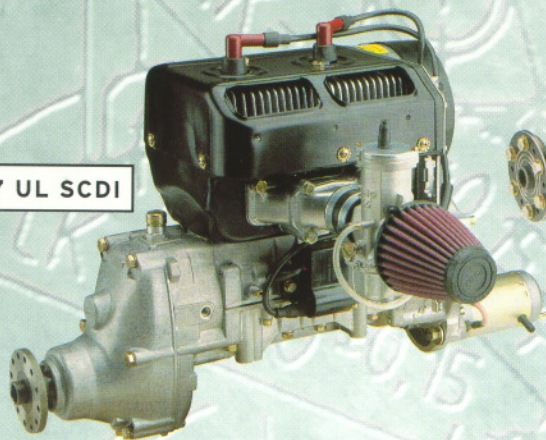


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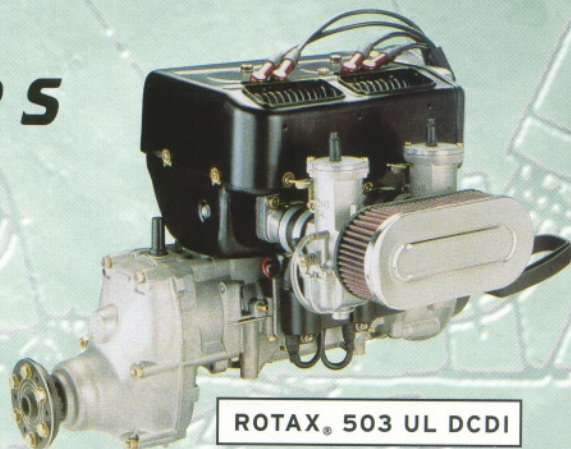
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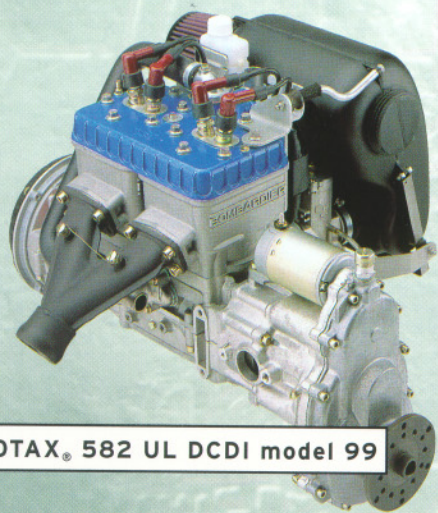
Maintenance Manual for Engine Types



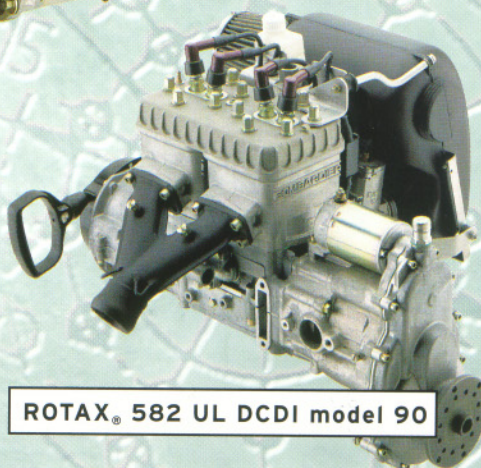
ROTAX® 447 UL SCDI



ROTAX® 503 UL DCDI



ROTAX® 582 UL DCDI model 99



ROTAX® 582 UL DCDI model 90

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⚠ WARNING

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

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

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5) Introduction

Thank you for using a ROTAX® aircraft engine.

Before carrying out maintenance work on the engine, carefully read the Maintenance Manual. It provides you basic information on safe operation of the engine.

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



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5.1) Remarks

The purpose of this Manual is to familiarize the maintenance staff approved by the local aviation authorities with some basic maintenance and safety information.

For competent maintenance and servicing, please, refer to the documentation provided in the Operator's Manual, Installation Manual and Illustrated Parts Catalog.

For additional engine-, maintenance- and parts information you may also contact the nearest ROTAX[®] aircraft engine distribution partner.

5.2) Engine serial number

On all enquiries or spare parts orders, always indicate the engine serial number, as the manufacturer makes product improvement modification to the engine. The engine serial number is located on the top of the crankcase, magneto side or the ignition cover (see fig. 001, 002, 003).

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6) Safety

Although the mere reading of such an instruction does not eliminate a hazard, the understanding and application of the information will promote correct use.

The information and components-/system descriptions contained in this Maintenance 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 Maintenance 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 brackets. Where precise accuracy is not required, some conversions are rounded off for easier use.

6.1) Repeating symbols

This Manual uses the following symbols to emphasize particular information. These indications are important and must be respected.

- ▲ **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.

6.2) Safety information

- ▲ **WARNING:** This engine, by its design, is subject to sudden stoppage! Engine stoppage can result in forced landings, no power landings or crash landings. Such crash landings can lead to serious injury or death.
- ▲ **WARNING:** Never fly the aircraft equipped with this engine at locations, air-speeds, altitudes, of 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.
- ▲ **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.



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- ☞ 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® makes no warranty or representation on the suitability of its engine's use on any particular aircraft. Further, ROTAX® makes 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.
- ☞ 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 to the maintenance, operation and any additional information which may be given to you by your dealer.
- ☞ Select and use proper aircraft instrumentation. This instrumentation is not included in the ROTAX® engine package. Only approved instrumentation can be installed.
- ☞ 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.
- ☞ To prevent unauthorized use, never leave the aircraft unattended with the engine 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.
- ☞ Keep an engine log and enter any unusual engine behaviour. Do not fly unless you have corrected a given problem and recorded the remedy in the log.
- ☞ 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 that any loose equipment or tools are properly secured before starting the engine.
- ☞ Never leave your aircraft or other vehicle unattended while the engine is running. If operated by someone else you could be sued even if the use was unauthorized by you.
- ☞ When in storage protect the engine and fuel system from contamination and exposure.
- ☞ Never operate the engine and gearbox without sufficient quantities of lubricating oil.
- ☞ Periodically verify level of coolant on 582 UL DCDI and 582 UL DCDI mod. 99.
- ☞ Never exceed maximum rated rpm. and allow the engine to cool at idle for several minutes before turning off the engine.

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- ☞ Operating the engine at high rpm. at low throttle position, for example during descent, may increase engine and exhaust temperatures and cause critical overheating. Always compensate and match rpm. with throttle position.
- ☞ Maintain your engine in top condition and assume it's going to quit running at any time. Leave yourself a way out in the event of unexpected failure.
- ☞ Never mix fuel in an enclosed area, or where fumes could reach the ignition point.
- ☞ Make sure all engine controls are operative, that you know ON and OFF positions of throttle and ignition, that they are easily accessible, and that you can operate them instinctively without hesitation.
- ☞ Never refuel if fuel could be spilled on hot engine components. Use only safety approved fuel containers and never transport fuel in an unsafe manner.
- ☞ Check engine suspension frequently as well as the drive components, fuel lines, wiring, and fuel and air filters.
- ☞ Check for fuel contamination, air vents, etc. Protect engine while not in use from any contamination entering fuel or carburetion system, but be sure to remove storage protection before starting the engine.

6.3) General operating and safety instructions

- ☞ Please, observe besides the instructions in our documentation also the generally valid safety- and accident preventive prescriptions and legal regulations as well as the relevant regulations by the competent aeronautical authorities.
- ☞ The information contained in the Maintenance Manual is based on data and experience and is considered to be applicable for a professional technician under normal working conditions. The instructions given in the Maintenance Manual are useful and necessary supplements to personal instruction, but can by no means substitute theoretical and practical personal instruction.
- ☞ The manufacturer or supplier has no influence on the personnel and operational conditions of the buyer and assumes no responsibility for sustaining effect of the personal instructions.
- ☞ We point to the fact that spare parts and accessories not supplied as genuine ROTAX® parts are not tested and therefore not released by ROTAX®. Installation and/or use of such products may change and negatively affect the constructive properties of the engine. For damages due to use of non-genuine parts and accessories ROTAX® refuses any liability.
- ☞ Unauthorized modifications and use of components or accessories not corresponding with the installation instructions exclude any liability of the manufacturer.
- ☞ The engine is accurately tested before delivery, this however does not exclude hazards in case of incompetent handling.
- ☞ Before taking the engine into operation, make yourself familiar with the respective controls and their function. Searching during operation is too late! In case of vibrations or unusual noise, stop the engine and remedy the cause.



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- ☞ Attention when draining hot oil: Danger of scalds!
- ☞ Disposal of used oil, fuels and filters as per local regulations.
- ☞ Liquids emerged (fuel or acids) can penetrate the skin and cause bad caustic injury. In case of accident immediately consult a doctor as bad infections may be engendered.
- ☞ Cleaning the engine with lye or alkaline solutions is forbidden, as a matter of principle. Use of a high pressure cleaner may cause engine failures and rust formation.
- ☞ When working on the electric system and on the engine, first detach the cable of the minus-pole and then of the plus-pole of the battery! When connecting the cables, first connect the plus- and then the minus-pole.
- ☞ Firmly attach the engine removed from the aircraft on an assembly trestle.
- ☞ Do not let the engine run in a closed room (poisoning hazard)!
- ☞ Always observe the engine while running from a secure place.
- ☞ When stopping the engine, switch off ignition and remove ignition key.
- ☞ Before refuelling, always stop the engine and remove ignition key. Do not refuel in closed rooms. Immediately clean off spilt fuel.
- ☞ At handling of fuel be very careful - increased fire danger! Never refuel in the vicinity of open flames or sparks able to ignite. Do not smoke when refuelling.
- ☞ Only use oil and fuel of the specified quality and store them in approved containers only.

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7) Technical documentation

The information given in the

- Installation Manual
- Operator's Manual
- Maintenance Manual
- Service Informations
- Spare Parts List

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

■ **ATTENTION:** Due to the fast technical progress and fulfilment of particular specifications of the customers, it may occur that existing laws, safety prescriptions, constructional and operational regulations cannot be transferred completely to the object bought, in particular for special constructions, or may not be sufficient.

◆ **NOTE:** The illustrations in this Maintenance Manual are stored in a graphic data file and are provided with a consecutive irrelevant number.

This number (00123) is of no significance for the content.

7.1) Use for intended purpose

- ☞ The engines are intended for use in non certified aircraft. In case of doubt the regulations of the national authorities or the respective sportive federations have to be observed.
- ☞ Use for intended purpose also means respecting the prescribed operational-maintenance and repair conditions. This also increases the engine lifetime.
- ☞ **Never** run the engine without propeller, this causes inevitably engine damage and hazard of explosion.

7.2) Instruction

Engines require instructions regarding their application, use, operation, maintenance and repair.

Technical documentation and directions are useful and necessary complementary elements for personal instruction, but can by no means substitute theoretical and practical instructions. These instructions should cover explanation of the technical context, advice for operation, maintenance, use and operational safety of the engine.

- ☞ This engine must only be operated with accessories supplied, recommended and released by ROTAX[®]. Modifications are only allowed after consent by the engine manufacturer.



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- **ATTENTION:** Spare parts must meet with the requirements defined by the engine manufacturer. This is only warranted by use of GENUINE ROTAX[®] parts and/or accessories (see illustrated parts catalog).

They are available only at the authorized ROTAX[®] Distribution- and Service partners.

If using other than GENUINE ROTAX[®] parts and/or accessories, any warranty by ROTAX[®] becomes void (see Warranty Conditions).

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8) General

The engine in principle consists of several main components and auxiliary units described in the following paragraphs.

8.1) Description

Refer to section 7 in the current Operator's Manual 447 UL SCDI - 503 UL DCDI - 582 UL DCDI mod. 99.

8.2) Technical data

8.2.1) 447 UL SCDI

Description:	Two-cycle, two-cylinder in line engine, mixture lubrication, fancooled or free air cooled
Bore:	67,5 mm (2,657 in.)
Stroke:	61 mm (2,40 in.)
Displacement:	436,5 ccm (26,635 cu.in.)
Compression ratio:	theoretical 9,6 effective 6,3
Power output: 1-carburetor:	29,5 kW (40,0 HP) at 6500 RPM
Max. torque:	approx. 46 Nm at 6000 RPM.
Max. rpm:	6800 RPM.
Direction of engine rotation:	counter-clockwise, viewed towards p.t.o. (without reduction gear-box)
Cylinder:	2 light alloy cylinders with cast iron sleeves
Piston:	Cast aluminium piston with 2 piston rings
Piston/cylinder clearance:	0,05 (.00197 in.)
Ignition system:	breakerless DUCATI capacitor discharge single ignition with magneto generator
Generator output:	170 W AC at 6000 1/min. and 13,5 V
Ignition timing:	1,88 mm = .0740 in. (18 °) B.T.D.C.
Spark plug:	14 mm, BR8ES
Electrode gap:	0,5 mm (.02 in.)
Carburetor:	BING 36 mm (1,417 in.), cable choke
Fuel pump:	pneumatic fuel pump DF 44
Fuel:	regular Gasoline, octane number not below MON 83 or RON 90 (unleaded preferred)



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Lubrication oil of engine:	SUPER 2-stroke oil (for high performance air cooled 2-cycle engines, proposed ASTM/CEC standard API-TC) mixing ratio 1 : 50 (2 per cent)
Lubrication oil of gear-box:	Gear oil, API-GL5 or GLSAE 140 EP, or 85 W - 140 EP
Starter:	Rewind Starter
Direction of prop. shaft rotation:	clockwise, viewed towards propeller flange
Cooling:	Fan cooled or free air cooled
Weight:	Engine without carburetor, intake silencer, fuel pump, exhaust system: 26,80 kg (59,00 lb.)
Optional features: Intake silencer:	for I-carburetor engine version ■ ATTENTION: If engine is supplied without intake silencer, the carburetor calibration must be modified for use with intake silencer.
After-muffler:	After-muffler to be fitted in addition to the standard muffler.
Air filter:	1) to be fitted directly on carburetor 2) to be fitted on the intake silencer
Electric starter:	electric starter, magneto side, without rewind starter (gearbox is possible)
Rectifier-regulator:	1) 866 080 requires minimum load of 12 V (1 Amp) to regulate 2) 264 870 no minimum load is required
Reduction gearbox: type „B“:	with torsional shock absorber ratios available: $i = 2,0 / 2,24 / 2,58 / 3,0$ max. allowed moment of inertia of propeller: 3000 kg cm^2
type „C“:	ratios available: $i = 2,62 / 3,0 / 3,47 / 4,0$ max. allowed moment of inertia of propeller: 6000 kg cm^2
High altitude compensator:	automatic high altitude adjustment of carburetor calibration, with modified carburetor (on request)

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8.2.2) 503 UL DCDI

Description:	two-cycle two cyl. engine in line, mixture lubrication or oil injection lubrication, fan cooled or free air cooled.
Bore:	72,0 mm (2,84 in.)
Stroke:	61 mm (2,40 in.)
Displacement:	496,7 ccm (30,31 cu.in.)
Compression ratio:	theoretical 10,8
Power output:	a) single carb.: 34,0 kW (46 hp) at 6500 RPM b) twin carb.: 37,0 kW (50,0 hp) at 6600 RPM
Max. torque:	a) 51 Nm b) 55 Nm
Max. rpm:	6800 RPM.
Direction of engine rotation:	counter-clockwise, viewed towards p.t.o. (without reduction gear-box)
Cylinder:	2 light alloy cylinders with cast iron sleeves
Piston:	Cast aluminium piston with 2 piston rings, one semi-trapez ring (top) and one rectangular ring
Piston/cylinder clearance:	0,07 ÷ 0,08 mm (.0028 ÷ .0032 in.)
Ignition system:	breakerless DUCATI capacitor discharge dual ignition with magneto generator.
Generator output:	170 W AC at 6000 RPM and 13,5 V
Ignition timing:	1,47 mm = .059 in. (16 °) BTDC
Spark plug:	14 mm, BR8ES
Electrode gap:	0,4 ÷ 0,5 mm (.016 ÷ .02 in.)
Carburetor:	2 x Bing 36 mm (1,42 in.), cable choke
Fuel pump:	pneumatic fuel pump DF 52
Fuel:	regular Gasoline, octane number not below MON 83 or RON 90 (unleaded preferred)
Lubrication oil of engine:	1) oil-in-fuel with Super-two stroke oil, proposed ASTM/CEC standard API-TC, mixing ratio 1:50 (2%) 2) by oil pump (optional) with the same oil ■ Attention: pour point 10 ° C below lowest operating temperature

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Lubrication oil of gear-box: or	Gearoil, API-GL5 or GL6 SAE 140EP, 85 W - 140 EP
Starter:	Rewind starter
Direction of prop. shaft rotation:	Clockwise, viewed towards propeller flange
Cooling:	Air cooled by axial fan, or free air for special applications

Weight without carburetor, intake silencer, fuel pump, exhaust system:
30,4 kg (67,0 lb.)

Optional features:

After-muffler:	After-muffler to be fitted in addition to the standard muffler.
Air filter:	1) to be fitted directly on carburetor 2) to be fitted on the intake silencer
Electric starter:	1) electric starter, magneto side, without rewind starter (gearbox is possible) 2) electric starter on "E" type gear- box
Rectifier-regulator:	1) 866 080 requires minimum load of 12 V (1 Amp) to regulate 2) 264 870 no minimum load is re- quired
Reduction gearbox: Type „B“:	with torsional shock absorber ratios available: $i=2,0/2,24/2,58/3,0$ The gearbox $i = 3,0$ can be deliv- ered only installed on engine. The max. allowed moment of inertia of the propeller is 3000 kg cm^2
Type „C“ and „E“: Max. allowed moment of inertia of propeller:	ratios available: $i=2,62/3,0/3,47/4,0$ 6000 kg cm^2
High altitude compensator:	Automatic high altitude adjustment of carburetor calibration, with modi- fied carburetor (on request)

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8.2.3) 582 UL DCDI and 582 UL DCDI mod.99

Description:	Two-cycle, two-cylinder-, in line rotary valve engine, mixture lubrication or by oil injection, liquid cooled, with integrated water pump and two-way thermostat.
Engine configurations:	dual ignition, 2-carburetors
Bore:	76,0 mm (2,99 in.)
Stroke:	64,0 mm (2.52 in.)
Displacement:	580,7 ccm (35,44 cu.in.)
compression ratio:	Theoretical: 11,5 - effective: 5,75
power output:	a) 48 kW (64,4 hp SAE) at 6500 RPM; b) 40 kW (53,6 hp SAE) at 6000 RPM; Match propeller to achieve above indicated full load r.p.m. as per engine version.
Torque:	a) 75 Nm (55,3 ft.lb.) at 6000 RPM; b) 68 Nm (50,1 ft.lb.) at 5500 RPM;
Max. rpm.:	a) 6800 RPM. b) 6400 RPM.
Direction of rotation:	Counter-clockwise, viewed towards p.t.o. (without reduction gearbox)
Cylinder:	2 light alloy cylinders with cast iron sleeve
Piston:	Cast aluminium piston with 2 piston rings
Ignition system:	Breakerless DUCATI capacitor discharge dual ignition with magneto generator
Generator output:	170W AC at 6000 RPM and 13,5 V
Ignition timing:	1,96 mm = .077 in. (18 °) BTDC
Spark plug:	14 mm, BR8ES
Electrode gap:	0,5 mm (.02 in.)
Rotary valve:	924 200, cut-off section 132 °
Rotary valve timing:	Opens 130° BTDC - closes: 50° ATDC Measured on crankcase openings, ± 4 ° tolerance
Carburetor:	2 x BING 36, cable choke
Fuel pump:	Pneumatic fuel pump DF 52

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Fuel:	Regular or premium gasoline, octane number not below MON 83 or RON 90 (unleaded preferred)
Lubrication oil of engine:	1) Oil-in-fuel with Super-two stroke oil, proposed ASTM/CEC standard API-TC, mixing ratio 1:50 (2%) 2) By oil pump (optional) with the same oil Attention: pour point 10 ° C below lowest operating temperature
Lubrication oil of reduction gear:	Gear oil API-GL5 or GL6, SAE 140 EP, or 85 W-140 EP
Direction of propeller shaft:	Clockwise, viewed towards propeller flange
Starter:	Rewind starter
Standard version includes :	Engine with <ul style="list-style-type: none">- carburetors with clamps- fuel pump- exhaust system
Weight:	29,3 kg (64,6 lb.) (without: exhaust system, carburetor, intake silencer, fuel pump, radiator)

Optional Features

Oil pump lubrication:	The engine is lubricated by an oil pump fitted to the engine. The carburetor is supplied with pure gasoline.
Intake silencer:	2) For 2-carburetor engine version ■ ATTENTION: If engine was supplied without intake silencer, the carburetor calibration must be modified for use with intake silencer.
After-muffler:	Special after-muffler to be fitted in addition to the exhaust muffler.
Airfilter:	1) To be fitted directly on carburetor 2) To be fitted in the intake silencer 3) Double filter (one filter for both carburetors)

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High altitude compensator:	Automatic high altitude adjustment of carburetor calibration, with modified carburetor (on request)
Electric starter:	1) Rewind starter with electric starter, p.t.o. side, for engine without gear box, 2) Electric starter, magneto side, without rewind starter (gearbox is possible)
Rectifier-regulator:	1) 866 080 requires minimum load of 12 V (1 A) to regulate 2) 264 870 no minimum load is required.

8.3) Components

See fig. 001, 002, and 003.

- | | | | |
|-----|--------------------|------|--|
| (1) | Propeller flange | (7) | Electric starter |
| (2) | Propeller gear box | (8) | Oil pump |
| (3) | Intake manifold | (9) | Electronic module(es) of ignition unit |
| (4) | Carburetor | (10) | Ignition housing |
| (5) | Water pump | (11) | Engine serial number |
| (6) | Exhaust manifold | (12) | Oil tank |

8.3.1) 447 UL SCDI

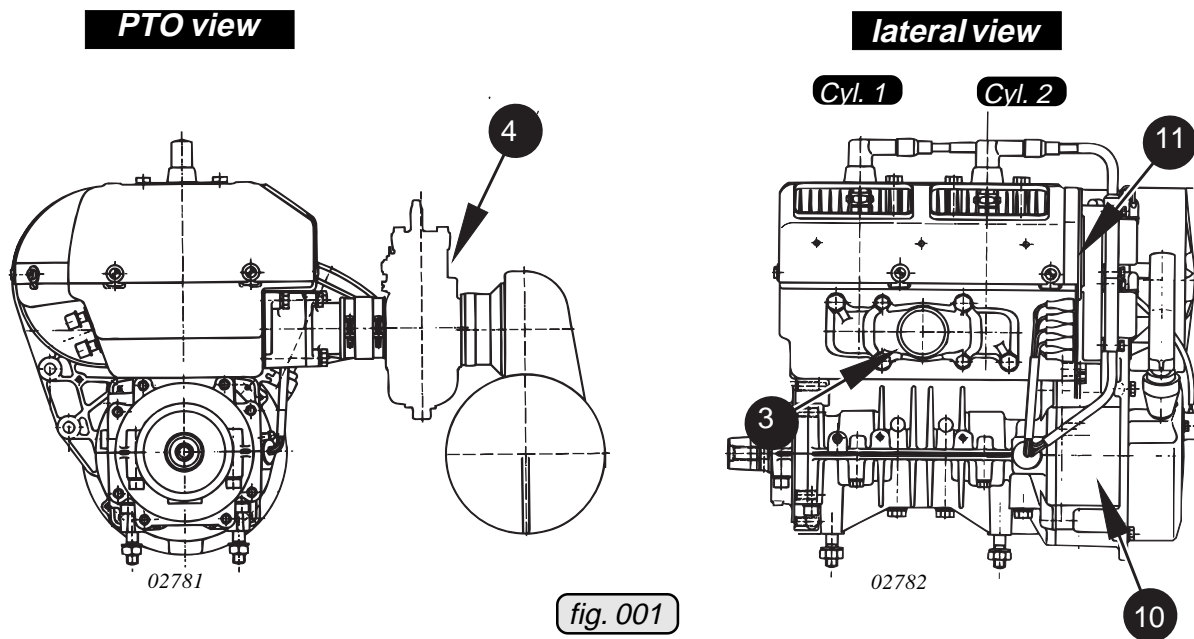
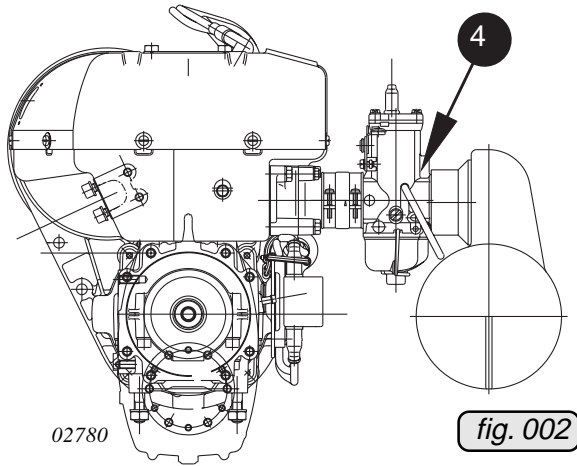


fig. 001

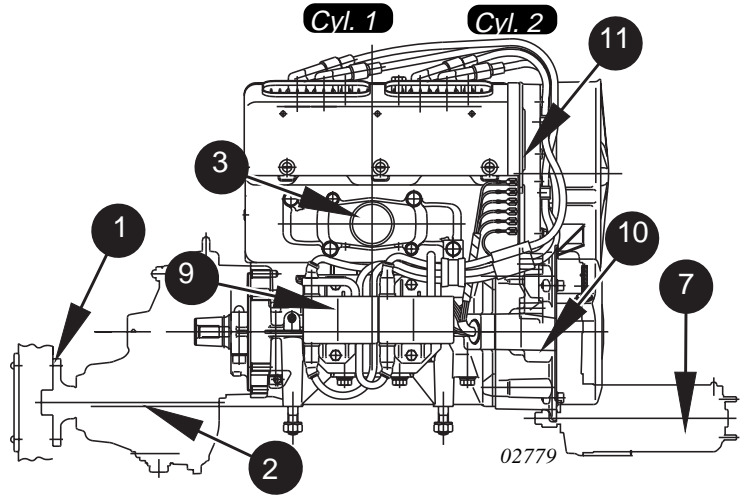
◆ Note: Illustration shows 447 UL with rewind starter, intake silencer, without gearbox.

8.3.2) 503 UL DCDI

PTO view



lateral view



◆ Note:

Illustration shows 503 UL DCDI with electric starter, intake silencer, and "B" type gearbox.

8.3.3) 582 UL DCDI

PTO view

lateral view

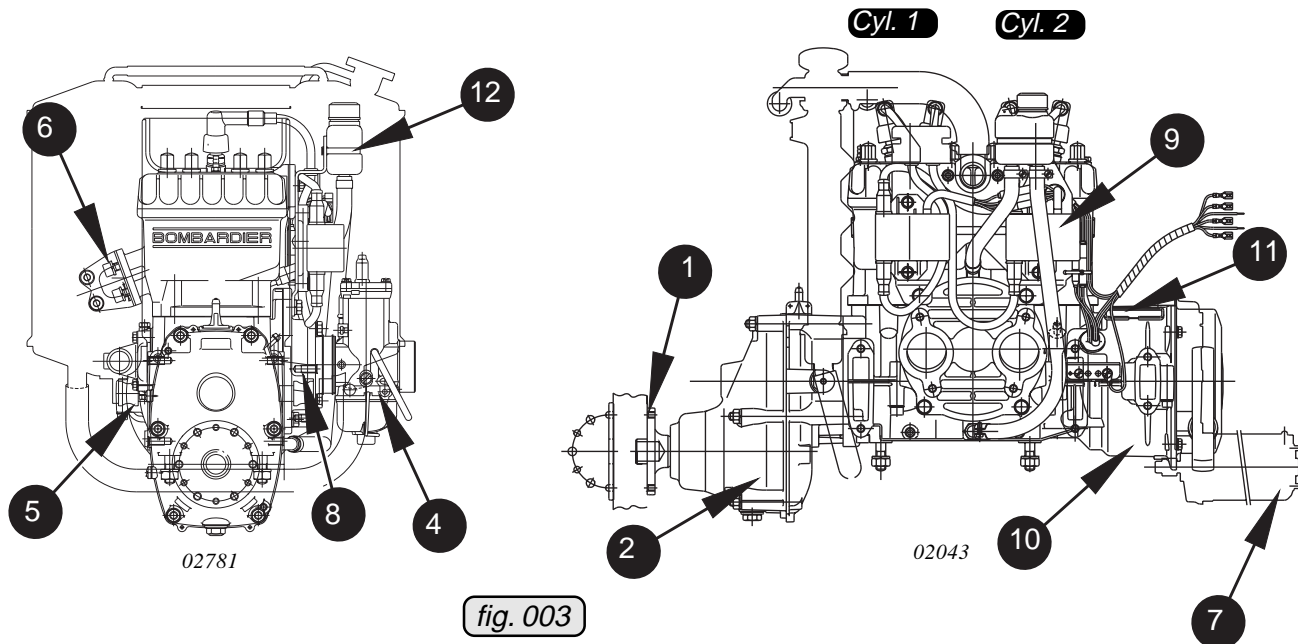


fig. 003

◆ Note: Illustration shows 582 UL DCDI with electric starter and “B” type gearbox.

d00374

9) Maintenance

In this Manual the maintenance of the engines 447 UL SCDI, 503 DCDI and 582 UL DCDI and 582 UL DCDI mod. 99 are described. The Manual is subdivided into sections and description of function of the various systems. Some overlapping maintenance instructions are treated as generally valid information at the beginning of this section.

The information given in the Maintenance Manual is based on data and experience which is considered to be applicable for a skilled mechanic under normal working conditions. The guidelines given in the Maintenance Manual are useful and necessary supplements to training. They, however, cannot substitute competent theoretical and practical personal instruction.

Maintenance of engines and systems requires special knowledge and special tools.

We particularly emphasize that parts and accessories not supplied as genuine ROTAX[®] parts are not verified for suitability by ROTAX[®] and thus are not released for use. Installation and/or use of such products may possibly change or negatively influence the design characteristics of the engine. For damages resulting from use of non-genuine parts and accessories ROTAX[®] refuses any liability.

Non-authorized modifications as well as the use of components and auxiliary components not corresponding to the installation instructions exclude any liability of the engine manufacturer.

Besides our instructions in the documentation supplied, also respect the generally valid safety and accident preventive directives and legal regulations.

9.1) General proceeding instructions

When carrying out maintenance and service work, respect without fail the safety regulations. At maintenance of cooling, lubricating and fuel system take care without fail that no contamination, metal chips, foreign material and/or dirt enters the system. Use only mallet (plastic or rubber) for dis- and re-assembly of parts.

Never loosen or tighten screws and nuts with pliers but only with the specified tools.

Before each reassembly check assembled components for missing parts. Only use the adhesives, lubricating, cleaning agents and solvents indicated in the maintenance instructions. If not respected, damage may be the consequence.

Exactly observe the tightening torques for screws and nuts. Overstretching or too loose tightening may cause severe engine damage.

Before re-using parts disassembled, clean, check and refit them per instructions.

9.2) Trouble shooting

In the Operator's Manual there is a list of possible failures as well as indication of possible remedy. For details refer to the Repair Manual 462-532-582.

See current Operator's Manual for engine types 447 UL SCDI, 503 DCDI, 582 UL DCDI mod. 99.

9.3) Basic information

To warrant correct servicing of the engine, the use of genuine parts is required. Use of special tools, devices and lubricating media is necessary.

▲ WARNING: Only qualified personnel trained especially for this engine are allowed to carry out the maintenance and service work.

Only use clean screws and nuts. Check the contact faces and threads for damages. In case of doubt, use new screws and nuts.

Always replace self-locking nuts once removed.

Respect without fail the tightening torques indicated in the respective table.

Replace all sealing rings, gaskets, lock washers, O-rings and oil seals at engine re-assembly.

9.4) Auxiliary tools

See fig. 004.

- Screwdriver ground to shape for piston pin circlip removal
- Compression tracer and 2 pressure gauges, adapter for dial gauge in spark plug thread
- Stud extraction tool
- Scraper, lapping fleece, grinding wheel, cover sheet, adhesive tape
- Cleaning agent, approved cleaners, funnel, graphite marker.

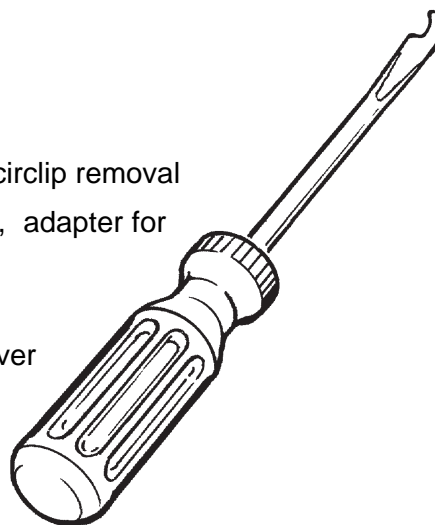


fig. 004

00141

9.5) Measuring tools

Vernier callipers,

Dial gauge,

Micrometer, internal micrometer,

Feeler gauge,

Stroboscope: Supply voltage 8 - 15 V. Flash triggering by inductive pick-up.

Multimeter: Electronic, 3 1/2 digits indication.
Current range 10 A.
Direct voltage range 200 V minimum.
Resistance range 200 W ÷ 2 MW
Acoustic continuity tester.

Oscilloscope: 2 channels
Analogous
Sensitivity 5 mV to 5V/div
Frequency limit 50 MHz

▲ WARNING: Using these instruments, observe the manufacturer's specifications.

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9.6) Special tools and devices

For the special tools required, refer to the current engine, illustrated parts catalog.

9.7) Consumable materials

9.7.1) Two stroke oil

In principle motor oil is used for lubrication of components during re-assembly, except where specified otherwise. Use only oils specified in the "Lubricant Chart" in order to avoid chemical reaction.

9.7.2) Lithium grease

Is used on all electrical connections, to avoid leakage current. After assembly is complete, apply Lithium grease to the connection as anti-corrosive.

9.7.3) Multi-purpose grease LZ

Generally usable, neutrally coloured multipurpose grease, water resistant and highly adherent. Usable for temperatures from -35°C to +120°C (-31°F to 248° F). The grease resists to mechanical load.

9.7.4) Corrosion inhibiting oil MOBILARMA 524

Corrosion inhibiting oil, insoluble in water, hydrocarbon basis with additives. The pour point is below -18° C (-3° F).

▲ **WARNING:** When handling chemicals, respect the generally valid safety directives.

9.7.5) Grease MOLYKOTE G-N

Is used on highly loaded bearing positions as initial lubrication and at press fits for prevention of fretting corrosion. MOLYKOTE is applied to both components mated. It is especially mentioned where to use it.

9.7.6) LOCTITE Anti-Seize 76710

High-temperature lubricating and anti-corrosion agent. LOCTITE Anti-Seize is always applied on both components mated and warrants for maintenance-free bearing seats due to the hermetically sealed sliding surface.

9.7.7) SILASTIC

Is used for vibration damping of the exhaust system springs. Run a bead of silastic from one end to the other of the springs.



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9.7.8) **LOCTITE "574 orange"**

Is a sealing material used as an alternative to conventional solid gaskets where a high friction factor and exactly defined distance between parts is required. LOCTITE sealing compound is a solvent-free liquid gasket applied to the sealing surfaces. After assembly it cures under hermetical conditions with metal contact within several hours. This gives a sealing completely adapted to the surface structure of the parts to be sealed.

Its surface sealing properties are guaranteed for temperature range between - 55°C and + 200°C (- 67°F to + 390°F). No corrosion is possible in the sealing gap.

9.7.9) **LOCTITE "648 green"**

Heavy duty adhesive or screw securing agent. Its cure time depending on the materials and temperatures is max. 12 hours and it resists temperatures from -55° C (- 67°F) up to +175° C (347° F). To separate parts secured by this agent, it may be necessary to heat the parts to approx. 250° C (480° F).

9.7.10) **LOCTITE "221 violet"**

Medium duty adhesive or screw securing agent suitable for materials of different properties. In case of strain the stress is distributed evenly over the whole surface of connection. The adhesive connection creates hermetic sealing for gas and liquids. This sealing property protects the parts from corrosion.

LOCTITE 221 is suitable for screws and nuts up to M12 threads and for low duty connections.

9.7.11) **MICRONORM shot blasting abrasive**

This abrasive is suitable for local and gradual very fine treatment of steel parts with rust film (propeller shaft). The MICRONORM shot blasting abrasive does not contain any noxious matter, is approved by the competent authorities and warrants for optimum cleaning. The granulates used are of sizes 40 to 60 µ. The surface roughness to be achieved is 0,5 - 1 µ representing a microfinish of the parts.

9.7.12) **Lapping fleece SR 4600 A - very fine grading**

Is sold by the meter and used for manual removal of smaller rust spots or oxidation, especially for optimum ground connections. It is most appropriate for removal of LOCTITE from surfaces or threads to make them metallic clean. Before reapplying LOCTITE, clean surfaces with nitro-thinner or degreasing agent (CASTROL ZA 30 or OMV - SOFT SOL). When using solvents, mind the safety regulations for persons and environments.

d00375

9.7.13) Cleaning agents

- ▲ **WARNING:** Use only approved cleaning agents (e.g. fuel, varsol, etc.) for cleaning metal parts.

Do not use cold cleaner on lye base degreasing agents. Do not clean coolant- and oil hoses with aggressive solutions. Clean off remains of sealing compound with sealant remover.

Soak combustion chamber, piston and cylinder head with cleaning agent and remove combustion residues with a bronze brush. Very good results were achieved with CASTROL "Clenvex 2000" as a cold cleaning agent on a basis of laboratory fuel and kerosine. It is a solvent - cold cleaner, free of halogen, on base of selected fuel fractions, and it is biologically disposable.

Never use caustic or corrosive cleaning agents.

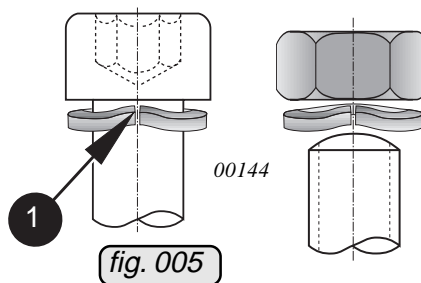
- ▲ **WARNING:** Proceed with great caution when using solvents. Inhaling of vapours is hazardous to health. Always dispose of solvent as per environmental regulations.

9.8) Securing elements

- **ATTENTION:** Self-locking nuts, cotter pins, tab washers and safety wires must be replaced each time they have been removed.

Respect without fail all additional indications regarding securing and sealing means and lubrication of fixation elements. Adhere to specified tightening torques.

- **NOTE:** Fit the lock washers with the bent up ends (1) facing the screw head or nut.



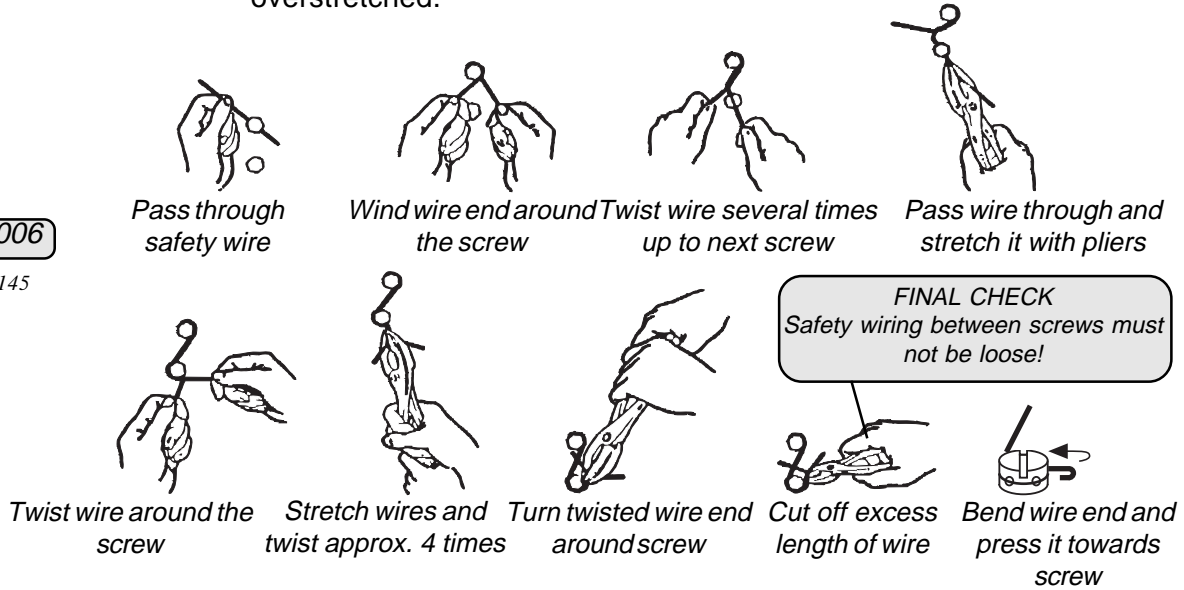
9.8.1) Safety wiring

See fig. 006 and 007.

Safety wiring serves to secure screws or nuts to prevent unintended loosening. The screws or nuts are secured by a 0,8 mm (.0315 in.) safety wire twisted 3 to 4 turns per 10 mm (.4 in.). The wire must by no means be overstretched.

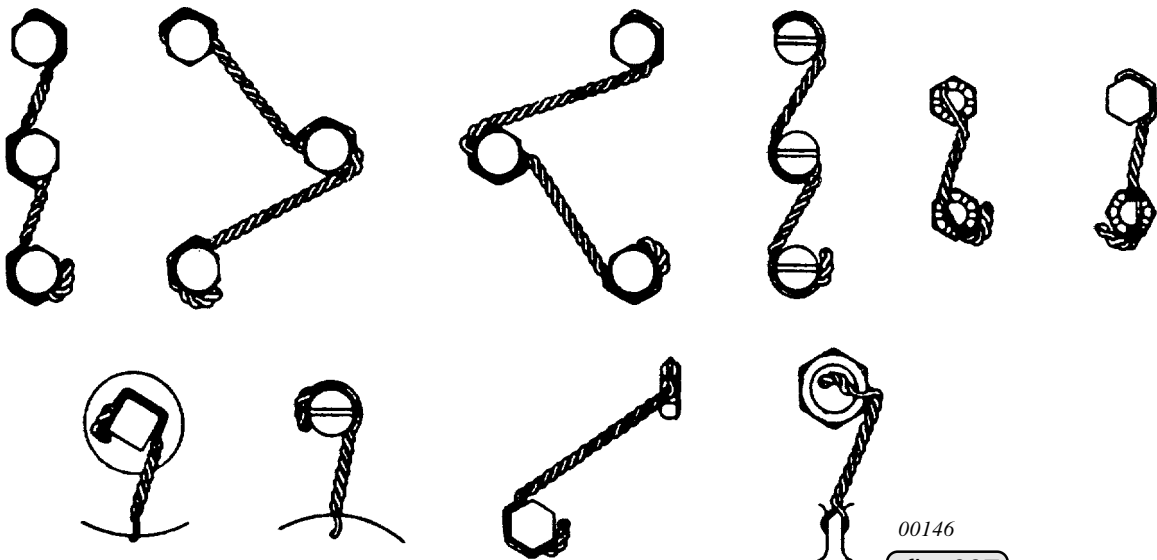
fig. 006

00145



▲ **WARNING:** As a principle, all external engine components and accessories must be wire-secured for safety reasons.

Various typical applications of safety wiring



00146

fig. 007

d00375



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9.8.2) Nut securing

When using a self-locking nut, take care that the polyamide insert ring on nuts according to DIN 985 as well as the securing element on nuts according to DIN 980 is positioned towards outside.

9.10) Treatment of corrosion and surface damages

At longer standstill it may occur that a rust film forms on various metal parts. With considerable corrosion or heavily corroded screws, nuts, shims, bearings, bushes etc., an exchange is inevitable.

Propeller shaft

The flange of the propeller shaft is likely to get a rust film. A special treatment is only possible with propeller shaft removed. After covering all bearing seats with plastic adhesive or a plastic tube, the propeller flange can be treated with MICRONORM shot blasting abrasive with incorporated anticorrosive.

At heavy rust damage, when the material is affected, renewal of the propeller shaft is necessary.

Electric system

Formation of a rust film on the permanent magnets in the magneto flywheel and on the metal cores of the pick-ups is harmless. Replace screws and lock washers at heavy oxidation or rust formation. Before reassembly clean all contact surfaces of the screws removed and apply LITHIUM grease. Take care that no foreign material falls into the magneto flywheel. Clean cable shoes and apply LITHIUM grease to the contact surfaces to assure lasting contact.

Check contact between plugs and/or fasten connections by separation test, if necessary apply contact spray to increase conductivity.

9.11) Engine preservation and engine back to operation

Refer to current Operators Manual 447 UL SCDI- 503 UL DCDI- 582 UL DCDI mod.99.



10) Maintenance Checks

- ▲ **WARNING:** Work on the engine is only allowed to be carried out by experienced two stroke mechanics. See Chapter 9.3).

The scheduled maintenance checks consist of the following groups:

10.1) Periodical maintenance

Time-related checks

These are checks prescribed after reaching defined hours of operation, to avoid engine troubles by preventive maintenance. A description of work to be carried out at specific time intervals is defined in the "MAINTENANCE SCHEDULE".

Seasonal checks

All rubber parts like hoses, rubber dampers, rubber coupling, carburetor socket etc. must be renewed every five years or as required by condition.



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10.2) Maintenance Schedule

The following maintenance is planned and necessary for ROTAX 447 UL SCDI, 503 UL DCDI, 582 UL DCDI and 582 UL DCDI mod. 99:

Checks and work	2 h	10 h	12,5 h	25 h	50 h	75 h	100 h	125 h	150 h	175 h	200 h	225 h	250 h	275 h	300 h	chapter	signature
1 Ground run				X												11.1	
2 Level check of liquids	X															11.2	
3 Retorque cylinder head nuts 1)	X															11.3	
4 Retorque exhaust manifold screws 1)	X	X														11.4	
5 Check rew ind starter rope 10)			X													11.5	
6 Check electric starter gear					X		X		X		X		X			11.6	
7 Inspect spark plugs 10)			X													11.7	
8 Replace spark plugs				X	X	X	X	X	X	X	X	X	X	X		11.8	
9 Check ignition system				X												11.9	
10 Check and clean inside spark plug caps 10)			X													11.10	
11 Checking of V- belt tension		X		X	X	X	X	X	X	X	X	X	X	X		11.11	
12 Lubricate ball joints				X	X	X	X	X	X	X	X	X	X	X		11.12	
13 Replace exhaust muffler springs						X			X			X				11.13	
14 Lubricate control cables 3)				X	X	X	X	X	X	X	X	X	X	X		11.14	
15 Check propeller balance and tracking 2,3)				X	X	X	X	X	X	X	X	X	X	X		11.15	
16 Inspect propeller mounting bolts 3)																11.16	
17 Clean and oil air filter				X	X	X	X	X	X	X	X	X	X	X		11.17	
18 Check fuel filter				X	X	X		X	X	X		X	X	X		11.18	
19 Replace fuel filter							X									11.18	
20 Check carburetor(s) and re-adjust (idle speed, cable tension, ...)	X			X	X		X		X		X		X			11.19	
21 Clean carburetor(s) and check for wear					X		X		X		X		X			11.19	
22 Replace jet needle and needle jet									X							11.20	
23 Check fuel pump (measure fuel pressure)						X			X			X				11.21	
24 Check gearbox oil level				X	X	X		X	X	X		X	X	X		11.22	
25 Replace gearbox oil		X					X				X					11.22	
26 Check and adjust gearbox, preload of springs (type B gearbox)							X				X					11.23	
27 Replace rotary valve lubrication oil							X									11.24	
28 Inspect cylinder head and piston crown 4)					X		X		X		X		X			11.25	
29 Inspect piston rings for free movement 5)					X		X		X		X		X			11.26	
30 Check piston diameter 7)					X 6)		X 6)		X		X 6)		X			11.27	
31 Piston ring: check gap 7,11)					X 6)		X 6)		X		X 6)		X			11.28	
32 Piston ring: check axial clearance (rectang. Ring) 8,12)					X 6)		X 6)		X		X 6)		X			11.28	
33 Check cylinder diameter 7,11)					X 6)		X 6)		X		X 6)		X			11.29	
34 Cylinder: check for roundness 7,11)					X 6)		X 6)		X		X 6)		X			11.29	
35 Replace cylinder head-, cylinder base- and exhaust-gasket 8)					X 6)		X 6)		X		X 6)		X			11.30	
36 Inspect piston pin and bearing									X							11.31	
37 Inspect crankshaft and replace outer seals if necessary									X							11.32	
38 General overhaul of engine 9)															X	11.33	
Checks and work	2 h	10 h	12,5 h	25 h	50 h	75 h	100 h	125 h	150 h	175 h	200 h	225 h	250 h	275 h	300 h		

02948

- 1) and after every replacement of gasket(s)
- 2) also after any damage
- 3) according to instructions of manufacturer
- 4) if carbon layer is more than 0,5 mm thick, decarbonize
- 5) if piston ring sticks clean and replace if necessary
- 6) if used in very dusty atmosphere
- 7) wear limit see Service Information 5 UL 91
- 8) If cylinder has been dismantled
- 9) To be carried out every five years or every 300 hours whichever comes first. contact authorized distributor or service center.
- 10) To be examined after every 12,5 hours of operation.
- 11) Necessary only if piston rings are not freely moving

d00376

11) Maintenance of the various systems:

11.1) Ground test

Check smooth engine run. Furthermore verify take-off RPM of engine and compliance with all limits.

11.2) Level check of liquids

Verify capacity of all operation liquids.

Such as:

Fuel capacity

Oil quantity for rotary valve drive (on engine 582 only)

Oil level in gearbox (see section 11.22)

Oil level for oil injection lubrication

Coolant level (on engine 582 only)

11.3) Retorque cylinder head nuts (only on 447 UL SCDI and 503 UL DCDI)

▲ **WARNING:** Engine must be cool for retorquing procedure of cylinder head nuts.

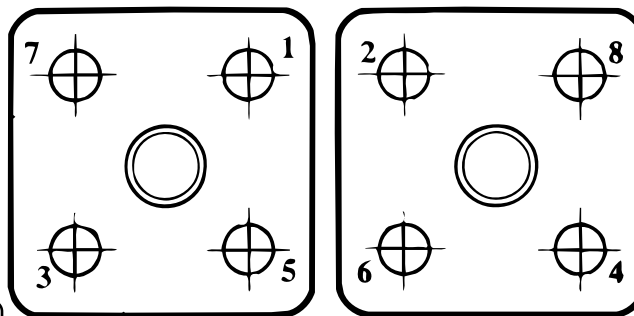
◆ **NOTE:** Consider both cylinders as one unit because they are joined by exhaust and intake manifolds. Use a cross sequence for tightening the nuts, starting from the center. Ensure that cowl screws are torqued less than the head nuts.

Diagram for torquing sequence when manifolds are in place

Tightening torque: 22 Nm (195 in.lb.)

02884

fig. 008



11.4) Retorque of exhaust manifold screws:

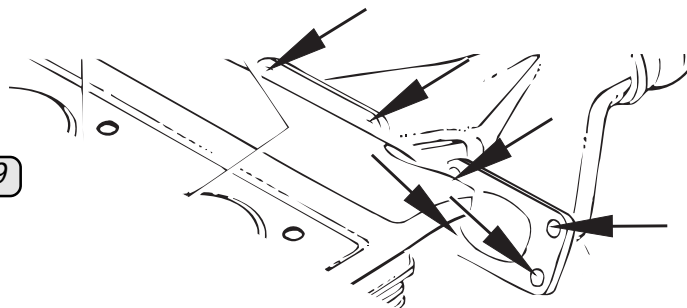
The screws of the exhaust manifold must be retightened to the specified torque.

Tightening torque for 503 UL DCDI and 582 UL DCDI: 22 Nm (195 in lb)

Tightening torque for 447 UL SCDI: 25 Nm (221 in lb)

fig. 009

02885



11.5) Checking of the rewind starter rope

Check starter rope condition according to maintenance schedule. Replace when worn or frayed.

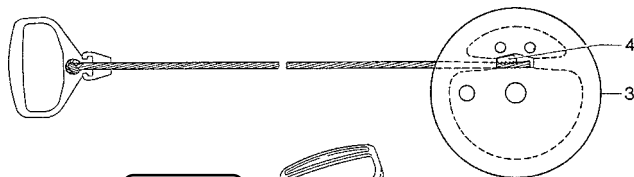
To change the starter rope, follow the procedure outlined (the numbers stated in brackets refer to the illustration).

11.5.1) Rewind starter dismantling:

First remove the rewind starter assembly from the engine.

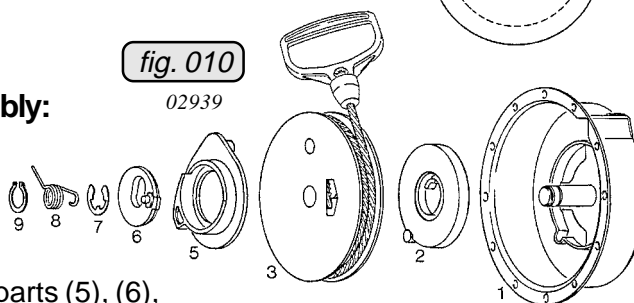
Second, remove the snap ring (9), loop spring (8), circlip (7), pawl lock (6), and the pawl (5).

Pull out the starter rope fully to the end, hold starter housing (1) and rope sheave (3) together in their position. There is an opening in the rope sheave. The key clamp (4) visible in the opening must be pushed out in the opposite sense of the pulling direction. Pull the rope out of the rope sheave.



11.5.2) Rewind starter reassembly:

Insert the new starter rope into the rope sheave, fit the key clamp in the same position as it was before and refit the parts (5), (6), (7), (8) and (9).



▲ **WARNING:** Do not remove spring container (2), this might cause injuries.

Do not operate the engine if the rewind starter is defective.

Most starter problems are due to improper handling.

11.6) Check electric starter gear

Inspect teeth and check free-wheeling of overrun clutch. Ensure neat fit of stop collar and circlip and proper shape of spring.

Check free movement of pinion on the coarse thread.

◆ **NOTE:** For further details see current Repair Manual 462-532-582.

11.7) Inspection of spark plugs

Due to varying fuel properties etc., check according to maintenance schedule. Replace as required or annually: Provided that spark plug heat range and the carburetor calibration are correct, the spark plugs will have a brownish tinge at the electrodes of both spark plugs after full load operation.

On engines with single carburetor, one sooty spark plug usually indicates a bad plug or faulty ignition system. If both plugs are sooty with oil deposits, carburation and air system should be checked. On engines with two carburetors you should switch the carburetor to trace the problem.

■ **ATTENTION:** Do not switch the carburetors on 618 UL DCDI because the jetting is different.

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■ **ATTENTION:** Always change both plugs. Never interchange plugs from one cylinder to the other.

If both plugs have "white" electrodes with "melt" droplets, first suspect lean mixture. If calibration is correct and there is no evidence of manifold leaks, lack of fuel, or incorrect float settings, don't change the plugs to a colder range. Check if cooling system is operating correctly.

■ **ATTENTION:** Heavy oil deposits on the electrodes and insulator may cause engine problems, exchange regularly according to maintenance schedule, or at any indications of trouble.

If, after cleaning or changing the spark plugs, you still have an ignition problem, check to see if only one cylinder is affected or both. Some thought to what is common to both systems or only one will isolate the problem more efficiently. If no external fault is found, the ignition unit must be checked.

■ **ATTENTION:** Never clean spark plugs with an abrasive cleaner.

Remember to correctly gap your plugs with a wire gauge (see technical data, section 8.2). Spark plugs must be torqued (see section 11.7). If problems occur too frequently, cause must be determined and rectified.

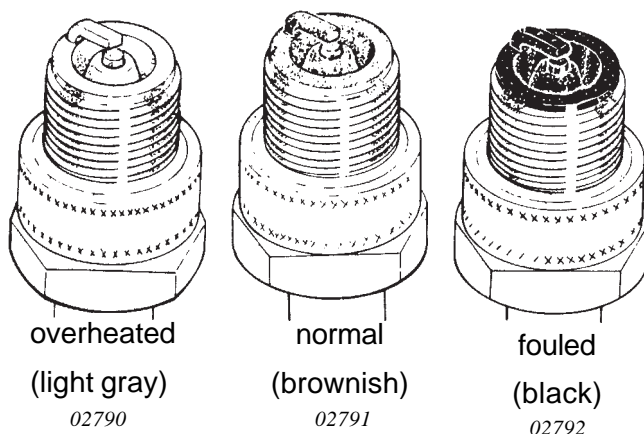


fig. 011

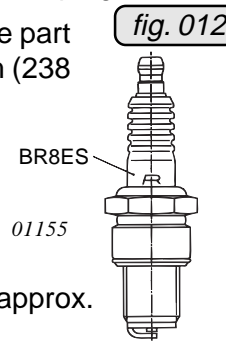
11.8) Replacement of spark plugs

The following type of spark plugs may be used at renewal of the spark plugs:

◆ **NOTE:** The resistance spark plug can be distinguished by the part no. and by the designation. Tightening torque: 27 Nm (238 in lb) only on cold engine.

part no.	spark plug designation	
897 050	spark plug without resistance	B8ES
897 055	spark plug with resistance	BR8ES

◆ **NOTE:** The "R" in the designation denotes the resistance of approx. 5 kW, which results in better R.F.I. suppression.



d00377

11.9) Check of the ignition system

Verify all electrical connections for good contact and ensure they are free of corrosion. Inspect the wiring for wear, damage and corrosion.

Before flight the function of the two ignition circuits (on 503 and 582) must be checked. For checking the ignition unit the engine must be operated at 3000 to 3500 1/min and alternately ignition circuit 1 and 2 must be switched off. The RPM-drop must not exceed max. 300 1/min.

11.10) Check and clean inside of spark plug connectors

Inspect spark plug connector for cracks, burn-off, dampness and fouling. Check connection with ignition cable and fitting of rain protection cover. The resistance value of the standard spark plug connector is $4,5 \div 5,5$ kW.

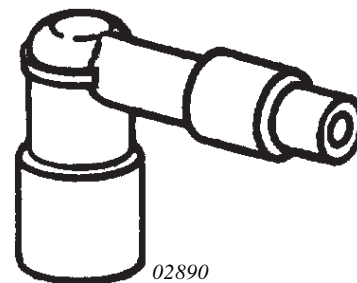
For various applications radio interference suppression plug connectors must be used according to respective regulations. These are more prone to troubles than the standard resistor type connector, due to the metal shielding.

Resistance of these connectors is $0,8 \div 1,2$ kW.

Never pull off spark plug connector on a running engine.

Clean contact surfaces in the spark plug connectors as required.

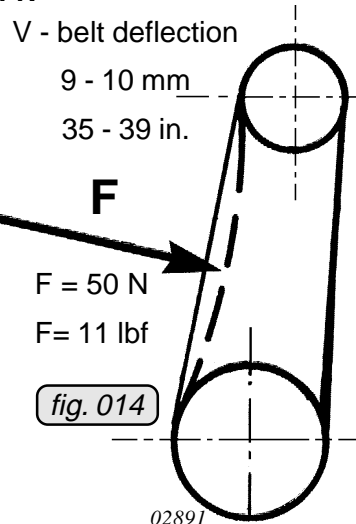
■ **ATTENTION:** On engine installation with spark plugs down, it is highly recommended to additionally secure spark plug caps.



11.11) Checking of V - belt tension (only on fan cooled 447 and 503 engines)

Replace belt if frayed or if it can no longer be tensioned to specification.

The tension of the V-belt can be adjusted by shims between the V-belt pulley half and the fan (resp. the protection sheave on 503). The V-belt is correctly tensioned when it can be depressed 9 - 10 mm (.35 ÷ .39 in.) to indicated force "F" (in the middle between the 2 V-belt sheaves).



11.12) Lubricate Ball joints

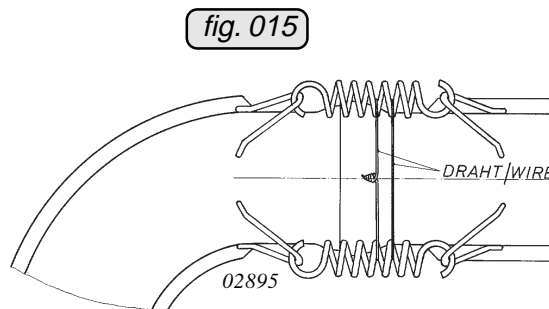
Check exhaust system prior to every flight for tightness, physical damage or changes in sound pattern. Especially inspect springs and hooks.

The muffler has to be supported on vibration damping blocks. All ball joints have to be greased regularly with heat resistant lubricant (e.g. LOCTITE Anti-Seize, 297 434) to avoid gripping or seizing of joints and consequent breaking of exhaust components.

11.13) Replace exhaust muffler springs

The muffler must be suspended on engine and frame and also be secured against loss without squeezing the ball joints.

Secure the muffler springs by wire against loss. The sketch illustrates a possibility how to interconnect the exhaust springs to prevent the vibration of these springs and thus pre-mature wear.



11.14) Lubricate control cables

Verify and lubricate all control cables in accordance with maintenance schedule of the aircraft builder.

◆ NOTE: Observe oil specification of the aircraft builder.

11.15) Check propeller balance and tracking

A new propeller must be balanced to better than 1gm to avoid vibration problems and overstressing of the drive system. Used propellers may be max. 2,5 gm out of balance.

11.16) Inspect propeller mounting bolts

Proceed according to propeller manufacturer instructions.

11.17) Clean and oil air filter

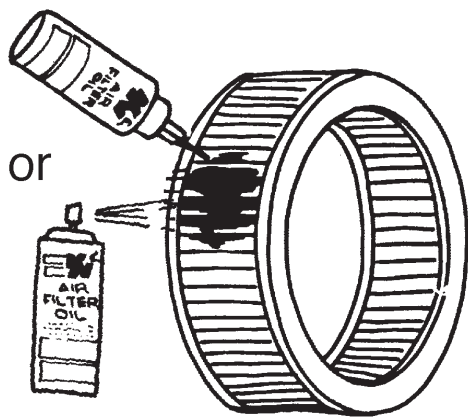


fig. 016

02892

11.17.1) Application of new air filters:

For a higher life-span and optimal engine protection the filter corrugations have to be moisturized with oil. Unoiled filters lose their effectiveness against dirt and dust.

Every corrugation of the filter has to be sprayed with oil. After 5 - 10 minutes the filter mat will be soaked with oil, noticeable on the uniform red colouring.

Never use gear oil, diesel, 2-stroke oil or motor oil as they attract water.

If necessary, apply filter grease on sealing face, but don't grease clamp connection of filter.

11.17.2) Cleaning of used air filters:

First, lightly tap off surface dirt and wet with cold water. Roll filter in filter cleaning and degreasing fluid.

Never use gasoline, steam, caustic liquids, detergents or high pressure cleaning.

The level of the cleaning fluid should be approx. 3/4 of the height of corrugations. Dirty fluid must not run inside of filter. Allow at least 5 minutes to dissolve the dirt.

02894



fig. 017

02893

After that, rinse filter with cold water from inside to outside.

Shake off and let it dry in free air. Don't dry with compressed air, over naked flame or with hot air fan.

Prior to installation, service filter with oil (see previous chapter).

Filter due for renewal depends on environmental conditions, but at the latest after 300 hours of operation.



fig. 018

11.18) Check and replacement of fuel filter

The flow through the filter may be restricted due to the long term build up of dirt. A more serious type of blockage, which can occur quite rapidly is caused by a reaction between detergents in certain two-stroke oils and water in the fuel.

Both types of blockage may be difficult to detect visually. If blockage is suspected, renew fuel filter or filter element. Subsequently avoid water contamination of fuel.

11.19) Clean carburetors and check for wear

Attend to the following:

- Stop engine at raised speed and verify float level.
- Inspect carburetor assy. for leakage.
- Check float valve for easy operation.
- Inspect clip of jet needle for wear.
- Inspect sieve sleeve.
- Clean the carburetor with fuel as required.

◆ NOTE: For further details see also current Repair Manual 462-532-582

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11.20) Replace jet needle and needle jet

The needle jet and jet needle must only be exchanged by a mechanic with experience on two-stroke engines and in accordance with the relevant Repair Manual 462-532-582, section carburetor.

11.21) Clean and check fuel pump

- Inspect the fuel pump.
- Verify the fuel pressure: 0,2 - 0,5 bar (3 - 7 p.s.i).

11.22) Check gearbox oil level, replace gearbox oil

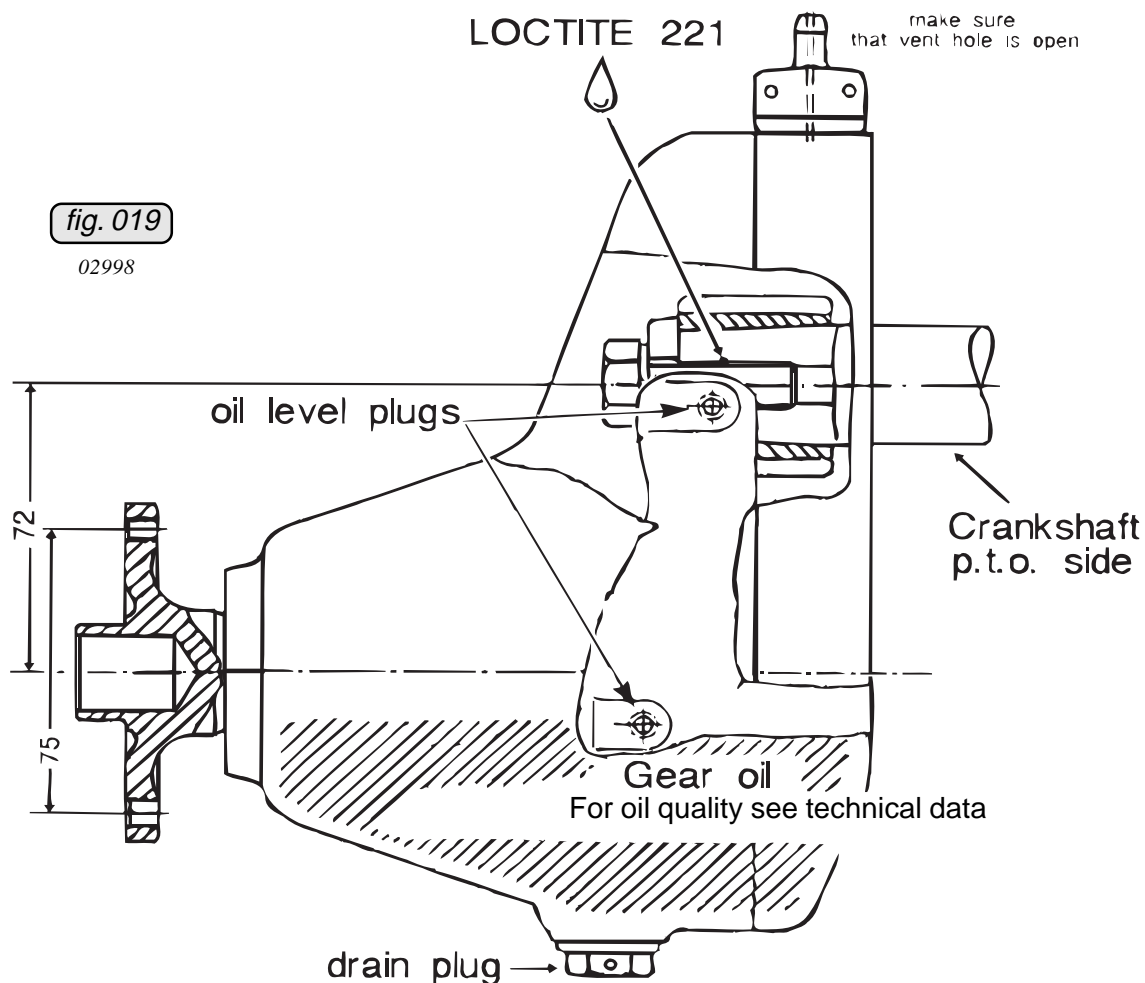
For draining the oil, remove magneto drain plug.

Replenish oil, until oil emerges at the respective lower oil level plug.

■ **ATTENTION:** The two large ventilation bores on both sides have to remain always open to warrant dissipation of heat at gearbox type C and E.

Wire-secure vent screw, oil level plugs and drain plugs.

◆ **NOTE:** Illustration shows "B" type gearbox



d00377

position of installation*	gearbox type		
	B	C/CL	E/EL
SZ	330 cm ³	200 cm ³	400 cm ³
SS	300 cm ³	120 cm ³	180 cm ³

02978

* refer to latest revision of the current installation manual.

11.23) Checking and adjusting of gearbox, preload of springs (B- type gearbox)

Place gearbox on a suitable support under hand press. Place the mounting yoke, part no. 876 880 on the dog gear (20) (see “disassembly and judgement”). Place angular ring (22) upside down (with “L” shape downwards (see ill.) on prop shaft to facilitate reading of the distance A. Apply a load of 16 kN (3600 lbs) on the dog gear via the mounting yoke. With this load, disk springs will be completely compressed.

■ **ATTENTION:** Do not exceed maximum load of 16 kN (3600 lbs), otherwise cover or dog gear will be damaged.

With springs in compressed state, measure A, the distance from top side of angular ring to lower edge of groove (see illustration). Relieve pressure, remove all items from prop shaft and compensate distance A, by placing appropriate shims (16) under distance ring (17). Shims are available as spare parts in the sizes 0,1 / 0,2 / 0,3 / 0,5 and 1,0 mm.

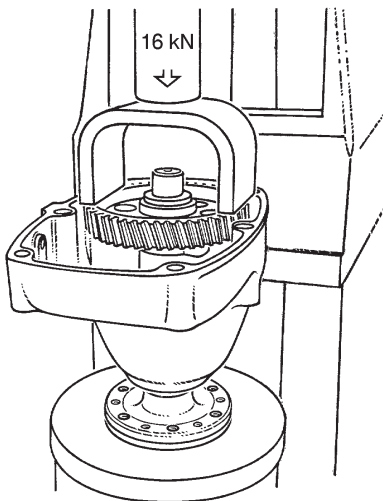


fig. 020 02899

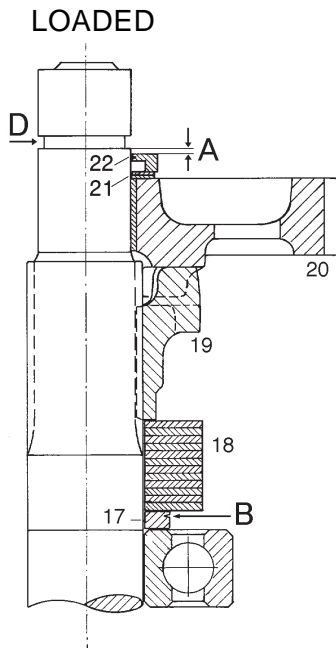


fig. 021 02896

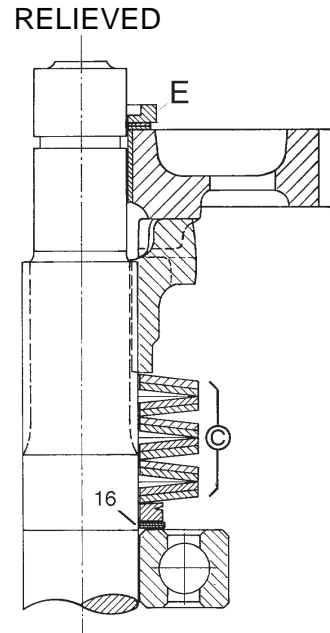


fig. 022 02895

d00377

11.24) Renewing of the rotary valve lubrication oil (582 UL DCDI /mod. 99 only)

Drain oil completely. For complete emptying, the engine must be inclined.

Afterwards refill the oil tank. Allow some time for settling. Crank the engine by hand several times to vent the system.

Fill tank to max. mark and after a short trail run verify the oil level again.

11.25) Inspection of the cylinder head and piston crown

Remove the cylinder head as per the current and relevant Repair Manual. Deposits on combustion chamber in cylinder head and on piston crown must not exceed 0,5 mm (0,02 in).

Excessive deposits must be removed carefully with lapping fleece.

▲ **WARNING:** Clean the pistons not installed in the engine but on the bench, to prevent carbon deposits ending up in the engine.

11.26) Inspection of the piston rings

Remove cylinder head and cylinder as per the current and relevant Repair Manual.

Verify easy movement of the piston rings. A sticking ring must be removed, use piston ring pliers when replacing rings.

If several rings have to be removed ensure assignment to the respective piston.

Clean removed piston rings and renew as required.

Never overstress piston ring as the ring would lose its pretension and the molybdenum coating might break off.

11.27) Check piston diameter

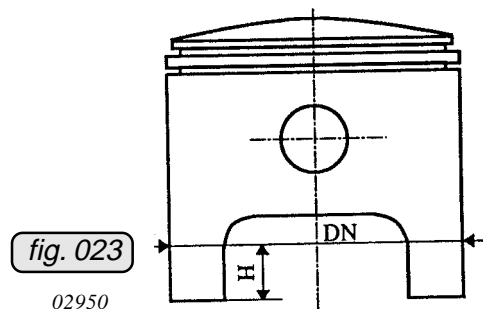
The dimension of the pistons must be in the range as stated in the table below.

Engine Type	ROTAX part. No.	Stamped on piston crown		Nominal Diameter DN \pm 0,005 mm		Oversizes ²⁾ available	Height H [mm] ¹⁾	piston to wall clearance [mm] new	piston to wall clearance [mm] Wear Limit
447 UL	886050	67,45	67,46	67,445	67,455	2	20,8	0,05-0,07	0,15
503 UL	996245	71,93	71,94	71,925	71,935	2	18	0,07-0,09	0,2
582 UL	888590	75,94	75,95	75,935	75,945	2	20,5	0,06-0,08	0,15

Notes:

- 1) Dimensions H = Height for measurement of the nominal diameter on new piston perpendicular to the center axis of the piston pin. For used pistons measuring the biggest diameter is also valid.
- 2) Please find nominal value of oversize pistons in the respective parts list.

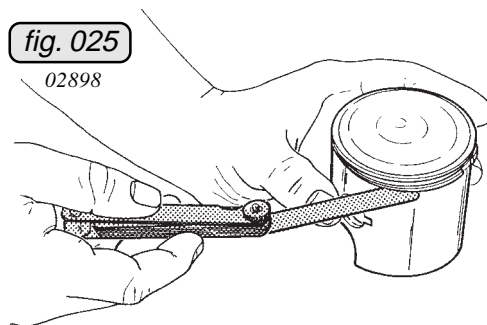
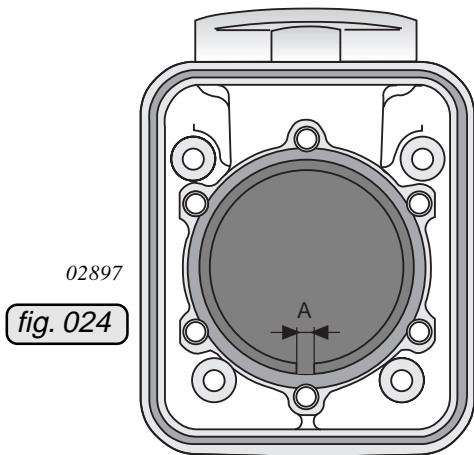
03125



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11.28) Piston ring, checking of gap and axial play

Remove piston rings, using piston ring pliers. Never overtension rings, otherwise ring loses its pretension, and Molybdenum coating will break off. Ensure to refit used piston rings into same location and position as before removal. A new rectangular ring may be fitted either way up.



Piston rings are checked for end gap and flank clearance. With ring fitted, clearance of flank can be checked by feeler gauge.

To measure the end gap "A" of a piston ring, position ring in a new cylinder using piston as pusher and check gap by feeler gauge. To check the end gap on a used ring for wear limit, position ring in the corresponding cylinder.

1st ring

Dimension	wear limit mm	(in.)
ring gap	1mm	0,039
ring clearance	0,2 mm	0,008

2nd ring

Will be renewed when the 1st ring is replaced.

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11.29) Checking of cylinder diameter and roundness

Cylinders are machined to 2 tolerance groups, marked on the spigot either red or green. The difference in bore dia. is 0,01 mm. Suitable pistons are available in the same colour code.

Dimension	new mm	(in.)	wear limit mm	(in.)
out of round	0,00 ÷ 0,02	(0,00 ÷ 0,0008)	0,05	(0,002)
conicity	0,00 ÷ 0,03	(0,00 ÷ 0,0012)	0,08	(0,0032)

Dimension (in.)	new mm	(in.)	wear limit mm
-----------------	--------	-------	---------------

Type 447 UL

Cylinder standard red	67,50 ÷ 67,51	(2,6575 ÷ 2,6579)	67,59	(2,66)
Cylinder standard green	67,51 ÷ 67,52	(2,6579 ÷ 2,6583)	67,60	(2,661)
Cylinder (1 st oversize, red) ...	67,78 ÷ 67,79	(2,8444 ÷ 2,8448)	67,87	(2,848)
Cylinder (1 st oversize, green)	67,79 ÷ 67,80	(2,8448 ÷ 2,8452)	67,88	(2,848)
Cylinder (2 nd oversize, red) ...	68,00 ÷ 68,01	(2,8543 ÷ 2,8547)	68,09	(2,858)
Cylinder (2 nd oversize, green)	68,01 ÷ 68,02	(2,8547 ÷ 2,8551)	68,10	(2,858)

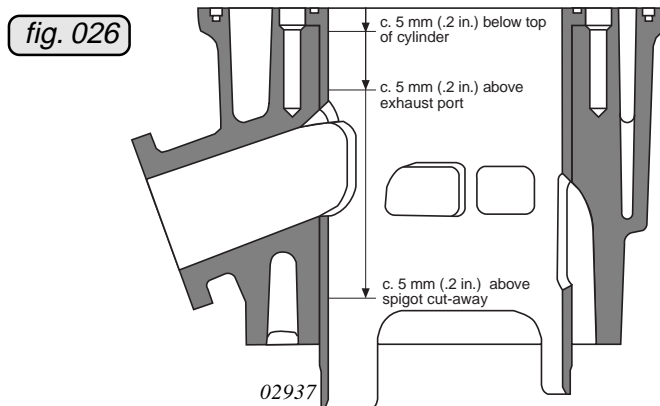
Type 503 UL

(standard, red)	72,00 ÷ 72,01	(2,835 ÷ 2,836)	72,10	(2,8385)
Cylinder (standard, green)	72,01 ÷ 72,02	(2,8350 ÷ 2,8354)	72,10	(2,8385)
Cylinder (1 st oversize, red)	72,25 ÷ 72,26	(2,8444 ÷ 2,8448)	72,35	(2,848)
Cylinder (1 st oversize, green)	72,26 ÷ 72,27	(2,8448 ÷ 2,8452)	72,35	(2,848)
Cylinder (2 nd oversize, red) ...	72,50 ÷ 72,51	(2,8543 ÷ 2,8547)	72,60	(2,858)
Cylinder (2 nd oversize, green)	72,51 ÷ 72,52	(2,8547 ÷ 2,8551)	72,60	(2,858)

Type 582 UL

Cylinder (standard, red)	76,01 ÷ 76,02	(2,9925 ÷ 2,9929)	76,10	(2,996)
Cylinder (standard, green)	76,02 ÷ 76,03	(2,9929 ÷ 2,9933)	76,10	(2,996)
Cylinder (1 st oversize, red)	76,26 ÷ 76,27	(3,0023 ÷ 3,0027)	76,35	(3,006)
Cylinder (1 st oversize, green)	76,27 ÷ 76,28	(3,0027 ÷ 3,0031)	76,35	(3,006)
Cylinder (2 nd oversize, red)	76,51 ÷ 76,52	(3,0122 ÷ 3,0129)	76,60	(3,016)
Cylinder (2 nd oversize, green)	76,52 ÷ 76,53	(3,0123 ÷ 3,013)	76,60	(3,016)

◆ NOTE: Diameter readings are taken in crankshaft axis and 90° across.



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11.30) Replace cylinder head-, cylinder base- and exhaust gaskets

◆ NOTE: Necessary only if cylinders have been removed.

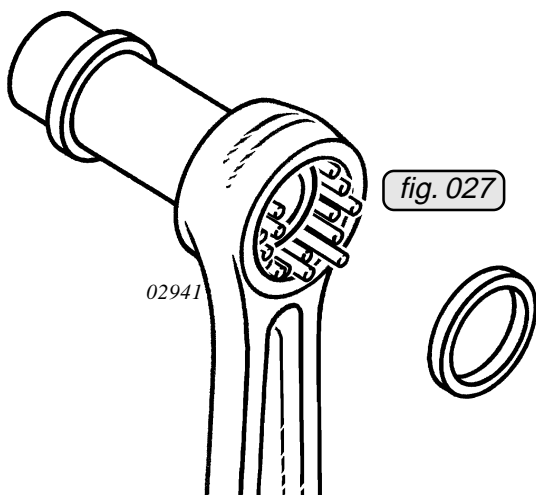
11.31) Inspect pins and bearings

11.31.1) Piston pin:

Check piston pin for wear and pitting at bearing contact surface and take diameter readings.

Dimension	new mm	(in.)	wear limit mm (in.)
Piston pin	17,997 ÷ 18,0	(0,7085 ÷ 0,709)	17,97 (0,707)

■ ATTENTION: Renew piston pin at detection of perceptible traces of wear, even if dimensions are correct, at beginnings of pitting or discoloration. Always renew piston pin circlips after every removal.



11.31.2) Piston pin bearing:

The needle cage has been superseded by a cageless needle bearing, increasing life-span essentially due to higher load capacity. The cageless needle bearing is a needle bearing with 31 needles and 2 thrust washers. On engine 582 UL this needle bearing has been fitted since the beginning of serial production.

◆ NOTE: It is strongly advised to fit the cageless piston pin bearing (part no. 832 320) at engine repair.

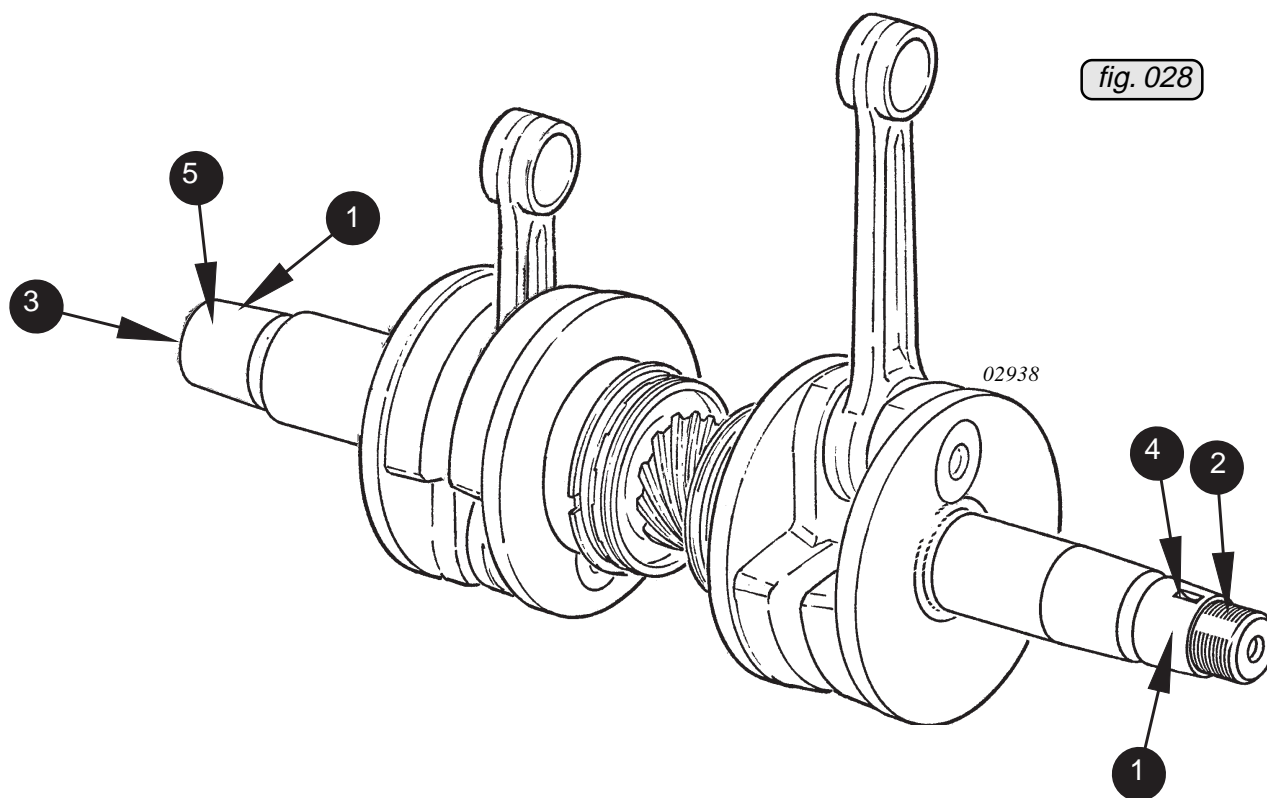
Inspect needles for wear and pitting. With one needle visibly damaged, renew all 31 needles.

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11.32) Inspect crankshaft and replace outer seals

The crankshaft is a built-up design with single components connected by pressfit.

- Check taper (1) on both ends of crankshaft.
- Check external (2) and internal (3) thread.
- Check groove (4) for Woodruff key on magneto-side.
- Inspect outer oil seals. Replace as necessary according to latest revision of the relevant repair manual 462-532-582.
- Check crankshaft for concentricity on PTO side (5). (Crank shaft fitted in the crankcase):
maximum out of round: 0,03 mm
- Inspect for corrosion.



11.33) General overhaul of the engine

For a general engine overhaul, the engine has to be shipped to an authorized distributor or Service Center.

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12) Required inspections after limits of operation have been exceeded:

12.1) Exceeding of max. permissible engine speed

Remove the cylinders and inspect the pistons for seizure.

12.2) Exceeding of max. permissible cylinder head temperature

Remove the cylinders and inspect the pistons for seizure and piston crown for depressions.



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12.3) Exceeding of max. permissible exhaust gas temperature

Remove the cylinders and inspect the pistons for seizure.

12.4) Fuel pressure below specified value

Remove the cylinders and inspect the pistons for seizure. Also inspect crankshaft end seals for leakage.

400387



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