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6) Description of design

6.1) Designation of type

Basic type:

e.g. ROTAX 912 UL 2

UL1: with prop flange for fix pitch propeller up to engine S/N 4,153.002

UL2: with prop flange for fix pitch propeller from engine S/N 4,153.100

UL3: with prop flange with drive of hydraulic governor for constant speed propeller

UL4: with prop flange for fix pitch propeller, but prepared for retrofit of hydraulic governor for constant speed prop

	auxiliary alternator	vacuum- pump	drive for rev-counter / hour meter
for UL1	yes	yes	yes
for UL2	yes	yes	yes
for UL3	yes	no	yes
for UL4	yes	yes	yes

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Optional extras to the above stated basic type:

◆ NOTE: Conversion of the types UL1, UL2, UL4 to type UL3 may be accomplished by the manufacturer (BOMBARDIER-ROTAX).

6.2) Standard engine design

- ☞ 4 stroke, 4 cyl. horizontally opposed, spark ignition engine, single central camshaft hydraulic tappets - push rods - OHV
- ☞ liquid cooled cylinder heads
- ☞ ram air cooled cylinders
- ☞ dry sump, forced lubrication
- ☞ ROTAX dual ignition, breakerless, capacitor discharge, interference suppression
- ☞ 2 constant depression carburetors
- ☞ mechanical fuel pump
- ☞ oil tank
- ☞ expansion tank (coolant)
- ☞ prop drive via integrated gear box with torsional shock absorber
- ☞ overload clutch, standard for version 912 UL3 and UL4
- ☞ overload clutch on request for version 912 UL1, UL2
- ☞ electric starter
- ☞ external start relay
- ☞ integrated AC generator
- ☞ external rectifier-regulator
- ☞ hydraulic governor for constant speed prop (for UL3 only)

7) Technical data

To maintain clarity, only data relevant for engine installation and operation will be stated in the Manual.

◆ NOTE: Connecting dimensions, filling capacities, drive and reduction ratios, electric output etc. can be found in the respective chapter of engine installation.

7.1) Operating limits

1. Takeoff speed: 5800 rpm. (5 min.)
max. continuous speed: 5500 rpm.
idle speed: around 1400 rpm.
2. Time limit for engine operation at weightless condition and with negative gravity acceleration: max. 5 sec at max. -0,5 g
3. Oil pressure: see fig. 46 nominal 1,5 ÷ 5 bar (22 ÷ 73 psi)
max. 7 bar (100 psi)
(at cold start a pressure of up to 7 bar =100 psi, is permitted for a short period).
min. 1,5 bar)
4. Oil temperature (see fig. 45) reading
in feed line to engine: min. 50° C (120° F)
max. 140° C (285° F)
normal operating temperature: 90 ÷ 110° C (190 ÷ 250° F)
- || 5. Cylinder head temperature see section 11.6.2
◆ NOTE: Investigation should be conducted to identify the hottest cylinder (cyl. 2 or 3), depending on the installation (tractor or pusher arrangement). See fig. 2 and 4.
6. Exhaust gas temperature: max. 880° C (1620° F) at take off
max. 850° C (1560° F)
normal operat. 800° C (1470° F)
(reading c. 70 mm = 2,75 in. after exhaust flange)
7. Range of operating temperature: -25° C (-13° F) to effective boiling point of fuel
8. Ambient temperature for electric components: (fig.4, pos. 20) max. 80° C (176° F)
9. Fuel pressure: 0,15 ÷ 0,4 bar (2,2 ÷ 5,8 psi.)
(see fig. 22 and 23) max. 0,4 bar (5,8 psi.)
10. Banking of plane: (if not stated otherwise) deviation from the effective vertical max. 40°
Up to this inclination the dry sump lubrication system warrants adequate lubrication in every flight situation.

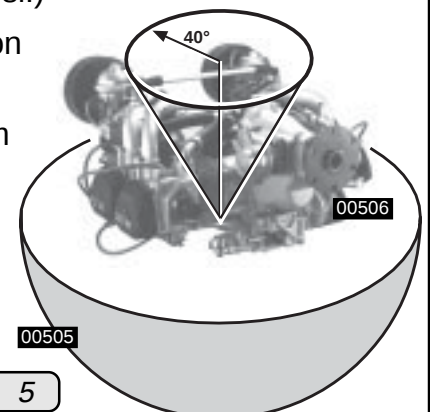


fig. 5

7.2) Installation dimensions (all dimensions in mm)

See fig. 2, 3 and 4.

	standard engine version ⁰⁰⁷²⁸		
	pos. (+)	neg. (-)	total •
max. dimension in x-axis	8,5	-581	589,5
max. dimension in y-axis	288	-288	576,0
max. dimension in z-axis	118	-276	394,0

◆ NOTE: Dimensions to point of reference (P). See fig. 2, 3 and 4.

7.3) Weights

Weight of engine defined to the following conditions:

✎ **Engine dry** from serial production (see chapter description of design)

Engine weight Version UL1 and UL2 without

overload clutch: 55,4 kg (122 lb.)

version UL4 with overload clutch: ... 57,1 kg (126 lb.)

version UL3: 59,8 kg (132 lb.)

Weight of

overload clutch 1,7 kg (3,75 lb.)

external generator assy.: 3,0 kg (6,60 lb.)

vacuum pump assy.: 0,8 kg (1,76 lb.)

hydraulic governor assy.: 2,7 kg (6,0 lb.)

7.4) 61 of engine and standard equipment

See fig. 2, 3 and 4.

	engine from serial production UL2	auxiliary alternator	hydraulic governor	vacuum- pump ⁰⁰⁷⁷⁴
centre os gravity in x-axis	-316	-100	-276	-255
centre os gravity in y-axis	-5	139	0	0
centre os gravity in z-axis	-83	6	56	56

◆ NOTE: Dimensions to point of reference (P). See fig. 2, 3 and 4.

7.5) Moments of inertia in kg cm²

See fig. 2, 3 and 4.

	version UL1 / UL2 / UL4	version UL3 ⁰⁰⁷⁷⁵
moment of inertia around axis x1 - x1 (kg cm ²)	11 100	11 600
moment of inertia around axis y1 - y1 (kg cm ²)	10 900	11 390
moment of inertia around axis z1 - z1 (kg cm ²)	17 400	18 200

11.6) Operating Limits

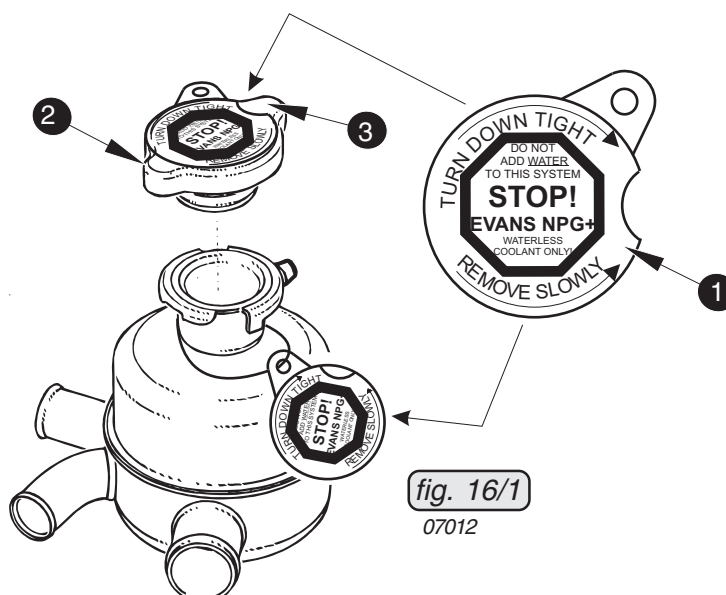
The operating limits (max. permissible cylinder head temperature) are dependent on the engine design but also essentially on the coolant used.

The hottest measuring point (cylinder 2 or 3) is to be specified by testing. For this purpose, see section 6.3 Engine Views. This is dependent on the installation (pulling or pushing propeller design).

The coolant to be used is defined clearly in the Operators Manual. Depending on the installation conditions, conventional coolants can also be used. The provision of proof about the max. reachable cylinder head temperature and thus the coolant to be used is the responsibility of the airplane manufacturer in regard to 11.6.1 and 11.6.2

■ **CAUTION:** The coolant to be used and its concentration is to be communicated in written form to the owner.

◆ **NOTE:** From ROTAX®, a warning sticker is to be delivered for the water-free coolant which is mounted separately on the expansion tank. When using this coolant, the warning sticker is to be mounted on the radiator cap in such a manner prior to delivery that the opening pressure (3) applied on the radiator cap remains visible. For this purpose, see fig. 16/1.



- 1 Warning sticker
- 2 Radiator cap
- 3 Excess-pressure information of radiator cap

11.6.1) Water-free Coolant

- max. permissible cylinder head temperature
see Operator's Manual section 10.1) Operating Limits.
- Coolant
see Operator's Manual section 10.2.1) Coolant.

11.6.2) Conventional Glycol / Water Coolant Mixture

The boiling point of conventional glycol / water coolant concentrate depends on the mixture ratio and on the system pressure, i.e. radiator cap.

Corresponding to the following table, the max. permissible cylinder head temperature is limited depending on the coolant concentrate used and may not be exceeded.

radiator cap	max. permissible cylinder head temperature
0.9 bar (13psi)	115 °C (239 °F)
1.2 bar (17.5psi)	120 °C (248 °F)

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During exclusive operation within the max. permissible cylinder head temperature, the following coolant can be used in the corresponding mixture ratio:

Description	Mixture ratio %**	
	concentrate	water
BASF Glysantine Anticorrosion*	50	50

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* or equivalent

** 50% antifreeze concentrate and 50% pure water, or an equivalent pre-mixed liquid

■ CAUTION: The antifreeze (frost protection) of this mixture is to be observed according to the manufacturer's specifications.

■ CAUTION: The correct mixture ratio is to be observed since otherwise the coolant can thicken and as a result can lead to damages to the cooling system.

23) ROTAX Authorized Distributors for Aircraft Engines

See current issue of Operator's Manual section 14 or in the Internet on the official website www.rotax-aircraft-engines.com.

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