oil suction tube at low temperatures. Stop engine and preheat oil.

13)Appendix to Aircraft Manual

13.1) Fuel according to DOT

02728

	912 UL / A / F	912 ULS / S
Canadian standard	CAN/CGSB-3.5	CAN/CGSB-3.5
Quality	Quality 1	Quality 3
min. AKI *	min AKI 87	min AKI 91
	AVGAS 100 LL	AVGAS 100 LL

* Anti Knock Index, (RON+MON)/2

Fuel:gasoline to Canadian General Standards Board, (Unleaded Automotive Gasoline),
or

AVGAS 100 LL

Due to higher lead content in AVGAS, the wear of the valve seats and deposits in the combustion chamber will increase. Therefore, use AVGAS only if you encounter problems with vapour lock or if the other fuel types are not available,

or

equivalent fuels according to Chapter 10.2.2).

■ **ATTENTION:** Use only fuel suitable for the respective climatic zone.

◆ **NOTE:** Risk of vapour formation if using winter fuel for summer operation.

13.2) Fuel according to FAA

Fuel: Standard Spec. for Automotive Spark-Ignition Engine, Fuel, ASTM D 4814,

or

AVGAS 100 LL

Due to higher lead content in AVGAS, the wear of the valve seats and deposits in the combustion chamber will increase. Therefore, use AVGAS only if you encounter problems with vapour lock or if the other fuel types are not available,

or

equivalent fuels according to Chapter 10.2.2).

■ **ATTENTION:** Use only use fuel suitable for the respective climatic zone.

◆ **NOTE:** Risk of vapour formation if using winter fuel for summer operation.

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Tel.: 7 93 30 17 40, Fax: 7 93 30 17 60
E-mail: Madmc@hol.fr
Contact person: Patrick Coyette

GERMANY:

for postcodes 0-5-6-7-8-9:

► **FRANZ AIRCRAFT ENGINES**

VERTRIEB GMBH

Am Eckfeld 6e, D-83543 ROTT AM INN
Tel.: 08039 / 90350, Fax: 08039 / 9035-35
E-mail: Franz-Aircraft.EF@t-online.de
Contact person: Eduard Franz

for postcodes 1-2-3-4:

► **FLIGHT-CENTER**

Flugplatz
D-27777 GANDERKESEE
Tel.: 04222 / 3789, Fax: 04222 / 6042
E-mail: flightcenter@olis.de
Contact person: Robert Heilig

GREAT BRITAIN / IRELAND / ICELAND:

► **SKYDRIVE LTD.**

Burnside, Deppers Bridge
LEAMINGTON Spa. CV 33 OSU
Tel.: 1926 / 612 188, Fax: 04222 / 613 781
E-mail: skydrive@avnet.co.uk
Contact person: Nigel Beale

GREECE / CYPRUS:

► **KINISI**

Ellis 1 str., GR-14563 KIFISSIA
Tel.: 01 / 620 8611; Fax: 01 / 625 0026
Contact person: Michael Poulikakos
Nick Siganos

HUNGARY:

► **HALLEY**

Baktai út 45, P.O. Box 425
H-3300 EGER
Tel.: 36 / 313-830, Fax: 36 / 320-208

ITALY / MALTA:

► **ICARO MOTORI S.R.L.**

Via Emilia, 61/B
I-27050 REDAVALLE (PV)
Tel.: 0385 / 74 591, Fax: 0385 / 74 592
E-mail: icaro@energy.it
Contact person: Corrado Gavazzoni

POLAND:

► **FASTON LTD.**

ul. Szeroka 2
PL-05-860 PLOCHOCIN
Tel.: + Fax: 22 / 40 01 96
Contact person: Wojtek Madry,
Manager

ROMANIA:

►S.C. BERIMPEX S.R.L.

Str. Dr. Taranu Grigore No. 8, Ap. 2, Sector 5
R-76241 BUCHAREST
Tel.: 1-410 90 03; Fax: 1-410 9020
E-mail: c_berar@sunu.rnc.ro
Contact person: Dr. Christian Berar

SLOVAKIA:

►TEVESO S.R.O.

Skroupova 441
CS-50002 HRADEC KRALOVE
Tel.: 049 / 56 30 127, Fax: 049 / 56 30 226
E-mail: teveso@mbox.vol.cz
Contact persons: Ing. Samal / Ing. Halek

SLOVENIA:

►PIPISTREL d.o.o.

Strancarjeva Ul. 11
5270 ADOVSCINA
Tel. 065 63 873, Fax: 065 61 263
E-mail: pipistrel@eunet.si
Contact person: Ivo Boscarol

SPAIN / PORTUGAL:

►AVIASPORT S.A.

Almazara 11
E-28760 TRES CANTOS (MADRID)
Tel.: (91) 803 77 11, Fax: (91) 803 55 22
E-mail: aviaspor@bcnetwork.es
Contact person: Mariano de Castro

SWITZERLAND / LIECHTENSTEIN:

►FRANZ AIRCRAFT ENGINES VERTRIEB GMBH

Am Eckfeld 6e, D-83543 Rott am Inn, GERMANY
Tel.: 08039 / 90350, Fax: 08039 / 9035-35
E-mail: Franz-Aircraft.EF@t-online.de
Contact person: Eduard Franz

TURKEY:

►KLASIK HALI A.S.

Klasik Hali is Merkezi, Bozkurt Caddesi No. 25/A
35230 Kapilar / IZMIR TURKEY
Tel.: (232) 441 4911; Fax: (232) 445 1285
Contact person: Tahir Onder, President

2) A M E R I C A

CANADA:

►ROTECH RESEARCH CANADA, LTD.

S 22 C39 RR6 STN MAIN
6235 Okanagan Landing Rd.
VERNON, B.C., V1T 6Y5
Tel.: 250 / 260-6299, Fax: 250 / 260-6269
E-mail: rotech@junction.net

NORTH / MIDDLE / SOUTH AMERICA:

►KODIAK RESEARCH LTD.

P.O. Box N 7113
Marlborough House Cumberland Street
NASSAU, BAHAMAS
Tel.: 242 / 356 5377, Fax: 242 322 6784
E-mail: kodiakbs@bahamas.net.bs

3) A U S T R A L I A

►AIRCRAFT ENGINE DISTRIBUTORS PTY. LTD.

P.O. Box 84, Boonah, QLD. 4310
Tel.: 07 5463 2755, Fax: 07 5463 2987
E-mail: sales@austflight.com.au
Contact person: Jim Fenton

►BERT FLOOD IMPORTS PTY. LTD.

P.O. Box 61, LILYDALE, VICTORIA 3140
Tel.: 03 / 9735 5655, Fax: 03 / 9735 5699
E-mail: flood@smart.net.au
Contact person: Bert Flood

NEW ZEALAND:

►TIPPINS INTERNATIONAL

P.O. Box 192, Tuakau
SOUTH AUCKLAND
Tel.: 09 / 233 - 4898, Fax: 09 / 233 - 4798
E-mail: data@ets.co.nz
Contact person: Murray Tippins

4) A F R I C A

EGYPT:

►SALEM BALLOONS

40 Talaat Harb St., CAIRO
Tel.: (2) 2991 946 / (2) 3038 214, Fax: (2) 3038 214
E-mail: sballoon@ritsec1.com.eg
Contact person: Weaam Salem, General Manager

ANGOLA / BOTSWANA / LESOTHO / MADAGASCAR / MALAWI / MOZAMBIQUE / NAMIBIA / SOUTH AFRICA / SWAZILAND / ZAMBIA / ZIMBABWE:

►AVIATION ENGINES AND ACCESSORIES (PTY) LTD

Private Bag X10021, Edenvale 1610, South Africa
Tel.: 011 / 455 4203/4/5/6/9, Fax: 011 / 455 4499
E-mail: flying@iafrica.com
Contact person: Mike Blyth

5) ASIA

CHINA / HONG KONG / MACAO:

► *DUEN MU CO.*

Room 1603, Telford House
16 Wang Hoi Road, Kowloon Bay
Kowloon, HONG KONG
Tel.: 2756 5725, Fax: 2754 4774
E-mail: cali@tfhtech.com
Contact person: W. C. Choi

CIS:

► *AVIAGAMMA JSCo.*

P.O. Box 51, 125 057 MOSCOW
Tel.: 095 / 158 31 23, Fax: 095 / 158 6222
E-mail: vkrag@city.line.ru
Contact person: Vladimir Andriytschuk
General Director

INDIA:

► *GREAVES LIMITED*

22-A, Janpath
NEW DELHI - 110 001
Tel.: 11/338 50 61/338 26 53 (Dir.), Fax: 11/37 82
553 Tlx.: 031-62663
E-mail:
greaves@GRVSDDEL.XEEDEL.XEEMAIL.com
Contact person: Wg Cdr S.N. Chhabra
Divisional Manager

INDONESIA / MALAYSIA / PHILIPPINES / SINGAPORE / THAILAND:

► *TPA PTE LTD.*

12 Little Road, #02-01/02
Lian Cheong Industrial Building
Singapore 536986
Tel.: (65) 289 8022
Fax: (65) 289 1011
E-mail: aviation@tpa.com.sg
Contact person: Chan Nyuk Lin

IRAN:

► *TASHAR CO. LTD.*

54 Khaled Esfamboli Ave., TEHERAN 15117
Tel.: 21 / 871 4787 / 872 3222, Fax: 21 / 872 2260
Contact persons: Morthesar Sadjat
Jusufi Nejadan

ISRAEL:

► *CONDOR-AVIATION INDUSTRIES LTD.*

P.O. Box 1903, 14 Topaz st.
Cesaria 38900
Tel.: 06 / 6265080, 90 / 50-290189
Fax: 06 / 62650 95
E-mail: condor@netvision.net.il
Contact person: David Viernik

J A P A N :

► *JUA, LTD.*

1793 Fukazawa, Gotemba City
SHIZUOKA PREF 412
Tel.: 550 / 83 8860, Fax: 550 / 83 8224
Contact person: Yoshihiko Tajika, President

KOREA:

► *HWA YOUNG MEDICAL & SCIENCE CO.*

Office address:
401 KeumKang Building
1439-1, Seocho 1 dong, seocho-ku, SEOUL 137-071
Tel.: 02 / 3472-0271-5,
Fax: 02 / 3472-0276 (02/3471-4753)
Contact person: John Lee, President
Mailing address:
SL Kang Nam
P.O. Box 918, SEOUL

PAPUA NEW GUINEA:

► *BERT FLOOD IMPORTS PTY. LTD.*

P.O. Box 61, LILYDALE, VICTORIA 3140
AUSTRALIA
Tel.: 03 / 9735 5655, Fax: 03 / 9735 5699
E-mail: flood@smart.net.au
Contact person: Bert Flood

TAIWAN:

► *TAIWAN MAXIEM INDUSTRIES*

7/1 Tung Feng Street, TAIPEI, 10 651
Tel.: 2 / 2704 6163, Fax: 2 / 2702 84 85
Contact person: Lester Lin

UNITED ARAB. EMIRATES:

► *AL MOALLA*

P.O. Box 7787
ABU DHABI
Tel.: 2 / 723 248, Fax: 2 / 788 073
E-mail: almoalla@emirates.net.ae
Contact person: Hussain Al Moalla

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15.1) Warranty Conditions / Warranty Card (912 A / F / S)

1) Period

ROTAX[®], as manufacturer, warrants through their authorized ROTAX[®] distributors **FROM THE DATE OF SALE TO THE FIRST CONSUMER**, every ROTAX[®] certified aircraft engine, sold as **NEW AND UNUSED**, and **delivered by an authorized ROTAX[®] distributor** for a period of the earliest of:

- ✎ 12 consecutive months for private use owners
- ✎ or 18 consecutive months from date of shipment of the manufacturer
- ✎ or the first 200 operation hours.

2) What an authorized ROTAX[®] distributor will do

The authorized ROTAX[®] distributor will, at its option, repair and/or replace components defective in material and/or workmanship under normal use and service, with a genuine ROTAX[®] component without charge for parts or labour, during said warranty period. All parts replaced under warranty become the property of ROTAX[®].

3) Condition to have warranty work performed

You must present to an authorized ROTAX[®] service-center, the hard copy of the ROTAX[®] warranty registration card and/or proof of purchase delivered to the customer from the selling dealer at time of purchase.

4) Exclusions - are not warranted

- ✎ Normal wear on all items
- ✎ Replacement parts and/or accessories which are not genuine ROTAX[®] parts and/or accessories.
- ✎ Damage resulting from the installation of parts other than genuine ROTAX[®] parts.
- ✎ Damage caused by failure to provide proper maintenance as detailed in the Operator's Manual. The labour, parts and lubricants costs of all maintenance services, including tune-ups and adjustments will be charged to the owner.
- ✎ Aircraft engines designed and/or used for racing or commercial purposes.
- ✎ All optional accessories installed on the aircraft engine (The normal warranty policy for parts and accessories, if any, applies).
- ✎ Damage resulting from running the aircraft engine without propeller.
- ✎ Damage resulting from modification to the aircraft engine not approved in writing by ROTAX[®].
- ✎ Damage caused by electrolysis.
- ✎ Cold seizure and piston scuffing.
- ✎ Use of a gear reduction not designed by ROTAX[®].
- ✎ Use of propellers which exceed the inertia and balance limits as specified by ROTAX[®].
- ✎ If engine instruments recommended by ROTAX[®] have not been installed.
- ✎ Losses incurred by the aircraft engine owner other than the parts and labour, such as, but not limited to, mounting and dismounting of the engine from the aircraft, loss of use, transportation, towing, telephone calls, taxis, or any other incidental or consequential damage.
- ✎ Damage resulting from accident, fire or other casualty, misuse, abuse or neglect.
- ✎ Damage/rust/corrosion premature wear to the engine caused by water ingestion.
- ✎ Damage resulting from sand/stones infiltration.
- ✎ Damage resulting from any foreign material ingestion.
- ✎ Damage resulting from service by an unqualified mechanic.

5) Expressed or implied warranties

This warranty gives you specific rights, and you may also have other legal rights which may vary from state to state, or province to province. Where applicable this warranty is expressly in lieu of all other expressed or implied warranties of ROTAX[®], its distributors and the selling distributor, including any warranty of merchantability or fitness for any particular purpose; otherwise the implied warranty is limited to the duration of this warranty. However, some states or provinces do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply.

Neither the distributor, nor any other person has been authorized to make any affirmation, representation or warranty other than those contained in this warranty, and if made, such affirmation, representation or warranty shall not be enforceable against ROTAX[®] or any other person.

ROTAX[®] reserves the right to modify its warranty policy at any time, being understood that such modification will not alter the warranty conditions applicable to aircraft engines sold while the above warranty is in effect.

6) Consumer assistance procedure

If a servicing problem or other difficulty occurs, please contact:

- ☎ authorized ROTAX[®] service-center or
- ☎ authorized ROTAX[®] distributor.

7) Validity:

Warranty will only be valid if the end user completes this registration card as soon as the aircraft engine goes into service, and returns it to the national authorized ROTAX[®] distributor (marked with "►" in section Distributors) of the area in which the aircraft engine is firstly operated.

This warranty will be effective for all certified aircraft engines delivered by ROTAX[®] as of June 1st, 1992.

8) ▲ Warning!

Never fly the aircraft equipped with this engine at locations, airspeeds, altitudes, or other circumstances from which a successful no-power landing cannot be made, after sudden engine stoppage. Aircraft equipped with this engine should only fly in VFR conditions.

9) ◆ Note:

All airworthiness requirements like JAR, FAR in their last applicable version have to be respected.

Maintenance- and repair works are only allowed to be carried out by persons and companies approved by the competent authorities.



WARRANTY REGISTRATION CARD

Edition 96 05 31



1. To be eligible for warranty, this registration card must be returned completed and signed by the end user to the authorized ROTAX distribution partner (see section 14) of the area of the permanent residence of the end user and / or in which the aircraft engine is firstly operated, within 30 days as of date of purchase.
2. No other warranties and / or guarantees than defined in the actual warranty conditions are made.
3. Engine type: **912** Registration/Version: _____

Engine no.:

Gearbox: Reduction i =

Inv. no.: date of purchase:

Warranty expires:

Buyer:

Seller:

I have read and understood the Operator's Manual in its entirety and carefully followed the described break-in procedure.

Date: _____ Signature: _____



Postkarte
Carte postale

M a r k e
T i m b r e

WARNING!

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

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

All airworthiness requirements like JAR, FAR in their last applicable version have to be respected.

Absender:
Expéditeur:

Postleitzahl - Code postal

Postleitzahl - Code postal Bestimmungsort - Lieu de destination

Bestimmungsland - Pays de destination

00061

1) Period

ROTAX[®] as manufacturer, warrants through their authorized ROTAX[®] distributors **FROM THE DATE OF SALE TO THE FIRST CONSUMER**, every ROTAX[®] non-certified aircraft engine, sold as **NEW AND UNUSED**, and **delivered by an authorized ROTAX[®] distributor** for a period of the earliest of:

- ✈ 6 consecutive months for private use owners
- ✈ or 12 consecutive months from date of shipment of the manufacturer
- ✈ or the first 100 operation hours.

2) What an authorized ROTAX[®] distributor will do

The authorized ROTAX[®] distributor will, at its option, repair and/or replace components defective in material and/or workmanship under normal use and service, with a genuine ROTAX[®] component without charge for parts or labour, during said warranty period. All parts replaced under warranty become the property of ROTAX[®].

3) Condition to have warranty work performed

You must present to an authorized ROTAX[®] service-center, the hard copy of the ROTAX[®] warranty registration card and/or proof of purchase delivered to the customer from the selling dealer at time of purchase.

4) Exclusions - are not warranted

- ✈ Normal wear on all items
- ✈ Replacement parts and/or accessories which are not genuine ROTAX[®] parts and/or accessories.
- ✈ Damage resulting from the installation of parts other than genuine ROTAX[®] parts.
- ✈ Damage caused by failure to provide proper maintenance as detailed in the Operator's Manual. The labour, parts and lubricants costs of all maintenance services, including tune-ups and adjustments will be charged to the owner.
- ✈ Aircraft engines designed and/or used for racing or commercial purposes.
- ✈ All optional accessories installed on the aircraft engine (The normal warranty policy for parts and accessories, if any, applies).
- ✈ Damage resulting from running the aircraft engine without propeller.
- ✈ Damage resulting from modification to the aircraft engine not approved in writing by ROTAX[®].
- ✈ Damage caused by electrolysis.
- ✈ Cold seizure and piston scuffing.
- ✈ Use of a gear reduction not designed by ROTAX[®].
- ✈ Use of propellers which exceed the inertia and balance limits as specified by ROTAX[®].
- ✈ If engine instruments recommended by ROTAX[®] have not been installed.
- ✈ Losses incurred by the aircraft engine owner other than the parts and labour, such as, but not limited to, mounting and dismounting of the engine from the aircraft, loss of use, transportation, towing, telephone calls, taxis, or any other incidental or consequential damage.
- ✈ Damage resulting from accident, fire or other casualty, misuse, abuse or neglect.
- ✈ Damage/rust/corrosion premature wear to the engine caused by water ingestion.
- ✈ Damage resulting from sand/stones infiltration.
- ✈ Damage resulting from any foreign material ingestion.
- ✈ Damage resulting from service by an unqualified mechanic.

5) Expressed or implied warranties

This warranty gives you specific rights, and you may also have other legal rights which may vary from state to state, or province to province. Where applicable this warranty is expressly in lieu of all other expressed or implied warranties of ROTAX®, its distributors and the selling distributor, including any warranty of merchantability or fitness for any particular purpose; otherwise the implied warranty is limited to the duration of this warranty. However, some states or provinces do not allow limitations on how long an implied warranty lasts, so the above limitation may not apply.

Neither the distributor, nor any other person has been authorized to make any affirmation, representation or warranty other than those contained in this warranty, and if made, such affirmation, representation or warranty shall not be enforceable against ROTAX® or any other person.

ROTAX® reserves the right to modify its warranty policy at any time, being understood that such modification will not alter the warranty conditions applicable to aircraft engines sold while the above warranty is in effect.

6) Consumer assistance procedure

If a servicing problem or other difficulty occurs, please contact:

- ✈ authorized ROTAX® service-center or
- ✈ authorized ROTAX® distributor.

7) Validity:

Warranty will only be valid if the end user completes this registration card as soon as the aircraft engine goes into service, and returns it to the national authorized ROTAX® distributor (marked with "►" in section Distributors) of the area in which the aircraft engine is firstly operated.

This warranty will be effective for all non-certified aircraft engines delivered by BOMBARDIER- ROTAX as of June 1st, 1992.

8) Danger!

This engine, by its design, is subject to sudden stoppage! Engine stoppage can result in crash landings. Such crash landings can lead to serious bodily injury or death.

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

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

▲ WARNING!

This is not a certificated aircraft engine. It has not received any safety or durability testing, and conforms to no aircraft standards. It is for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety.

User assumes all risk of use, and acknowledges by his use that he knows this engine is subject to sudden stoppage.



WARRANTY REGISTRATION CARD

Edition 96 05 31



1. To be eligible for warranty, this registration card must be returned completed and signed by the end user to the authorized ROTAX distribution partner (see section 14) of the area of the permanent residence of the end user and / or in which the aircraft engine is firstly operated, within 30 days as of date of purchase.
2. No other warranties and / or guarantees than defined in the actual warranty conditions are made.
3. Engine type: **912** Registration/Version: _____

Engine no.:

Gearbox: Reduction i =

Inv. no.: date of purchase:

Warranty expires:

Buyer:

Seller:

I have read and understood the Operator's Manual in its entirety and carefully followed the described break-in procedure.

Date: _____ Signature: _____



Postkarte Carte postale	<div style="border: 1px dashed black; padding: 10px; text-align: center;">Marke Timbre</div>				
<u>DANGER!</u> This engine, by its design, is subject to sudden stoppage! Engine stoppage can result in crash landings. Such crash landings can lead to serious bodily injury or death. Never fly the aircraft equipped with this engine at locations, airspeeds, altitudes, or other circumstances from which a successful no-power landing cannot be made, after sudden engine stoppage. Aircraft equipped with this engine should only fly in DAYLIGHT VFR conditions.					
<u>WARNING!</u> This is not a certificated aircraft engine. It has not received any safety or durability testing, and conforms to no aircraft standards. It is for use in experimental, uncertificated aircraft and vehicles only in which an engine failure will not compromise safety. User assumes all risk of use, and acknowledges by his use that he knows this engine is subject to sudden stoppage.					
		Postleitzahl - Code postal	Bestimmungsort - Lieu de destination		
				Bestimmungsland - Pays de destination	
		Absender: Expéditeur:			
				Postleitzahl - Code postal	

03002

WARRANTY REGISTRATION CARD

Edition 96 05 31



1. To be eligible for warranty, this registration card must be returned completed and signed by the end user to the authorized ROTAX distribution partner (see section 14) of the area of the permanent residence of the end user and / or in which the aircraft engine is firstly operated, within 30 days as of date of purchase.
2. No other warranties and / or guarantees than defined in the actual warranty conditions are made.
3. Engine type: **912** Registration/Version: _____

Engine no.:

Gearbox: Reduction i =

Inv. no.: date of purchase:

Warranty expires:

Buyer:

Seller:

I have read and understood the Operator's Manual in its entirety and carefully followed the described break-in procedure.

Date: _____ Signature: _____

