

BRP-Rotax
INSTALLATION MANUAL

Chapter: 75–00–00
COOLING SYSTEM

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SYSTEM DESCRIPTION

For a detailed System description refer to the latest issue of the Operators Manual.

SYSTEM LIMITATIONS

Operating limits



Refer to latest issue of the Operators Manual .

⚠ WARNING

Non-compliance can result in serious injuries or death!

The cooling system must be designed so that the operating limits are not exceeded. To minimize flow resistance, use radiators that have both a parallel flow and have a low flow resistance. A prime example would be the GENUINE ROTAX® radiators. Be sure to use short hoses and pipelines.

Cooling

The engine cooling system 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 and overflow bottle.

Coolant

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

Expansion tank

The expansion tank is closed with a pressure cap (with pressure relief valve and return valve). As the coolant heats up and expands, the pressure relief valve opens and the coolant flows via hose at atmospheric pressure to the transparent overflow bottle. As it cools down, the coolant is sucked back into the cooling circuit.

Shape, size and position

The shape, size and position of the radiator(s) depends mainly on the space available in the aircraft.

Measuring the coolant temp.

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

The temperature sensors are located in cylinder head 2 and 3.

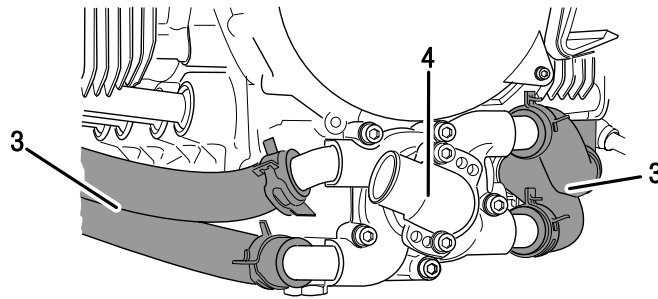
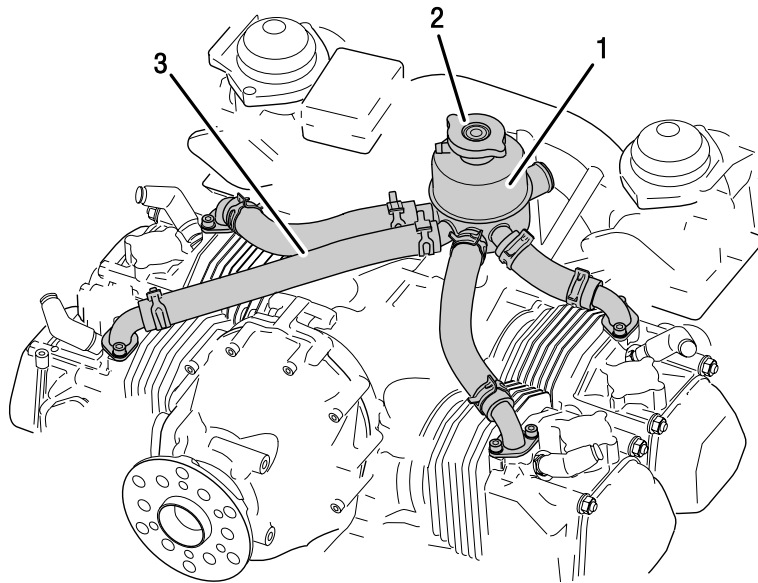
Radiator

If a GENUINE ROTAX® radiator is being used, then an oil-water heat exchanger must not be present. The radiator is dimensioned to cater for the heat of the coolant and cannot cope with the additional heat generated by the oil system.

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INTERFACE DESCRIPTION

INTERFACE OVERVIEW



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Figure 8.1: Cooling system

1 Expansion tank

2 Radiator cap

3 Coolant hose

4 Water pump

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HYDRAULIC INTERFACES

Water inlet elbow

Interface Parameter	Min.	Max.
Cooling system pressure (relative)	1.6 bar (23.2 psi)	-
Cooling water temperature	- 20 °C (- 4 °F)	125 °C (257 °F)
Cooling water flow (at 5800 rpm)	60 l/h (15.85 US gal/min.)	-
Slip on length	19 mm (0.75 in)	

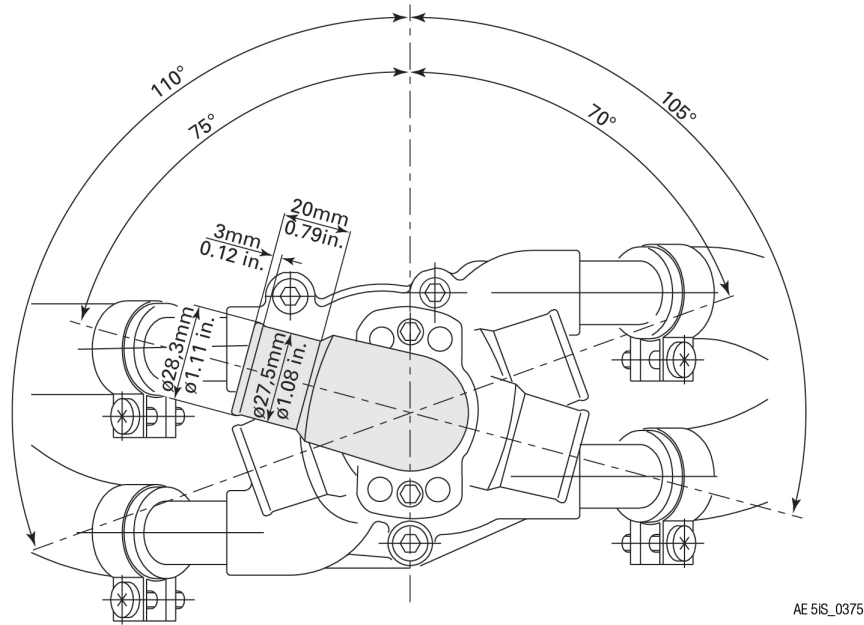


Figure 8.2: Water inlet elbow

Connection: Outer diameter 27 mm (1.07 in).

Water outlet

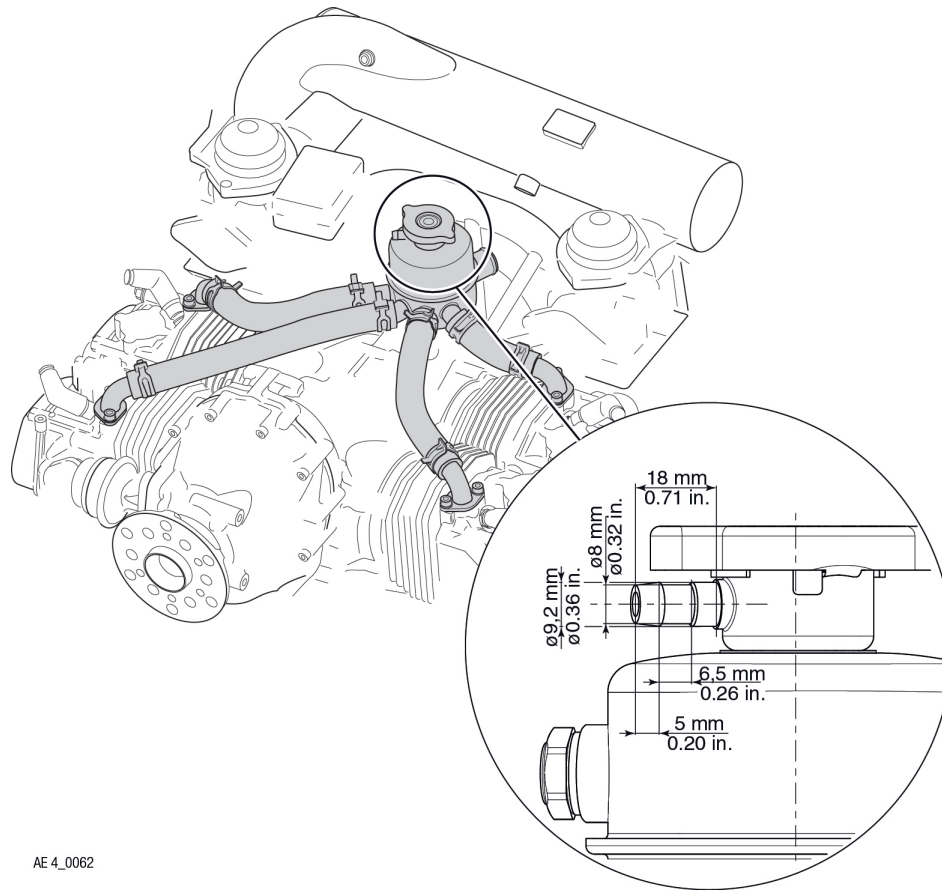
Interface Parameter	Min.	Max.
Cooling system pressure (relative)	1.6 bar (23.2 psi)	-
Cooling water temperature	- 20 °C (- 4 °F)	130 °C (266 °F)
Cooling water flow (at 5800 rpm)	70 l/h	-

Connection: Inner diameter 25 mm (0.98 in).

Expansion tank connection

Interface Parameter	Min.	Max.
Slip on length	18 mm	

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Figure 8.3: Expansion tank connection

AIR COOLING INTERFACES

⚠ WARNING

Non-compliance can result in serious injuries or death!

The furnishing of proof in accordance to the latest FAR and EASA, has to be conducted by the aircraft manufacturer.

For front installation in a closed cowling, ducting of cooling air to the cylinders is recommended. In this case a costly horizontal partitioning can be avoided.

NOTE

The engine remains in this case completely on the warm side of the engine compartment and is very well accessible. In special cases a separate cold air supply to the air intake filters has to be provided.

BRP-Rotax has developed especially for this application a non-certified cooling air ducting to be conducted by the aircraft manufacturer.

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Position	x-axis	y-axis	z-axis
P1	- 300 mm (- 11.81 in.)	- 30 mm (- 1.18 in.)	- 14 mm (- 0.55 in.)

Cooling air duct **NOTE**

In some special cases (entirely closed cowl) a separate cold air supply to the induction air filter should be provided.

Following recommendations should assist the aircraft or fuselage manufacturer in selecting suitable cooling air ducts:

Specification	Description
Cooling capacity	The cooling air duct must be designed so, that it transfers thermal energy of approx. 6 kW (5.7 BTU/s) at take-off performance.
Cross section of air duct	Cross section of the air duct min. 100 cm ² (15.50 in ²).
Material	Glass fibre reinforced plastic or heat and fire resistant material.
Attachment options	Friction-fit on engine block and mounting above the cylinder and the crankcase.

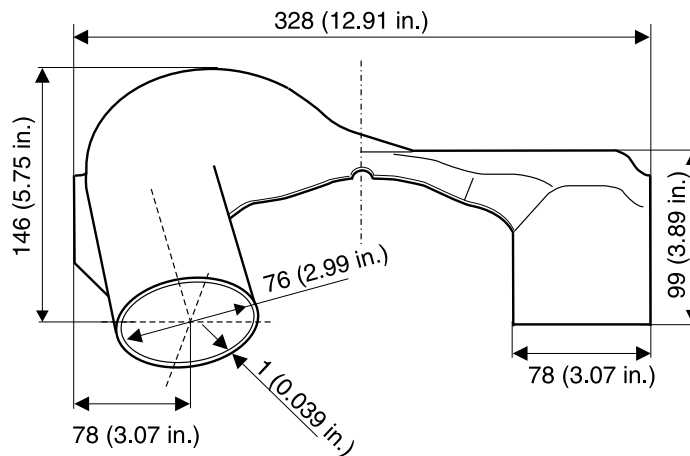


Figure 8.4: Cooling air duct for tractor

INSTALLATION NOTES

General

The representation of components in this chapter which are not within scope of the delivery is only symbolic. The design shown in this chapter does not represent a specified execution but should support the understanding of the system.

The final design, the selection and specification of parts according to the respective applicable regulations, the consideration of the system limitations and interface description as well as the comprehension of the operating limits in every operational state is in the responsibility of the aircraft manufacturer.

The aircraft manufacturer has to make sure that the operating limits given in the Operators Manual can be supervised by the pilot. The execution of the installation must allow the operation of the engine according to the Operators Manual.

INSTALLATION OVERVIEW

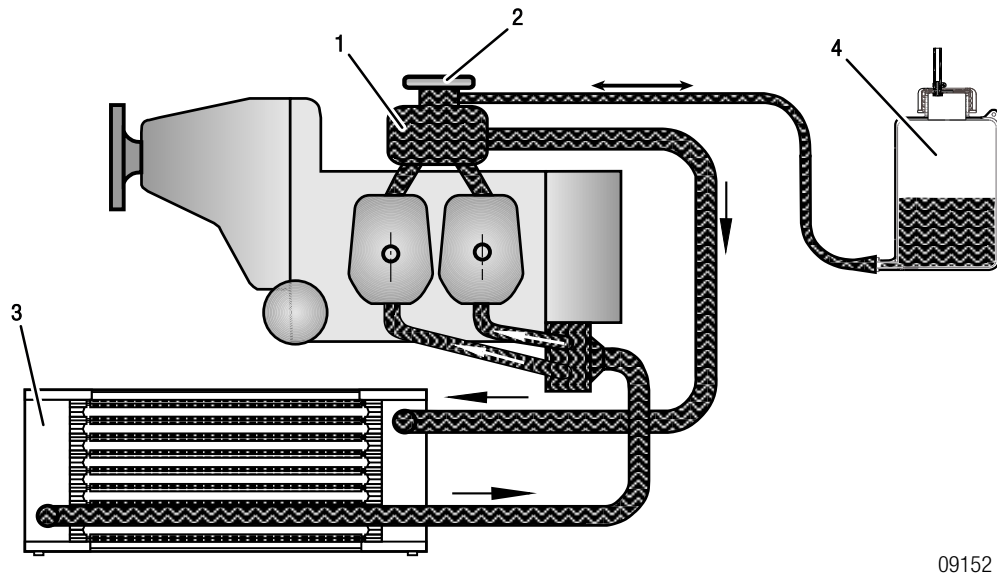


Figure 8.5: Cooling system

- 1 Expansion tank
- 3 Radiator

- 2 Pressure cap
- 4 Overflow bottle

COOLANT HOSES

ATTENTION

Hoses exposed to direct heat radiation from the exhaust system, must be suitably protected with heat-resistant protection covers, for example.

Aluminium tubes with an inner diameter of 25 mm (0.98 in) can be used instead of longer hoses. These must have a bulge in order to prevent coolant hoses working loose.

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NOTE

Note, the addition of an aluminium tube will double the number of hose clamps required!

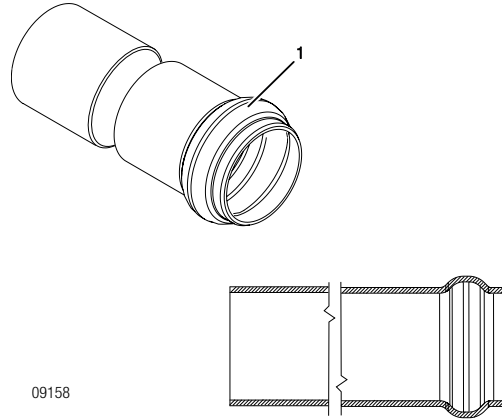


Figure 8.6: Aluminium tube

1 Bulge

Temperature resistance	min. 125 °C (257 °F)
Pressure durability	min. 5 bar (72 psi)
Inner diameter	25 mm (1")
Bending radius	min. 175 mm (6.89 in.) (except moulded hoses)
Material	100 % resistant to glycol, antifreeze, ozone

Hose from expansion tank

⚠ WARNING

Non-compliance can result in serious injuries or death!

A soft walled hose is not suitable as it can collapse and cause cooling system failure.

- The hose from the expansion tank to the overflow bottle must be rated for vacuum/suction for min. 125 °C (257 °F), e.g. it must be strong enough to withstand high temperatures and vacuum/suction during the cooling down period.
- The aircraft manufacturer must give the possibility to the pilots to check the coolant level in the expansion tank. Also it is necessary to inform the pilots about the daily inspection of the coolant level in the aircraft manufacturers operators (pilots) manual or an adequate link to the Operators Manual
- It is recommended that adequate measures are taken for carrying out these inspections, e.g. a flap or panel on the cowlings or a warning instrument in the cockpit for low coolant level.

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COOLANT TYPES

Without Suffix -01 Permissible coolant types:

- Conventional coolant based on ethylene glycol
- Waterless coolant based on propylene glycol

See SI-914-019.

Conventional coolant

Conventional coolant is recommended as it commonly available and has a greater thermal heat transfer capability. Its limitation is its lower boiling point.

Waterless coolant Waterless coolant is recommended if the design of the aircraft can not maintain the coolant temperature limit 120 °C (248 °F).

Mixing ratio

ATTENTION		
Obey the manufacturers instructions!		
Description	Mixture ratio	
	Concentration	Water
Conventional coolant	50 %	50 %
Some conventional coolants are available pre-mixed by the manufacturer. In this case do not mix with water, instead follow the manufacturers instructions.		
Waterless coolant	100 %	0

Boiling point

- **Conventional coolant**
Conventional coolant with a rate of 50 % water cannot boil at a temperature below 120 °C (248 °F) at a pressure of 1.2 bar (18 psi). The max. coolant temperature limit is therefore 120°C (248 °F).

NOTE

Permanent monitoring of coolant temperature and cylinder head temperature is necessary.

- **Waterless coolant**
Waterless coolant has a very high boiling point that prevents coolant loss due to “boiling over” (vapor loss), but not to prevent detonation, which can occur with cylinder head temperatures higher than 135 °C (275 °F) . It does not require pressure to maintain its boiling point. Due to a lower thermal conductivity the engine temperature will typically run about 5-10 °C (41- 50 °F) higher with waterless coolant.

NOTE

*Permanent monitoring of cylinder head temperature is necessary.
Additional monitoring of the actual coolant temperature is possible but not necessary for waterless coolant.*

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NOTE

When using EVANS NPGR, NPG+ or added pure ethylene glycol as a coolant, note that these fluids have a flammability rating 1 (classification LOW at a scale from 0 to 4). The mentioned coolants are complying according to their material safety data sheet with a flammability classification, which has only low danger and a low risk of flammability. To date, no cases in engine operation or flight operation, laboratory conditions or from the field were reported, which show unsafe conditions of ROTAX® aircraft engines in combination with the relevant coolants.

Marking

ATTENTION
The coolant to be used and its concentration (percentage water rate) must be correctly communicated to the owner. Waterless coolant must not mix with water, as otherwise it will lose the advantages of a high boiling point.

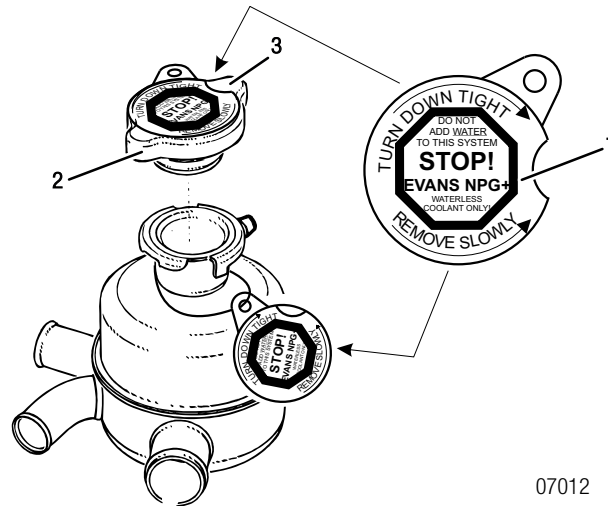


Figure 8.7: :Marking of the coolant

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

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Suffix -01

Permissible coolant types:

- Conventional coolant based on ethylene glycol

ATTENTION

Obey the latest edition of Service Instruction SI-914-019, for the selection of the correct operating media.

Conventional coolant is recommended as it commonly available and has a greater thermal heat transfer capability. Its limitation is its lower boiling point.

NOTE

Permanent monitoring of coolant temperature is necessary.

ATTENTION

Obey the manufacturers instructions!

Description	Mixing ratio	
	Concentrate	Water
Conventional coolant	50 %	50 %
Some conventional coolant is available pre-mixed by the manufacturer. In this case do not mix with water, instead follow the manufacturers instructions.		

Boiling point

Conventional coolant:

Conventional coolant with the rate of 50 % water cannot boil at a temperature below 120 °C (248 °F) at a pressure of 1.2 bar (18 psi). The max. coolant temperature limit is therefore 120 °C (248 °F).

NOTE

Permanent monitoring of coolant temperature is necessary.

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REQUIREMENTS, PERMISSIBLE LOCATION AND INSTALLATION POSITION

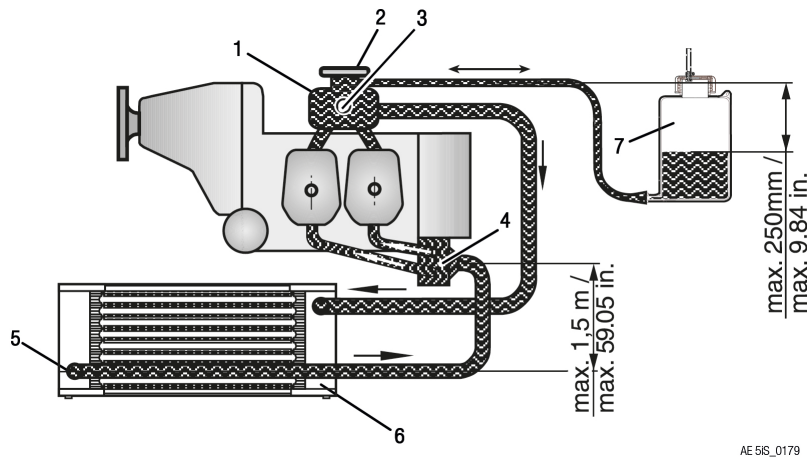


Figure 8.8: Permissible location

- | | | | |
|---|-------------------|---|--------------|
| 1 | Expansion tank | 2 | Pressure cap |
| 3 | Fluid level glass | 4 | Water pump |
| 5 | Radiator outlet | 6 | Radiator |
| 7 | Overflow bottle | | |

Radiator

⚠ WARNING

Non-compliance can result in serious injuries or death!

The components must be designed and installed such that the permissible operating temperatures are maintained and the max. values are not exceeded. This must also apply to "Hot day conditions"! If need be, take appropriate measures.

ATTENTION

If required, the radiator outlet may be located max. 1.5 m (4.92 ft.) underneath the inlet elbow of the water pump and no higher than the expansion tank.

Expansion tank location

To ensure proper operation of the cooling system, the expansion tank with pressure cap in the main operating systems must be installed on the highest point of the cooling circuit.

NOTE

The expansion tank is fitted on top of the engine in standard configuration.

Overflow bottle

The system also needs an overflow bottle in which surplus coolant is collected and returned to the coolant circuit during the cooling down period.

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ATTENTION

Ensure proper operation of the cooling system.
The suction height between overflow bottle and expansion tank must not exceed 250 mm (10 in.).

NOTE

For proper operation ensure that the hose to the overflow bottle is as short as possible.

Overflow bottle requirements

See SB-914-025“Modification of the overflow bottle“, latest issue.

- Transparent material
- Temperature resistant from -40 °C to +130 °C (-40 °F to 266 °F)
- 100 % resistant to glycol and suitable for all other antifreeze agents
- Volume approx. 0.5 l (0.13 US gal)
- With vent diameter at least 2.5 mm (0.1 in)
- Label about indicating function and content

Capacity overflow bottle

⚠ WARNING

Non-compliance can result in serious injuries or death!
The overflow bottle must never be empty, otherwise air will be sucked into the cooling circuit; this can have a negative effect on the safe operation of the engine.

Installation overflow bottle

ATTENTION

Emerging coolant can be flammable under certain conditions.
The overflow bottle and its supply and discharge must not be installed close to the exhaust system.

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CONNECTING SIZE AND POSITION OF CONNECTIONS

The hoses must be fixed with appropriate clips to prevent loss, e.g. with spring type hose clamps, such as those used for the coolant hoses between the water pump and cylinder. Clamps of this type have performed well in the field.

To radiator	Outside diameter	25 mm (1")
	Slip-on length	max. 22 mm (7/8")
To overflow bottle	Outside diameter	8 mm (3/8")
	Slip-on length	max. 15 mm (9/16")
Water inlet elbow	Outside diameter	27 mm (1 1/16")
	Slip-on length	max. 19 mm (3/4")

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Connecting dimension

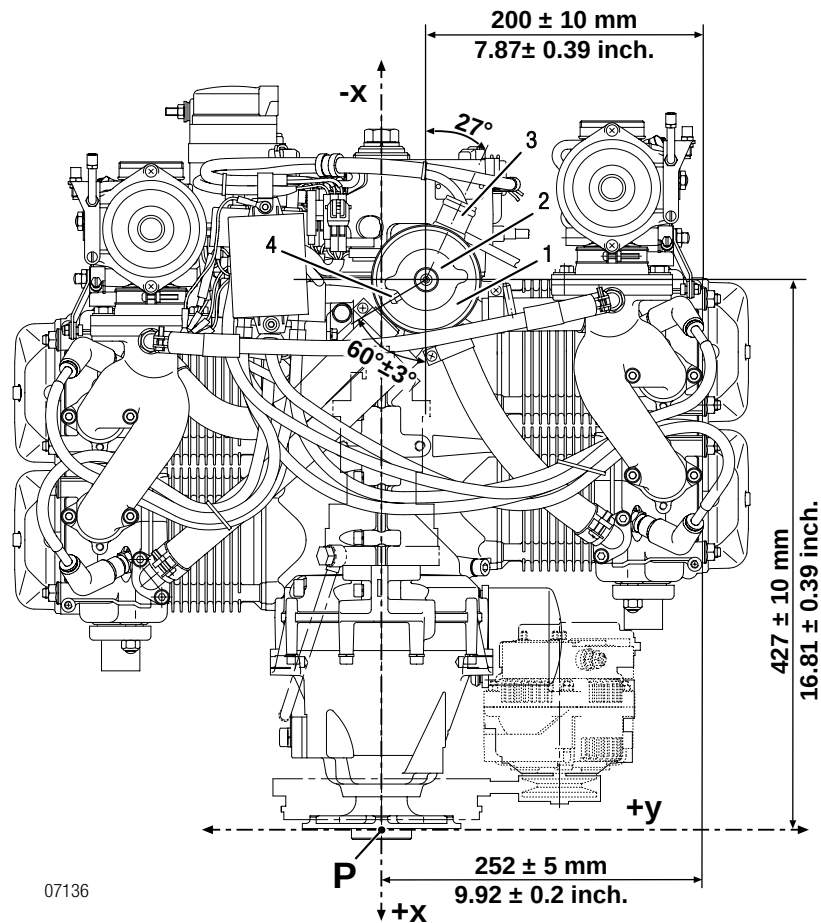


Figure 8.9: Connecting dimension

- | | |
|------------------------------|-------------------------------------|
| 1 Expansion tank | 2 Radiator cap |
| 3 Connection to the radiator | 4 Connection to the overflow bottle |

Water inlet elbow

ATTENTION

Prevent leakage!

Utilize the full slip-on length for all connections. Secure hoses with suitable clamps or crimp connection.

Choose between six possible installation positions of water inlet elbow appropriate to specific installation (see [Fig. Connecting dimension](#)).

Use two M6x20 Allen screws and lock washers to attach the water inlet elbow. Tighten screws to 10 Nm (90 in lb).

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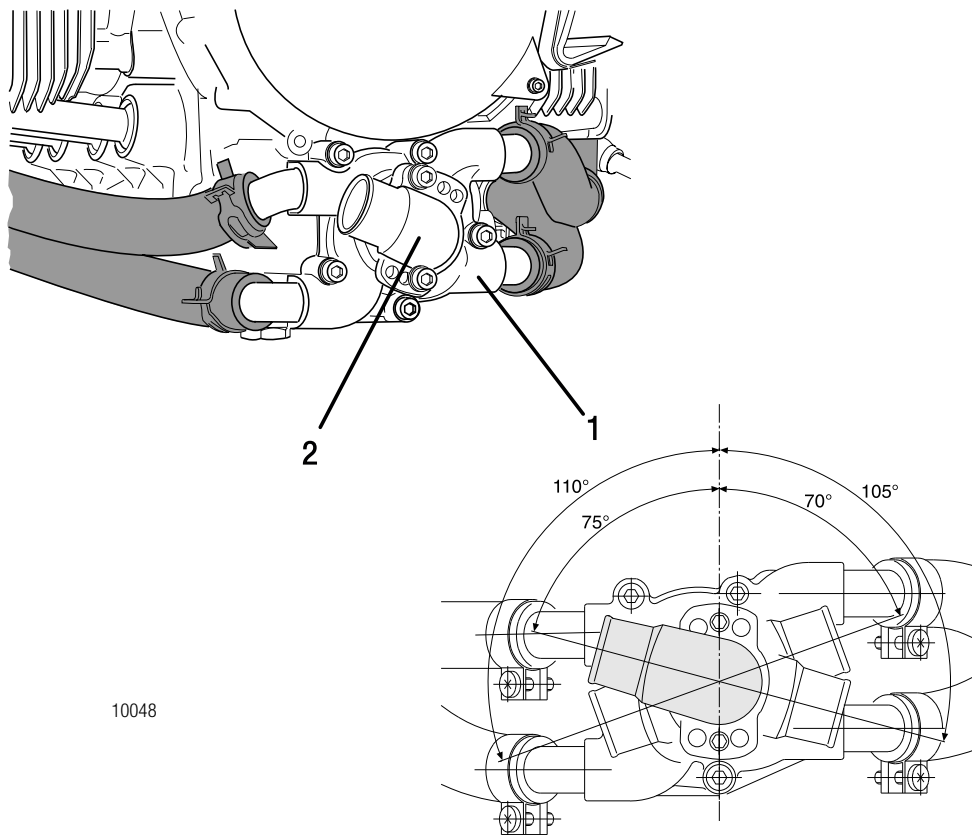


Figure 8.10: Water inlet elbow

1 Water pump housing

2 Water inlet elbow

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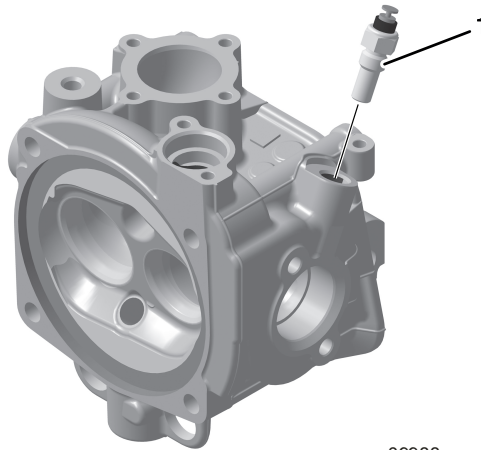
VALIDATION OF INSTALLATION

The maximum coolant temperature must be determined in order to check the efficiency of the cooling system.

Suffix -01

**Measurement of
coolant
temperature**

There are two temperature sensor on the cylinder 2 and 3 for measuring the coolant temperature. During flight test the place with the highest coolant temperature must be found, this can vary with different engine installation (cowling or free installation, tractor or pusher, fight speed etc.)



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Figure 8.11: Coolant temperature sensor

1 Coolant temperature sensor

NOTE

At engines with cylinder heads of the new configuration, the cooling system must be designed so that the operating limits are not exceeded. A determination of the dependency on coolant temperature and cylinder head temperature is not necessary any more.

without Suffix -01

**Cylinder head
temperature**

There are two temperature sensors, one each on cylinder 2 and 3. During flight test the place with the highest coolant temperature must be found, this can vary with different engine installation (cowling or free installation, tractor or pusher, fight speed etc.)

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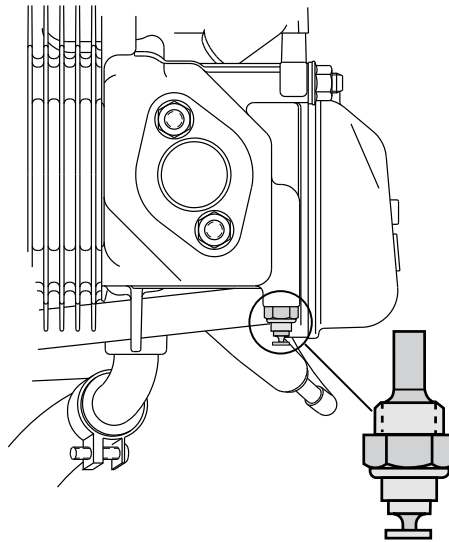


Figure 8.12: Temperature sensors (without Suffix -01)

Coolant outlet temperature

⚠ WARNING

Non-compliance can result in serious injuries or death!
Do not restrict the coolant flow with the sensor.

ATTENTION

It is possible to record a false measurement when measuring fluid temperatures.
If fluid volume is lost and the sensor is not fully submerged in the liquid, the indicating instrument could incorrectly display a lower temperature, by measuring the air temperature instead of the coolant temperature.

The measuring of the coolant exit temperature is performed using a separate sensor, which has to be installed in the line between expansion tank and radiator inlet.

Cylinder wall temperature

Max. permitted cylinder wall temperature on hottest cylinder is 200 °C (392 °F). See the following figure.

NOTE

If this temperature is exceeded, appropriate measures (e.g. cooling air ducts, modifications to cowling, etc.) must be taken to bring it within limits again.

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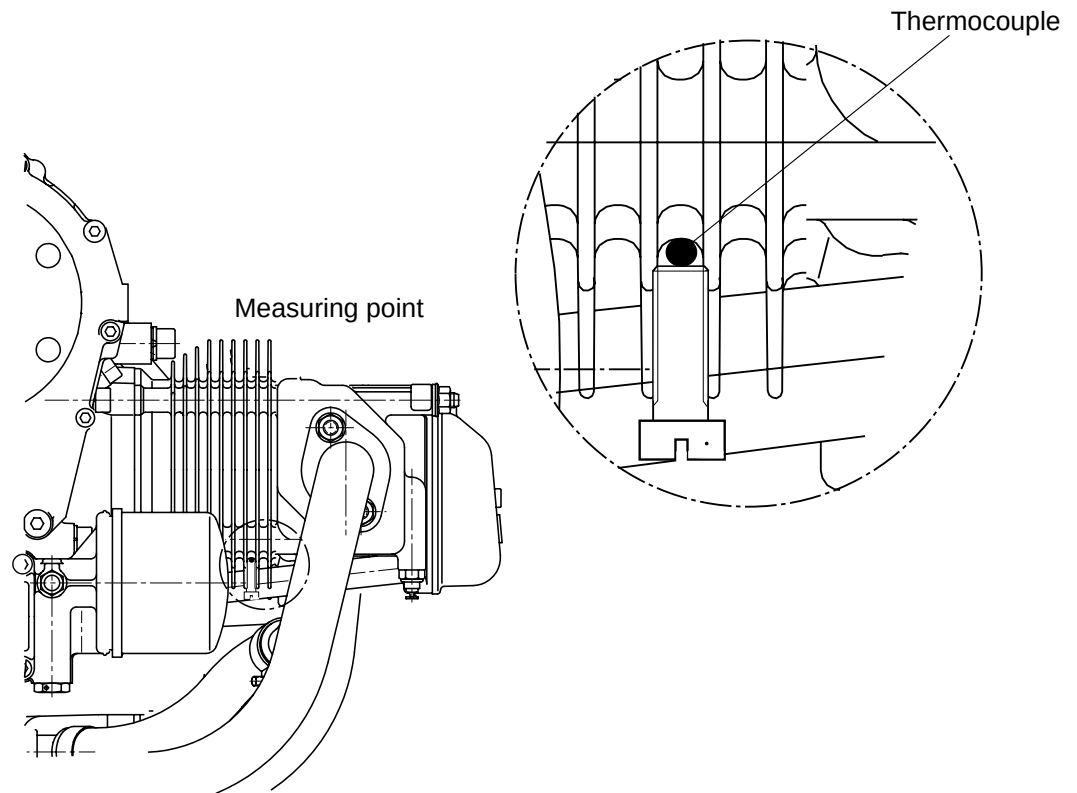


Figure 8.13: Measuring point

Pressure test

To ensure the System has no leakage, remove the pressure cap from the expansion tank. Then attach the pressure tester and pump the system until the pressure manometer shows 1.2 bar (18 psi). After min. 1 minute, there should be still 1.2 bar (18 psi) pressure in the system.

- Check the efficiency of the coolant radiator and its proper sealing between cowling and radiator.
- Check the proper flow between expansion tank and overflow bottle.
- Ensure that no ram air is induced onto the overflow bottle vent line.
- Check efficiency of air duct (if installed) and proper air flow through the duct and around cylinders.
- Consider cold (winter) and hot (summer) conditions in ground and flight testing.
- Check proper dampening of the water radiator and stressless installation and proper sealing.

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DETERMINATION OF OPERATING LIMITS, COOLANT AND NECESSARY MODIFICATION ON RADIATOR INSTALLATION FOR ENGINE

Maximum values **With Suffix -01: Not relevant.**

Maximum values **Without Suffix -01.**

Depending on the achieved maximum values of the cylinder head temperature and the coolant temperature following action are necessary:

Conventional coolant		
Coolant temperature	Cylinder head temperature	Action
less than 120 °C (248 °F)	less than 135 °C (275 °F)	Both values are below operating limit. It is necessary to monitoring constantly cylinder head temperature and coolant exit temperature. Cooling capacity too low. Check of the installation necessary.
more than 120 °C (248 °F)	less than 135 °C (275 °F)	
less than 120 °C (248 °F)	more than 135 °C (275 °F)	
more than 120 °C (248 °F)	more than 135 °C (275 °F)	

Waterless coolant		
Coolant temperature	Cylinder head temperature	Action
less than 120 °C (248 °F)	less than 135 °C (275 °F)	Maximum cylinder head temperature is below operating limits. Operating with waterless coolant, is permissible without modification to the installation.
more than 120 °C (248 °F)	less than 135 °C (275 °F)	
less than 120 °C (248 °F)	more than 135 °C (275 °F)	Cooling capacity too low. Check of the installation necessary.
more than 120 °C (248 °F)	more than 135 °C (275 °F)	

NOTE

For detection of possible indication error an additional monitoring of the cylinder head temperature is necessary which shows an exceeding in case of coolant loss.

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Flight test

The aircraft manufacturer has the option of converting the coolant temperature and the cylinder head temperature to an aircraft specific cylinder head temperature. This is possible by calculating the difference between the head material and the coolant temperature. Refer to the [flight test example](#) that follows.

Once the calculation is made and the indicating instrument re-labelled it is acceptable to use the cylinder head temperature as the primary cockpit display instead of installing a sensor in the coolant flow.

The measurement is based on the maximum coolant temperature and cylinder head temperature according to the current requirement.

ATTENTION

In no case a cylinder head temperature higher than the limit (see table of maximum values) can be defined because detonation could not be sufficiently prevented.

Flight test example

Calculated values

(Maximum values found for coolant temperature and cylinder head temperature. Refer to the current specification of the FAA and/or EASA)

Coolant temperature	102 °C (216 °F)
Cylinder head temperature	110 °C (230 °F)
= Difference cylinder head and coolant temperature	8 °C (46 °F)

The cylinder head temperature is 8 °C (46 °F) higher than the coolant temperature.

thus

Coolant temperature limit	120 °C (248 °F)
+ Difference cylinder head and coolant temperature	8 °C (46 °F)
= Total	128 °C (262 °F)

The highest cylinder head temperature permitted is 128 °C (262 °F), so that the max. coolant temperature is kept.

With this special application, safe operation of the engine that prevents boiling of the coolant is possible up to a cylinder head temperature of 128 °C (262 °F).

ATTENTION

This cylinder head temperature with the limit found for this type must be displayed constantly in the cockpit. The indicating instrument and the Manuals must be changed to cylinder head temperature.

ATTENTION

The design of the radiator installation must be changed (example: cowl modifications), if the operating temperature exceeds the specified limits.

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OPERATING LIMITS

⚠ WARNING

Non-compliance can result in serious injuries or death!

The cooling system must be designed so that operating temperatures will not exceed the maximum values.

“Boiling point of the coolant”

Monitoring the cooling system is important for controlling engine cooling and prevent knocking combustion within the operating limits. It is important that the coolant circuit is designed so that the coolant does not reach boiling point under any conditions. If the temperature exceeds the boiling point, the engine can quickly overheat due to loss of coolant. The boiling point of the coolant is mainly influenced by:

- Coolant types (not for Suffix -01)
- Mixture ratio (percentage of water)
- System pressure (opening pressure of radiator cap)

Coolant temperature

with Suffix -01

Coolant outlet temperature maximum 120 °C (248 °F)

NOTE

Permanent monitoring of coolant temperature is necessary.

Coolant temperature

without Suffix -01

Coolant outlet temperature maximum 120 °C (248 °F).

Cylinder head temperature

	Conventional coolant	Waterless coolant
914 F/UL	maximum 135 °C (275 °F)	maximum 135 °C (275 °F)
	NOTE <i>Permanent monitoring of coolant temperature and cylinder head temperature is necessary.</i>	NOTE <i>Permanent monitoring of cylinder head temperature is necessary. Additional monitoring of the actual coolant temperature is possible but not necessary for waterless coolant.</i>

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Correlation between coolant temperature and cylinder head temperature

There is in principle a regular relationship between coolant temperature and cylinder head temperature. The coolant transfers some of the combustion heat to the radiator. Thus, the coolant temperature is usually lower than the cylinder head temperature. But the temperature difference between coolant and cylinder head is not constant and can vary with different engine installation (cowling or free installation, tractor or pusher, flight speed, etc.).

NOTE

The basic requirement for safe operation is that boiling of conventional coolant must be prevented. The boiling point of conventional coolant is 120 °C (248 °F) with a 50/50 mixture proportion and a system pressure of 1.2 bar (18 psi).

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GENERAL NOTES ON THE COOLING SYSTEM

⚠ WARNING

Non-compliance can result in serious injuries or death!

The furnishing of proof in accordance to the latest FAR and EASA, has to be conducted by the aircraft manufacturer.

Essential parts of the cooling system, such as radiator, etc., are available for this engine from BRP-Rotax.

ATTENTION

Risk of chafing, wear , loss of coolant.

Ensure that no contact with hoses or hose clamps of the engine is given (risk of chafing, wear, loss of coolant) at the installation of external components (governor, vacuum pump).

Radiator

ATTENTION

The size and type of radiator should be adequate to transfer thermal energy of approx. 30 kW (28.45 BTU/s) at take-off power.

In an installation as depicted with the radiator in a higher position than the standard supplied expansion tank, a water accumulator has to be fitted instead of the expansion tank. Additionally a suitable expansion tank has to be installed at the highest point of the cooling circuit.

NOTE

Experience has shown that with good airflow, a radiator with an area of 500 cm² (77.5 in²) is required for trouble free operation.

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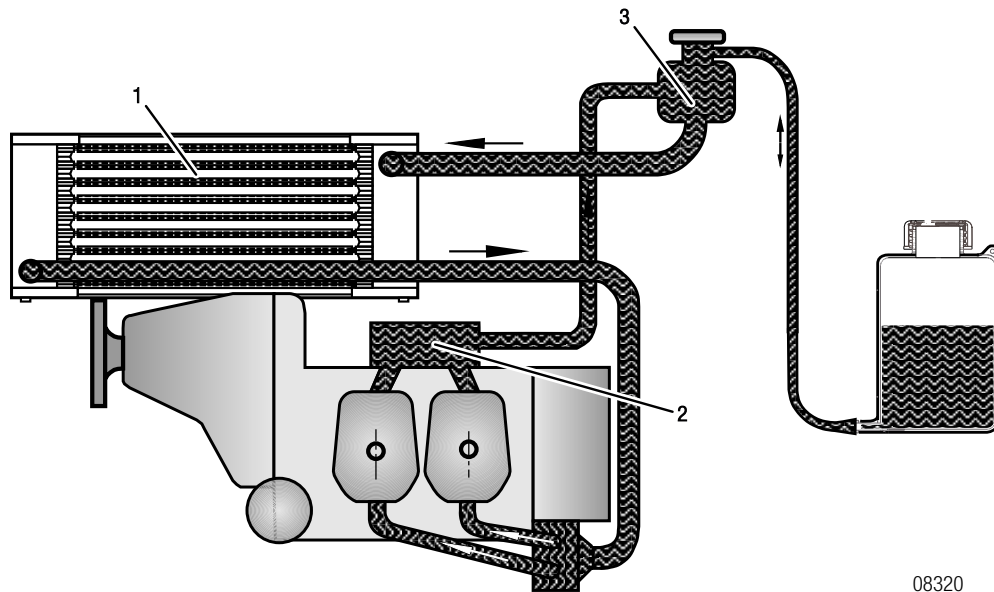


Figure 8.14: Radiator

- 1 Radiator
- 2 Water accumulator
- 3 Expansion tank

Flow rate	The flow rate in the coolant circuit is approx. 60 l/min (15.85 US gal/min.) at 5800 rpm. At full throttle, an approximate value of around 0.75 m ³ /s (28.59 cu.ft/sec) can be assumed for the required cooling air flow.
Flow resistance	The flow resistance of the coolant in the optional ROTAX® radiator is correctly adjusted for the cooling system. If using other radiators, check the flow rate and cooling capacity.
Installation of the radiator	No provision has been made for attachment of the radiator(s) on the engine (rubber mounts are recommended).

ATTENTION

If a GENUINE ROTAX® radiator is not being installed, ensure sufficient cooling capacity.

The radiator must be installed without distortion or stress and be free of vibrations.

To achieve the best possible cooling effect via the airflow passing through the cooler, it is recommended to install a tight fitting, flexible seal or duct between the cowling and radiator.

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COOLANT CAPACITY

4 cylinder heads	560 cm ³ (0.020 cu.ft) (without Suffix -01) 400 cm ³ (0.016 cu.ft) (with Suffix -01)
Coolant pump	100 cm ³ (0.004 cu.ft)
Expansion tank	250 cm ³ (0.009 cu.ft)
Overflow bottle	approx. 0.5 l (0.13 US gal)
2 m coolant hose (InnerØ 18 mm)	500 cm ³ (0.018 cu.ft)
Total coolant quantity for engine	approx. 1.5 l (0.4 US gal)

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Unintended engine stoppage by seizing	
part	possible cause
Camshaft bearings/Conrod bearings	rather consequential damage wear (low oil pressure)
NOTICE The entire assembly must be dismantled, inspected and re-paired.	

- The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
- Inspect all systems for correct functioning.
- Detailed inspection of affected engine components.

Cylinder head

A rise in cylinder head temperature or coolant temperature above normal operating limits (see Operators Manual) is a clear signal for a failure in the cooling system.

Cylinder head temperature or coolant temperature too high	
part	possible cause
Cooling system	not enough coolant bad venting
Return valve is not working	malfunction
Radiator	contaminated
Radiator cap	leaking
Pressure relief valve	malfunction
Water pump	malfunction

3.1) Returning engine to service after submerging in water

General note

NOTICE

The engine must be marked clearly "Engine submerged in water". Define if it was fresh water or salt water.

An engine which has been submerged in water must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness. See latest Maintenance Manual of the relevant engine type.

Inspection

- Inspect all systems for correct functioning.

NOTE: Prior to the detailed inspection, all parts should be cleaned and inspected for corrosion. For accessories (e.g. vacuum pump, fuel filter etc.) the instructions and specifications of the corresponding manufacturer must be followed.

BRP-Powertrain
MAINTENANCE MANUAL

Complete inspection of these components:	
generator	cooling system
gearbox	valve train system
engine suspension frame	exhaust system
fuel system	lubrication system
ignition system	electric starter
cylinder unit	

In most cases an overhaul is necessary, in this regard send the engine without delay to an authorized ROTAX overhaul facility for inspection.

If an engine was submerged into water, all electrical components (e. g.: ignition coils, stators, spark plugs, spark plug connectors, turbocharger control unit, sensors, wiring harness) must be replaced.

NOTE: Discoloration or corrosion are signs of submerging in water.

3.2) Inspection in extreme climatic conditions

General note

NOTICE

Every 25 hr. checks of air filter, coolant radiator and oil cooler are necessary.

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

Flying in areas with extreme climatic conditions or in extreme altitudes requires adjustment of the carburetor jetting and of the cooling system. To do this, it is necessary to contact the aircraft manufacturer and an authorized ROTAX distributor.

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BRP-Powertrain
MAINTENANCE MANUAL

3.3) Exceeding of max. admissible engine RPM

General note **NOTES:** Any exceeding of the max. admissible engine RPM must be entered by the pilot into the engine log book stating duration extent of overspeeding and pertinent detail.

5800 rpm up to max. 6200 rpm

If the limit was exceeded for max. 1 minute up to 6200 rpm

Step	Procedure
1	No action is required.

5800 rpm up to max. 6200 rpm

If the limit was exceeded for more than 1 minute up to 6200 rpm

Step	Procedure
1	Check that the push-rods are straight.

6200 rpm up to max. 6500 rpm

If the limit was exceeded for max. 1 minute up to 6500 rpm

Step	Procedure
1	Check that the push-rods are straight.

6200 rpm up to max. 6500 rpm

If the limit was exceeded for more than 1 minute up to 6500 rpm

Step	Procedure
1	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Check that the push-rods are straight.
3	Inspect the crankshaft for out-of-roundness and torsion. See chapter 72-00-00 of the latest Heavy Maintenance Manual.
4	Inspect all systems for correct functioning.
5	Detailed inspection of affected engine components.

more than 6500 rpm

If the speed of 6500 rpm was exceeded

Step	Procedure
1	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Check that the push-rods are straight.
3	Check differential pressure.
4	Replace the crankshaft. Check the drive gear for out-of-roundness and torsion. See chapter 72-00-00 of the Heavy Maintenance Manual.
5	Check if piston had contact with valve.

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BRP-Powertrain
MAINTENANCE MANUAL

Step	Procedure
6	Check roundness of valves.
7	Inspect all systems for correct functioning.
8	Detailed inspection of affected engine components.

3.4) Cooling system temperature exceeded

General note

NOTICE

If the cooling system temperature is exceeded, other limits are also often exceeded, e.g. oil temperature. Please observe the relevant instructions.

NOTES:

Any exceeding of the max. admissible cooling system temperature must be entered by the pilot into the engine log book, stating duration extent of excess temperature and pertinent detail.

3.4.1) Exceeding of max. cylinder head temperature (relevant for engine S/N without Suffix -01)

See latest SB-912-068.

Graphic

Overview and proceed:

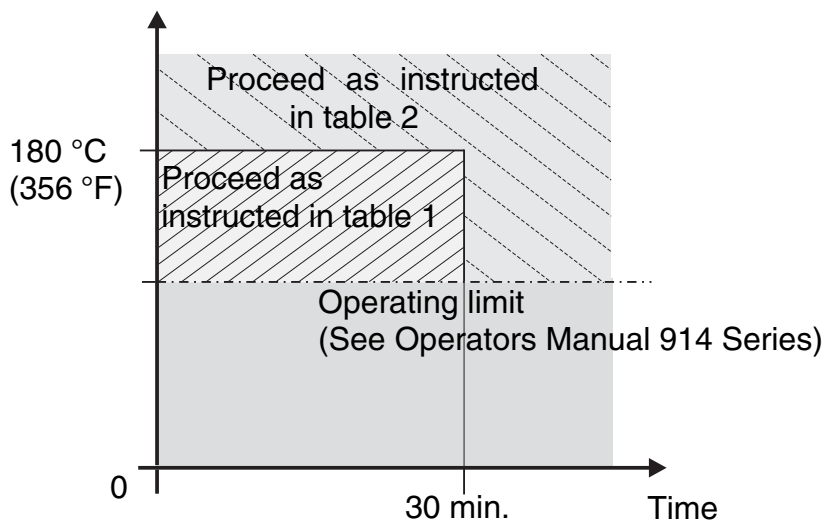


Fig. 2

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BRP-Powertrain
MAINTENANCE MANUAL

**Exceeding up to
180 °C (356 °F)**

Table 1.

Max. temperature exceeded up to 180 °C (356 °F) - briefly	
Step	Procedure
1	The whole cooling system must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect all further systems for correct functioning.
	Carry out detailed inspection of the affected engine components such as. - Leakage check on the cooling system. - Check that the cylinder head attachment is fitted securely. If the cylinder head nut is loose, proceed as instructed in sec. "Excess temperature of over 180 °C (356 °F) and/or for longer than 30 min." - Check all coolant fittings (feed/outflow) for secure fit.

**Exceeding of
over 180 °C
(356 °F)**

Table 2.

Excess temperature of over 180 °C (356 °F) and/or for longer than 30 min.	
Step	Procedure
1	The whole cooling system must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect all further systems for correct functioning.
3	Carry out detailed inspection of the affected engine components.
4	Check compression by carrying out a differential pressure check.
5	All cylinder heads and cylinders must be removed and subjected to a detailed check including hardness testing. See chap. 72-00-00 in the Heavy Maintenance Manual.

3.4.2) Exceeding of max. coolant temperature (relevant for engine S/N with Suffix -01)

See latest SB-912-068.

General note

NOTICE

If the coolant temperature is exceeded, other limits are also often exceeded, e.g. oil temperature. Please observe the relevant instructions.

NOTES: Any exceeding of the max. admissible coolant temperature must be entered by the pilot into the engine log book, stating duration extent of excess temperature and pertinent detail.

Grafik

Overview and proceed;:

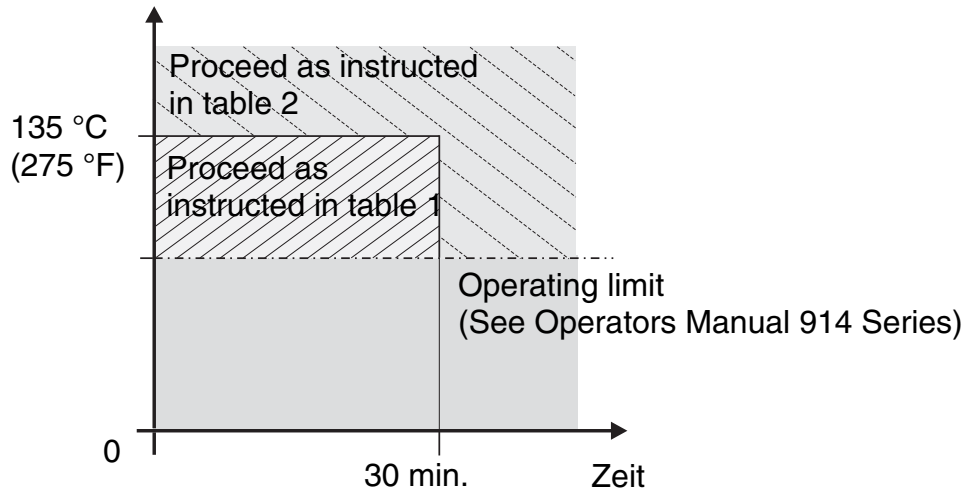


Fig. 3

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3.5) Exceeding the max. permissible oil temperature

General note

NOTICE

If the max. permissible oil temperature is exceeded, other limits are often exceeded, too, e.g. the cooling system temperature. Please observe the relevant instructions.

NOTES:

Any exceeding of the max. admissible oil temperature must be entered by the pilot into the engine log book, stating duration extant of excessive temperature and pertinent detail.

Graphic

Overview and proceed;:

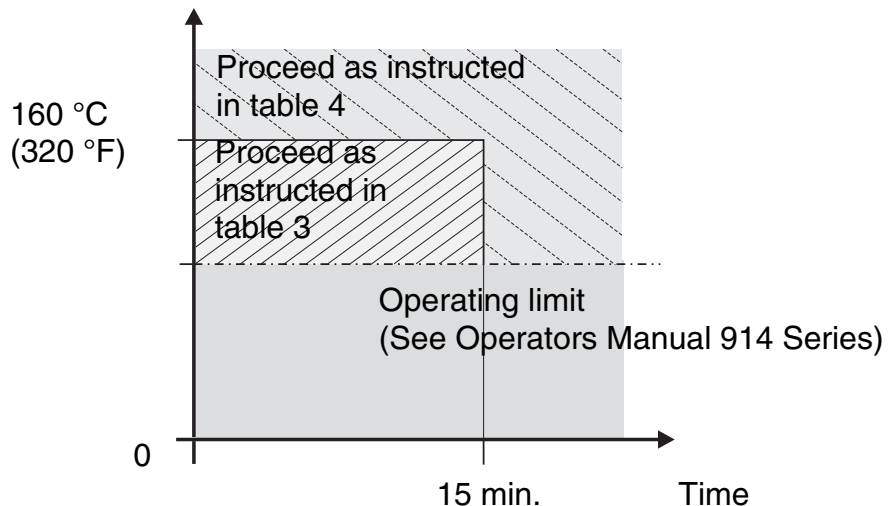


Fig. 4

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BRP-Powertrain
MAINTENANCE MANUAL

**Exceeding up to
max. 160 °C
(320 °F)**

Table 3.

Excess temperature up to max. 160 °C (320 °F) max. 15 min.	
Step	Procedure
1	The whole oil system must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect oil level in the oil tank.
3	Inspect oil cooler for contamination and check the entire oil circuit for correct functioning.
4	Check that oil lines are routed correctly and undamaged.
5	Cut oil filter housing and inspect filter mat for foreign matter.
6	Carry out oil change.
7	Inspect all further systems for correct functioning.

**Exceeding over
160 °C (320 °F)**

Table 4.

Excess temperature over 160 °C (320 °F) for longer than 15 min.	
Step	Procedure
1	The whole engine must be inspected, repaired or overhauled in accordance with the BRP-Powertrain instructions for continued airworthiness.
2	Inspect all further systems for correct functioning.
3	Carry out detailed inspection of the affected engine components.
4	Inspect the whole oil system (oil cooler, oil lines) must be inspected.
5	Cut oil filter housing and inspect filter mat for foreign matter.

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MAINTENANCE MANUAL

4) Reporting

General note

According to the regulation of EASA part 21A.3 / FAR 21.3 the manufacturer shall evaluate field information and report to the authority. In case of any relevant occurrences that may involve malfunction of the engine, the form on the next page should be filled out and sent to the responsible authorized ROTAX distributor.

NOTES: The form is also available from the official ROTAX AIRCRAFT ENGINES Homepage in electronic version.

www.FLYROTAX.com

Register: **Document type/Diverses**

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Waterless coolant

See also Chapter Operating media coolant.

Cylinder head temperature	
Max.	135 °C (275 °F)
Permanent monitoring of cylinder head temperature is necessary.	

Conventional coolant

Applicable for engine S/N with Suffix -01. See also Chapter Operating media coolant.

Coolant temperature limit measured in the cylinder head	Engine Type
Max. 120 °C (248 °F)	914 F/UL
Permanent monitoring of coolant temperature is necessary.	

Ambient temperature

Max. at start	50 °C (120 °F) (ambient temperature)
Min. at start	- 25 °C (- 13 °F) (oil temperature)

Fuel pressure

⚠ WARNING	
Non-compliance can result in serious injuries or death! Exceeding the max admissible fuel pressure will override the float valve of the carburetor and to engine failure.	
Max.	Airbox pressure + 0.35 bar (5.08 psi)
Min.	Airbox pressure + 0.15 bar (2.18 psi)
Normal	Airbox pressure + 0.25 bar (3.63 psi)

Propeller governor

Power consumption of the hydraulic propeller governor	
Max.	600 W

Vacuum pump

Power consumption of the vacuum pump	
Max.	300 W

Oil pressure

Max.	7 bar (102 psi)
Min.	0.8 bar (12 psi) (below 3500 rpm) 1.5 bar (22 psi) ²
Normal	2.0 to 5.0 bar (29 to 73 psi) (above 3500 rpm) 1.5 to 5.0 bar (22 to 73 psi) ²

ATTENTION

For a short period admissible at cold start.

Oil temperature

Max.	130 °C (266 °F)
Min.	50 °C / 120 °F
normal operating temperature	approx. 90 to 110 °C (190 – 230 °F)

Exhaust gas temperature

Max.	950 °C (1742 °F)
------	------------------

Conventional coolant temperature

Applicable for engine S/N without Suffix -01. See also Chapter Operating media coolant.

Coolant temperature (coolant exit temperature)

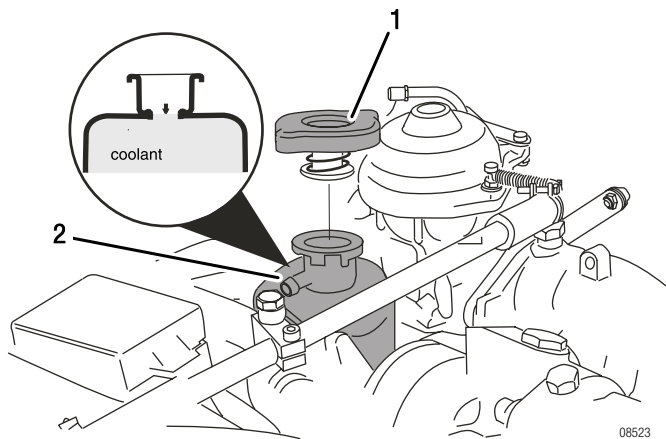
Max.	120 °C (248 °F)
------	-----------------

Cylinder head temperature

Max.	135 °C (275 °F)
Permanent monitoring of coolant temperature and cylinder head temperature is necessary.	

-
2. 914 F up to S/N 4420085
914 UL up to S/N 4417665

Expansion tank

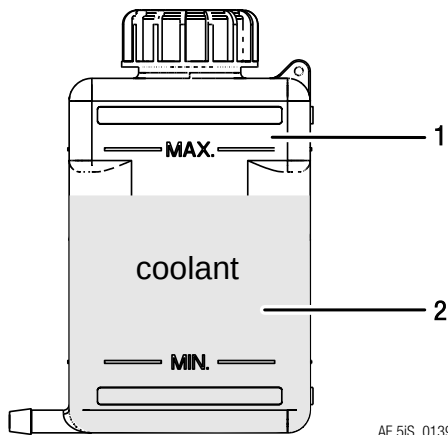


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Figure 1: Expansion tank

- 1 Radiator cap
- 2 Expansion tank

Overflow bottle



AE 5IS_0139

Figure 2: Overflow bottle

- 1 Overflow bottle
- 2 Coolant

3.1) Daily checks

Safety

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

⚠ WARNING

Risk of burnings and scalds! Hot engine parts!
Conduct checks on the cold engine only!

⚠ WARNING

Non-compliance can result in serious injuries or death!
Ignition "OFF" Before moving the propeller switch off both ignition circuit and secure the aircraft. Have the cockpit occupied by a competent person.

ATTENTION

If established abnormalities (e.g. excessive resistance of the engine, noise etc.) inspection in accordance with the relevant Maintenance Manual is necessary. Do not release the engine in-to service before rectification.

Coolant level

ATTENTION

Operating media must be observed.
Inappropriate coolant quantity can lead to serious engine damage.

The specifications given in [Chapter 2.2](#) must be adhered to when refilling coolant.

Step	Procedure
1	Verify coolant level in the expansion tank , replenish as required up to top. The max. coolant level must be flush with the bottom of the filler neck.
2	Verify coolant level in the overflow bottle , replenish as required. The coolant level must be between max. and min. mark.

ENVIRONMENTAL NOTE

Protect the environment!
Do not harm the environment by spilling coolant. Dispose coolant in an environmentally friendly manner.

4.6) Re-Start during flight

If the propeller continues to rotate during flight by windmilling, but the speed is not sufficient to start the engine, the electric starter can be used. It is not required to wait until the propeller stops rotating.

4.7) Exceeding max. admissible engine speed

Exceeding engine speed

Reduce the engine speed. Any exceeding of the max. admissible engine speed must be entered by the pilot into logbook, stating the exact time and duration of engine over speed.

- A maintenance inspection should be carried out

4.8) Exceeding of max. admissible cooling system temperature

ATTENTION

Reduce engine power setting to the minimum necessary and carry out precautionary landing.

4.8.1) Exceeding of max. admissible cyl. head temperature

ATTENTION

Reduce engine power setting to the minimum necessary and carry out precautionary landing.

Cylinder head temperature max.

Applicable for engine S/N without Suffix -01.

- Any exceeding of the max. admissible cylinder head temperature must be entered by the pilot into the logbook, stating duration and extent of over-temperature condition.
- Carry out an unscheduled maintenance check according to Maintenance Manual Line chapter 05-50-00.

4.8.2) Exceeding of max. admissible coolant temperature

ATTENTION

Reduce engine power setting to the minimum necessary and carry out precautionary landing.

Coolant temperature max.

Applicable for engine S/N with Suffix -01.

2.2) Operating media-Coolant

ATTENTION

Obey the latest edition of Service Instruction SI-914-019, for the selection of the correct operating media.

Conventional coolant

Conventional coolant mixed with water has the advantage of a higher specific thermal capacity than water-less coolant.

Application

When correctly applied, there is sufficient protection against vapor bubble formation, freezing or thickening of the coolant within the operating limits.

Use the coolant specified in the manufacturer's documentation.

Mixture

ATTENTION

Obey the operating media manufacturer's instructions!

Applicable for engine S/N without Suffix -01.

Designation	Mixture ratio %	
	Concentrate	Water
conventional e.g. BASF Glysantine anticorrosion	50*	50
waterless e.g. Aero Cool 180°	100	0

* coolant component can be increased up to max. 65 %.

Applicable for engine S/N with Suffix -01.

Designation	Mixture ratio %	
	Concentrate	Water
conventional e.g. BASF Glysantine anticorrosion	50*	50

* coolant component can be increased up to max. 65 %.

3.2) Before engine start

Carry out pre-flight checks.

3.3) Pre-flight checks

Safety

⚠ WARNING

Non-compliance can result in serious injuries or death!

Ignition "OFF" Before moving the propeller switch off both ignition circuit and secure the aircraft. Have the cockpit occupied by a competent person.

⚠ WARNING

Risk of burnings and scalds! Hot engine parts!

Conduct checks on the cold engine only!

Operating media

Step	Procedure
1	Check for any oil-, coolant- and fuel leaks. If leaks are evident, rectify and repair them before next flight.

Oil level

ATTENTION

Operating media must be observed.

Inappropriate oil quantity can lead to serious engine damage.

The specifications given in [Chapter 2.4](#) must be adhered to when refilling oil.

Step	Procedure
1	NOTE <i>Propeller shouldn't be turned in reverse of the normal direction of engine rotation.</i> Remove bayonet cap from the oil tank, turn the propeller slowly by hand in direction of engine rotation several times to pump residual oil from the engine into the oil tank.
2	It is essential to build up compression in the combustion chamber. Maintain the pressure for a few seconds to let the gas flow via the piston rings into the crankcase. The

SERVICE BULLETIN

CHANGE OF COOLANT SPECIFICATION ON ROTAX[®] ENGINE TYPE 912 AND 914 (SERIES)

SB-912-043 UL R1

SB-914-029 UL R1

MANDATORY

Repeating symbols:

Please, pay attention to the following symbols throughout this document emphasizing particular information.

▲ **WARNING:** Identifies an instruction, which if not followed, may cause serious injury or even death.

■ **CAUTION:** Denotes an instruction which if not followed, may severely damage the engine or could lead to suspension of warranty.

◆ **NOTE:** Information useful for better handling.

1) Planning information

1.1) Engines affected

All versions of the engine type:

- 912 UL all
- 912 ULS all
- 912 ULSFR all
- 914 UL all

|| - all aircraft manufacturer which aircraft equipped with ROTAX[®] engine type as listed.

For complete instructions and compliance to this service bulletin refer to Service Bulletin SB-912-043/SB-914-029, latest edition section 1.2 onward.

◆ **NOTE:** Section 1.6) Approval: Is not required for engines of the type UL (series).
Section 3) Accomplishment: In addition: persons with adequate type-specific training.

SERVICE BULLETIN

CHANGE OF COOLANT SPECIFICATION ON ROTAX® ENGINE TYPE 912 AND 914 (SERIES)

SB-912-043 R2

SB-914-029 R2

MANDATORY

Repeating symbols:

Please, pay attention to the following symbols throughout this document emphasizing particular information.

▲ **WARNING:** Identifies an instruction, which if not followed, may cause serious injury or even death.

■ **CAUTION:** Denotes an instruction which if not followed, may severely damage the engine or could lead to suspension of warranty.

◆ **NOTE:** Information useful for better handling.

1) Planning information

1.1) Engines affected

All versions of the engine type:

- 912 A all
- 912 F all
- 912 S all
- 914 F all
- all aircraft manufacturer which aircraft equipped with ROTAX® engine type as listed.

1.2) Concurrent ASB/SB/SI and SL

More to this Service Bulletin the following additional Service Instruction must be observed and complied with:

- SI-912-016 / SI-914-019 "Selection of suitable operating fluids" current issue

1.3) Reason

Using conventional coolant with a mixing ratio of 50% coolant and 50% water may cause in some applications boiling of the coolant before reaching the max. allowable cylinder head temperature.

On all affected engines the following changes have to be considered and accomplished (if applicable).

- Change of coolant specification
- Change of the cylinder head temperature limits
- Introduction of a new coolant temperature limit and the requirement to measure and monitor this parameter
- Change of radiator cap

1.4) Subject

Change of coolant specification on ROTAX® engine type 912 (Series) and 914 (Series)

1.5) Compliance

- at latest December 31, 2007, incorporate the mandatory use of waterless coolant into the relevant documentation of the aircraft.

|| Alternatively the use of conventional coolant is possible. In such case the new operating limit (coolant temperature) has to be applied. The work/compliance has to be performed according to section 3.

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

1.6) Approval

The technical content is approved under the authority of DOA Nr. EASA.21J.048.

1.7) Manpower

Engine installed in the aircraft - - - manpower time will depend on installation and thus, no estimate is available from the engine manufacturer.

1.8) Mass data

Change of weight - - - none

Moment of inertia - - - unaffected

1.9) Electrical load data

No change

1.10) Software accomplishment summary

No change

1.11) References

In addition to this technical information refer to current issue of

- Operator's Manual (OM)

- Illustrated Parts Catalog (IPC)

- Maintenance Manual (MM)

- all relevant Service Instructions (SI)

◆ NOTE: The status of manuals can be determined by checking the table of amendments of the manual. The 1st column of this table is the revision status. Compare this number to that listed on the ROTAX WebSite: www.rotax-aircraft-engines.com. Updates and current revisions can be downloaded for free.

1.12) Other publications affected

The following documentations become effective with this Service Bulletin:

Description	part no.	Issue	Date	Rev.	Chapter	Page
Operator's Manual 912 Series	899370	0	1998 07 01	4*		
Operator's Manual 914 Series	899641	0	1998 12 01	4*		
Installation Manual 912 A	897860	0	1997 01 16	2*		
Installation Manual 912 F	897796	0	1996 01 23	3*		
Installation Manual 912 S	899376	0	1998 09 01	2*		
Installation Manual 912 UL	897711	2	1997 03 26	2*		
Installation Manual 914 Series	897816	1	2006 07 01	0*		

* or higher revision

The replacement pages have to be included without delay into the respective documentation of the aircraft manufacturer.

1.13) Interchangeability of parts

Not affected

2) Material Information

2.1) Material - cost and availability

Price and availability will be supplied on request by ROTAX[®] Authorized Distributors or their Service Centers.

2.2) Company support information

None

2.3) Material requirement per engine

Fig.no.	New part no.	Qty/engine	Description	Old part no.	Application
	922070	1	radiator cap	922075*	ROTAX [®] 912/914 (Series)

* if not part no. 922070 installed already . See SI-25-1997 „Running Modifications“ current issue.

2.4) Rework of parts

None

2.5) Special tooling/lubricant-/adhesives-/sealing compound - Price and availability

None

3) Accomplishment / Instructions

Accomplishment

3.1) Replacement of the radiator cap

Replace on all affected engines the radiator cap part no. 922075 (0,9 bar) (13 psi) with a new radiator cap part no. 922070 (1,2 bar) (18 psi).

◆ NOTE: The boiling point depends additionally on other factors such as the system pressure. At higher system pressure slightly higher boiling point can be obtained.

All work has to be performed in accordance with the relevant Maintenance Manual.

3.2) Check cooling system - Efficiency of the cooling system

These measures must be performed by the aircraft manufacturer.

◆ NOTE: All work has to be performed in accordance with the relevant Installation Manual (section Cooling system).

3.2.1) Determination of the achievable maximum coolant temperature and cylinder head temperature

Depending on the maximum operating temperature achieved following measures have to be taken:

maximum values for		coolant used for tests	
Coolant temperature	Cylinder head temperature	Conventional coolant	Waterless coolant
less than 120 °C (248 °F)	less than 135 °C ¹⁾ (275 °F) 150 °C ²⁾ (300 °F)	Additional instruments for displaying coolant temperature is necessary ³⁾	Modifications to the instruments or limit not necessary
more than 120 °C (248 °F)	less than 135 °C ¹⁾ (275 °F) 150 °C ²⁾ (300 °F)	Cooling capacity too low. Check of the installation necessary	
less than 120 °C (248 °F)	more than 135 °C ¹⁾ (275 °F) 150 °C ²⁾ (300 °F)		Cooling capacity too low. Check of the installation necessary
more than 120 °C (248 °F)	more than 135 °C ¹⁾ (275 °F) 150 °C ²⁾ (300 °F)		

◆ NOTE: Depending on the gained temperatures (coolant outlet temperature compared to cylinder head temperature) the aircraft manufacturer has to adapt the obtained limits in the relevant documentation (Operators Manual and/or Flight Manual).

¹⁾ engine type 912S / 914F

²⁾ engine type 912A / 912F

³⁾ Additional instruments for displaying coolant temperature marked with a 120 °C (248 °F) max. limit is necessary or new calibration of the CHT gauge to an aircraft specific cylinder head temp. See current relevant Installation Manual section "cooling system".

Procedure for engine installations for which the CHT-limit was reduced previously to 120 °C (248 °F) with the initial issue of this Service Bulletin:

This limit is conservative, as the actual temperature of the liquid is normally lower than the temperature of the aluminium head material. If no problems occur with exceeding of this limit of 120 °C (248 °F) no further verification is necessary.

Approval of translation to best knowledge and judgment - in any case the original text in the German language and the metric units (SI-system) are authoritative.

SERVICE LETTER

Non-approved modifications or use of ROTAX® unapproved engine components or accessories for ROTAX® Aircraft Engines

ATA System: 00-00-00 General

1) Planning information

To obtain satisfactory results, procedures specified in this publication must be accomplished with accepted methods in accordance with 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
912 i Series	all
915 i Series	all
916 i Series	all
912 Series	all
914 Series	all
2-stroke UL aircraft engines	all
2-stroke certified aircraft engines	all

1.2) Concurrent ASB/SB/SI and SL

In addition to this Service Letter 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) with relevance to perform this maintenance, repair or overhaul task.
- SL-912-006/SL-914-006, title "Use of third party after-market piston kits", current issue.

1.3) Reason

ROTAX® has been informed that third party after-market replacement kits, modifications and non-genuine ROTAX® components or accessories are presently being marketed. The manufacturer indicate partial diverse reasons such as performance increase, low fuel consumption etc. for their application. The various claims for increase in performance, fuel consumption reduction and enticing low prices are not approved by ROTAX® for ROTAX® aircraft engines.



WARNING

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

The use of any third party after-market replacement kits, modifications and non-genuine ROTAX® components or accessories is not approved by ROTAX® and may result in engine damage and/or engine failure resulting in personal injury and/or death.

SERVICE LETTER

1.4) Subject

Non-approved modifications or use of ROTAX[®] unapproved engine components or accessories for ROTAX[®] Aircraft Engines.

1.5) Compliance

NONE - For Information Only



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.

1.7) Labor time

Estimated labor hours:

Engine installed in the aircraft ---labor time will depend on airframe installation and therefore no estimate is available from the engine manufacturer.

1.8) Mass data

Change of weight - - - unknown.

Moment of inertia - - - unknown.

1.9) Electrical load data

No change.

1.10) Software modifications

No change.

SERVICE LETTER

1.11) References

In addition to this technical information refer to current issue of

- in general Illustrated Parts Catalog (IPC)
- in general Operators Manual (OM)
- in general Installation Manual (IM)
- in general Maintenance Manual Line (MML)
- in general Maintenance Manual Heavy (MMH)

NOTE: The status of the Manuals can be determined by checking the table of amendments. The 1st column of this table shows the revision status. Compare this number to the one listed on the ROTAX website:

www.flyrotax.com. Updates and current revisions can be downloaded for free.

1.12) Other Publications affected

None.

1.13) Interchangeability of parts

Not affected.

2) Material Information

2.1) Material

Price and availability will be provided on request by ROTAX® Authorized Distributors or their independent Service Centers.

2.2) Company support information

None.

2.3) Material requirement per engine

Not affected.

2.4) Material requirement per spare part

Not affected.

2.5) Rework of parts

None.

2.6) Special tooling/lubricants- /adhesives- /sealing compounds

None.

SERVICE LETTER

3) Accomplishment/Instructions

General

- ROTAX® reserves the right to make any amendments to existing documents, which might become necessary due to this standardization, at the time of next revision or issue.

Further material on general inspection, maintenance and repair can also be found in relevant Advisory Circular AC 43.13 from FAA.

Advisory Circular

The Advisory Circular (AC) contains maintenance methods, techniques and practices.

3.1) Illustrated Parts Catalog - related information



See current Illustrated Parts Catalog (IPC) for the respective engine type.

3.2) Installation - related information



See current Installation Manual (IM) for the respective engine type.

3.3) Operation - related information



See current Operation Manual (OM) for the respective engine type.

3.4) Maintenance (Line) - related information



See current Maintenance Manual Line (MML) for the respective engine type.

3.5) Maintenance (Heavy) - related information



See current Maintenance Manual Heavy (MMH) for the respective engine type.

3.6) Information about third party after-market replacement piston kits

The manufacturers of various modifications are suggesting that replacement of the parts in the ROTAX® engines can be easily undertaken by owners or operators. ROTAX® strongly recommends to have the maintenance, especially the removal and replacement of the engine components in ROTAX® engines carried out by ROTAX® authorized representatives, like an authorized Distributor, Service Center, or properly trained and endorsed technician.

WARNING

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

The use of non approved parts in ROTAX® engines is not recommended and is strongly discouraged.

No factory testing has been done with engines equipped with these third party replacement kits, modifications and non-genuine ROTAX® components or accessories in ROTAX® engines, therefore the effects on engine performance, reliability and serviceability cannot be predicted. The design, materials and workmanship has not been verified. Defects in design, materials or construction may result in engine damage and / or catastrophic engine failure.

Use of third party replacement kits, modifications and non-genuine ROTAX® components or accessories or spare parts (e.g. pistons, cylinder, carburetor, fuel injection system, turbo charger retrofit set,...) may result in some or more of the following:

- cylinder and piston failure
- crankshaft or connecting rod failure
- damage to crankcase
- lean mixture operating conditions resulting in rough running and / or valve seat- and valve guide burning
- damage from detonation or pre-ignition
- hard starting
- damage to the reduction gear unit
- negative effect on different systems (fuel system, lubrication system, cooling system)

The manufacturers of some third party replacement kits are also supplying instructions for the removal and replacement of components in the ROTAX® engines. These instructions may not be complete and may lead to engine damage during disassembly or re-assembly of the engine.

Engine damage may also occur due to incorrect re-assembly of the engine or by the improper reuse of parts such as O-rings and seals.

WARNING

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

Removal and replacement of components in the ROTAX® engines is a procedure that requires the correct tools and proper training, and should not be attempted outside of a ROTAX® Authorized Distributor or Service Center.

Damages resulting from the use of any improper third party replacement kits, improper modifications and improper non-genuine ROTAX® components or accessories will not be covered by the ROTAX® limited warranty on the engine.

SERVICE LETTER

3.6.1) Example of a “repaired” crankshaft

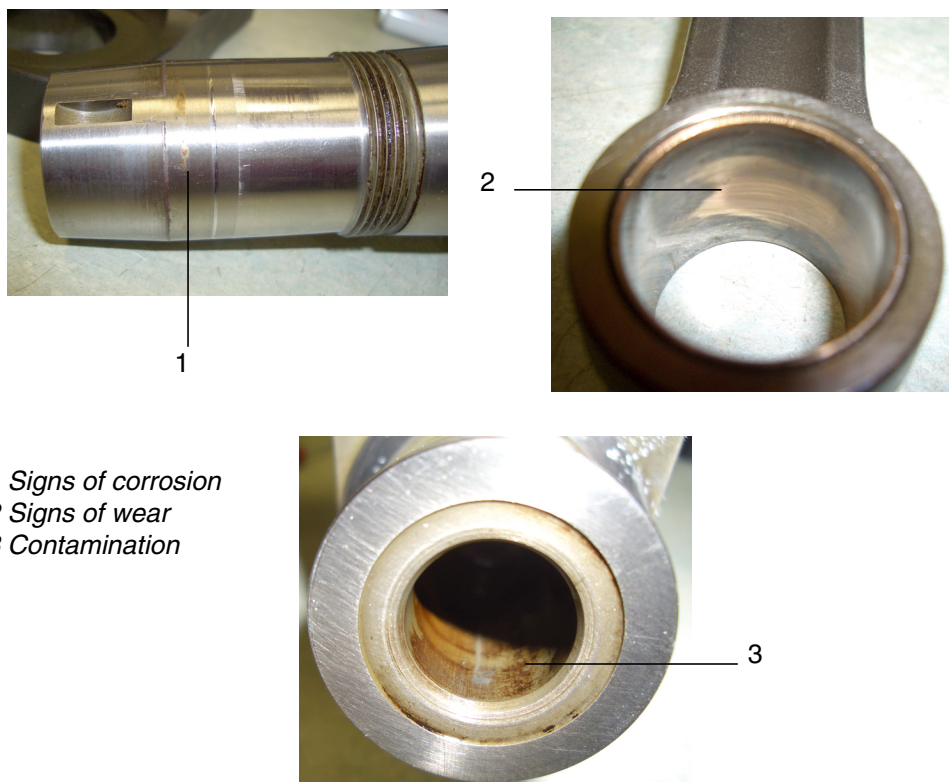
See Fig. 1.

A supposed exchange crankshaft was purchased and was tested for its quality of repair and overhaul according to the ROTAX® instructions and following was found:

- The crankshaft has a ROTAX® part no. 888164 and a serial number (S/N) of S/N 11798, but was not marked as overhauled and shows some serious deficiencies:
 - signs of corrosion in the area of the oil seal (pos. 1)
 - crankshaft was beyond the out of round limit
 - torque at twist test was below limit
 - a conrod bearing shows signs of wear (pos. 2)
 - contamination in the oil channels (pos. 3)

Such a crankshaft is not airworthy and should not be installed or any parts reused according to ROTAX® instructions.

NOTE: The repair has neither a work report nor a release certificate (e.g. Form One Tag) available.



1 Signs of corrosion
2 Signs of wear
3 Contamination

Fig. 1
Crankshaft

08365,08366,08367

d06945.fm

3.6.2) Example of non-genuine ROTAX® oil filter

See Fig. 2.

Based on reports from the field a non-genuine ROTAX® oil filter was tested for its quality and suitability according to the ROTAX® instructions, where following was found:

- The oil filter infringes on copyright/without permission from ROTAX® a ROTAX ENGINE Type 912/914 label (pos. 1) and has some serious technical deficiencies:
 - no by-pass valve (pos. 2) = in case of contamination this can lead to a completely blocked oil system
 - filter insert (pos. 3): shorter than the genuine = less filter surface and reduced dirt pick-up
 - no genuine ROTAX® part number
 - sharp-edged inner spring (pos. 4) = this can cause wear and cracks in the filter housing
 - no return-valve (pos. 5) = after switching-off the engine self-draining of the oil filter will not be avoided. When the engine is started again it will require a longer time (less film lubrication) until the necessary operating pressure is reached.

Such an oil filter is not airworthy and should not be installed or be further used according to ROTAX® instructions

non-genuine ROTAX® oil filter

- 1 Label
- 2 By-pass valve
- 3 Oil filter insert
- 4 Spring
- 5 No return valve installed

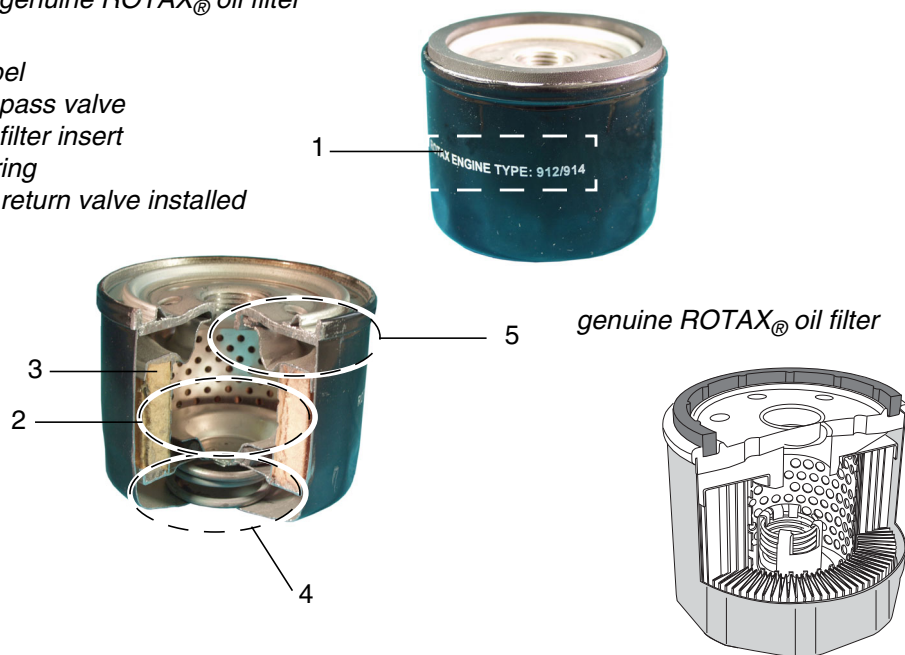


Fig. 2
Oil filter

08452,08426,08427

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SERVICE LETTER

3.6.3) Example of a non-genuine ROTAX electric starter

See Fig. 3 and Fig. 4.

Based on reports from the field a non-genuine ROTAX[®] electric starter for ROTAX[®] 912/914 was verified for its quality and suitability according to the ROTAX[®] instructions, where following was found:

- The electric starter uses a ROTAX[®] 912/914 engine label (pos. 5) without permission from ROTAX[®] and has some serious technical deficiencies:
 - no oil seal (pos. 1) in support (pos. 2)

WARNING

Non-compliance with these instructions could result in engine damages, personal injuries or death.
This can cause oil return issues into the oil tank due to loss of crank-case pressure.

- no genuine ROTAX[®] part number (pos. 3)
- no standard serial number (pos. 4), which is signed on essential components for traceability at ROTAX[®]

Such an electric starter is not airworthy and should not be installed or be further used according to ROTAX[®] instructions.

Non-genuine ROTAX[®] electric starter



5 Engine label



Fig. 3

09459,09460

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SERVICE LETTER

Genuine ROTAX® electric starter

- 1 Oil seal
- 2 Support
- 3 Genuine ROTAX® part number
- 4 Genuine ROTAX® serial number

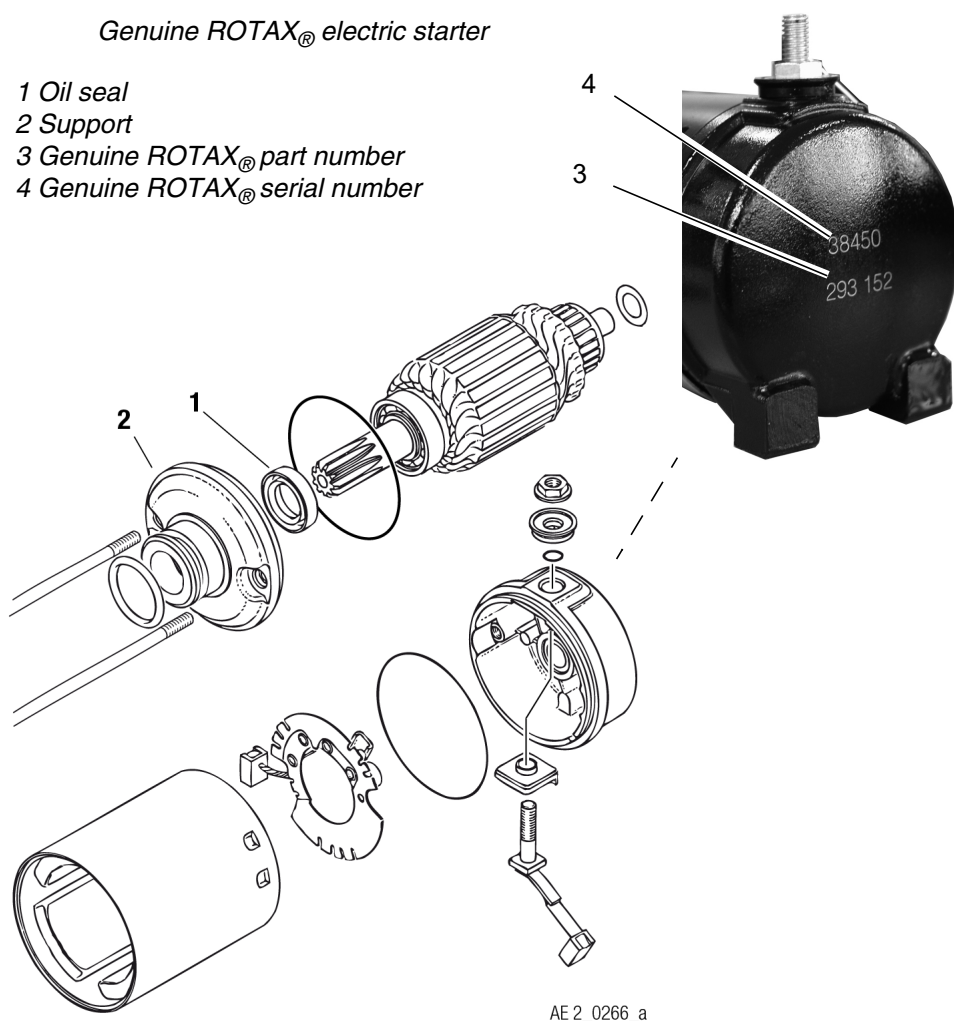


Fig. 4

SERVICE LETTER

3.6.4) Example of a non-genuine ROTAX® air filter

See Fig. 5.

Based on reports from the field a non-genuine ROTAX® air filter for ROTAX® 915 iS engine was verified for its quality and suitability according to the ROTAX® instructions, where following was found:

- A 9 mm (0.355 in.) hole (pos. 1) was present at the clamping side of the filter. This can allow unfiltered air, moisture and contamination to be ingested and damage turbocharger and other internal engine components
- no ROTAX® logo nor no genuine ROTAX® part number (pos. 2) was present

Such an air filter is not airworthy and should not be installed or be further used according to ROTAX® instructions.

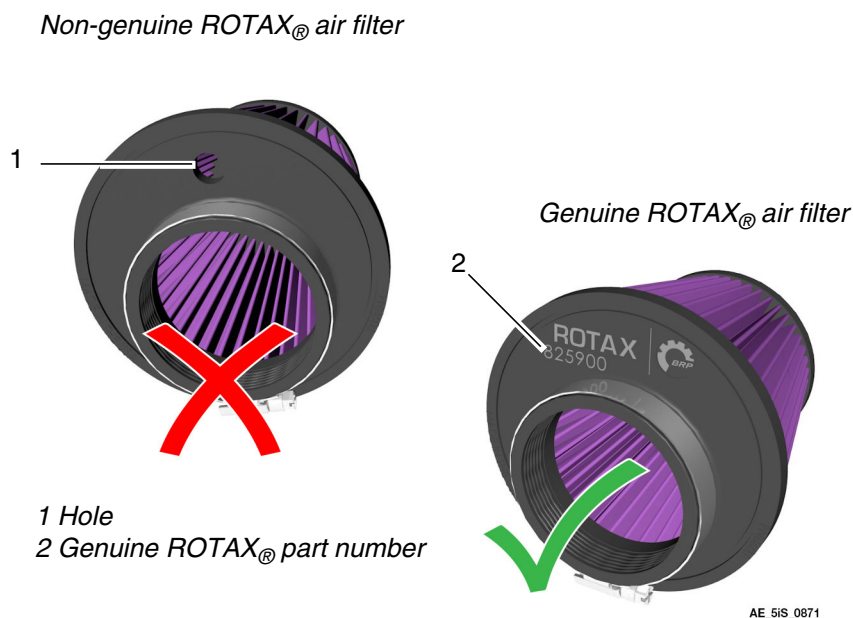


Fig. 5

3.7) Recommendation

- Ensure before purchase the source and technical release of the part
- For repaired and overhauled parts request the relevant report and take care that these are documented in accordance with ROTAX® instructions
- For certified parts/engines request further on an Airworthiness Approval Tag.

SERVICE LETTER

3.8) Summary

- The use of any third party replacement kits, modifications and non-genuine ROTAX® components or accessories for ROTAX® engines is NOT approved by ROTAX® and is very strongly discouraged.
- Use of any improper third party replacement kits, improper modifications and non-genuine ROTAX® components or accessories may cause engine damage resulting in catastrophic engine failure
- Damages resulting from the use of any improper third part replacements kits, improper modifications and improper non-genuine ROTAX® components or accessories will not be covered by the ROTAX® limited warranty on the engine.

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

NOTE: Work on EASA certified parts might affect the EASA Form 1 and does require appropriate documentation by authorized persons. Repairs must be entered into the engine logbook and also do apply for the EASA Form 1.

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.

3.9) Inquiries

Inquiries regarding this Service Letter 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 <https://dealerlocator.flyrotax.com>.

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

Exploded views are **not technical drawings** and are for reference only. For specific detail, refer to the current documents of the respective engine type.