

# MANUAL

for

# ROTAX ENGINES

100 - 125 - 150 - 165 cc

200 - 250 cc



1963 Edition

ROTAX-WERK AG.

Gunskirchen/Wels

Austria

Technical Data of  
100, 125, 150 and 165 cc Engines

Capacity in cc	98	124	148	163
Bore in mm	48	54	59	62
Stroke in mm	54	54	54	54
Performance at 3000 RPM, (Continuous Rating), HP	2,2	3,0	4,0	4,5
Compression Ratio: Standard	8,75	6,5	6,5	8,5
High Output Version	--	--	8,0	--
Cycle	2			
Number of Cylinders	1			
Cooling	Air			
Reduction Ratios:				
Single Reduction Gear	2,1 = 1430 RPM at 3000 RPM crankshaft speed			
	2,8 = 1070 RPM at 3000 RPM crankshaft speed			
Double Reduction Gear	7,6 = 390 RPM at 3000 RPM crankshaft speed			
	10,5 = 290 RPM at 3000 RPM crankshaft speed			
Ignition	1. Flywheel Magneto BOSCH MZ/URB 1/116/6			
	2. Flywheel Magneto Generator with lighting coil 16 watts (alternating current) BOSCH LM/URB 1/116/17(18/1)			
Advanced Ignition	3-3,5 mm B.T.D.C., not adjustable during operation			
Break of Magnetic Flux	7 - 11 mm			
Carburetor	BING Centre Float 20 mm ø			

## Air Cleaner

1. Wet Air Cleaner
2. Cyclone Air Cleaner with Oil Bath

## Engine Lubrication

High Quality Motor Oil SAE 40  
or SAE 50, mixed to the  
fuel at

ratio of 1:25	4 %
during run-in 1:20	5 %

For special applications  
follow instructions of the  
manufacturer of your  
particular equipment.

If the engine is equipped with a flywheel magneto generator with lighting coil (output 16 watts a.c.) the use of bulbs amounting to 20 watts is recommended, particularly if the engine runs above 3000 RPM.

Technical Data of  
200 and 250 cc Engines

Capacity in cc	200	250
Bore in mm	62	69
Stroke in mm	66	66
Performance at 3000 RPM (Continuous Rating) HP	6	7
Compression Ratio: Standard	6,5	7,5
High output version	--	8,4
Cycle	2	
Number of Cylinders	1	
Cooling	Air	
Reduction Ratios:		
Single Reduction Gear	3,2 = 940 RPM at 3000 RPM crankshaft speed	
	2,8 = 1070 RPM at 3000 RPM crankshaft speed	
	2,1 = 1430 RPM at 3000 RPM crankshaft speed	
Double Reduction Gear	10,44 = 290 RPM at 3000 RPM crankshaft speed	
	9,2 = 330 RPM at 3000 RPM crankshaft speed	
Ignition	1. Flywheel Magneto BOSCH MZ/USB 1/143(2/2)  2. Flywheel Magneto Generator with lighting coil 16 watts (alternating current) BOSCH LM/USB 1/143/16(2/2)	
Advanced Ignition	3,5 - 4 mm B.T.D.C.	
Break of Magnetic Flux	8 - 12 mm	

Carburetor

BING Centre Float 22 mm  $\phi$

Air Cleaner

1. wet Air Cleaner

2. Cyclone Air Cleaner with  
Oil Bath

Engine Lubrication

High Quality Motor Oil SAE 40  
or SAE 50, mixed to the fuel  
at the

ratio of 1:25 4 %

during run-in 1:20 5 %

In particular cases observe  
prescriptions of the  
manufacturer of your aggregate.

Gear Lubrication

Gear Oil SAE 80

If the engine is equipped with a flywheel magneto  
generator with lighting coil (output 16 watts a.c.) the  
use of bulbs amounting to 20 watts is recommended,  
particularly if the engine runs above 3000 RPM.



## General Remarks

ROTAX engines are two-cycle engines, cooled by a fan mounted on the flywheel. Both careful and extensively tested design and rugged construction, as well as the use of high quality parts warrant maximum reliability and durability. With proper maintenance and care, and with the use of suitable fuel and oil, the engine will give you trouble-free service for many years.

The ROTAX design incorporates the latest technical developments. In order to take advantage of future developments, we reserve the right to make modifications in the ROTAX design without notice.

## Engine Lubrication - Fuel Oil Mixture

ROTAX engines are operated by a mixture of standard grade, brand name gasoline and high quality motor oil SAE 40 or SAE 50, the oil lubricating the moving engine parts. If particular 2-cycle motor oil is available (especially in Europe), the mixing ratio is 25:1, i.e. 1/5 litre of oil (= 200 cc = 180 g) for 5 litres of gasoline, or 1/3 pint of oil for 1 gallon of gasoline.

Otherwise outboard motor oil should be used and mixed at the ratio of 20:1.

If the engine is equipped with a kerosene fuel conversion kit, oil has to be added to the kerosene at the same ratio.

Too much oil will cause carbon deposits on the spark plug, on the piston, in the cylinder ports and in the muffler and will cause difficulties. In addition, the piston rings may stick. If too little oil is used, lubrication will be insufficient, the piston will seize and the bearings will be damaged.

## Gear Lubrication

Engines with gears are fully lubricated when they leave the factory. After every 60 hours of operation remove oil filler plug and pour in gear oil as high as the oil

level screw. Take care that the engine stands straight.

### Governor Lubrication

Only governor lever and ball joint have to be cleaned and lubricated from time to time. For proper functioning of the governor it is essential that these parts move easily.

### Run-in

It is important that full engine load is not applied during the first 20 hours of operation. Moving parts must gradually adjust themselves to each another. The more carefully run-in limitations are observed, the more reliable the engine will perform later on. During the run-in period the engine does not deliver yet its full output.

### Starting and Stopping the Engine

#### Starting

Open fuel valve.

Open gas lever  $1/4$  to  $1/2$ .

Close choke.

Depress tickler on float chamber until fuel flows out.

Start engine (see "Starter Devices").

If engine is equipped with de-compression valve, it can be started more easily if this valve is briefly depressed during the process. When the engine is warm, the choke need not be closed and the tickler need not be depressed.

#### Operation

After starting open choke.

Set gas lever according to requirement.

With engines equipped with speed governor, gas lever must be fully opened; otherwise the governor will not work properly.

While the engine is running, the ignition cable must under no circumstances be disconnected from the spark plug (to stop the engine, for instance), since this would cause ignition coil troubles.

### Stopping

Close fuel valve and depress shorting button.

Stopping for several months: treat engine externally with protection grease and internally with preservation oil. To do so remove air cleaner, accelerate engine and depress shorting button. At the same time let the engine take in 20 to 30 cc of preservation oil through the carburetor socket.

### In Case of Starting Difficulties

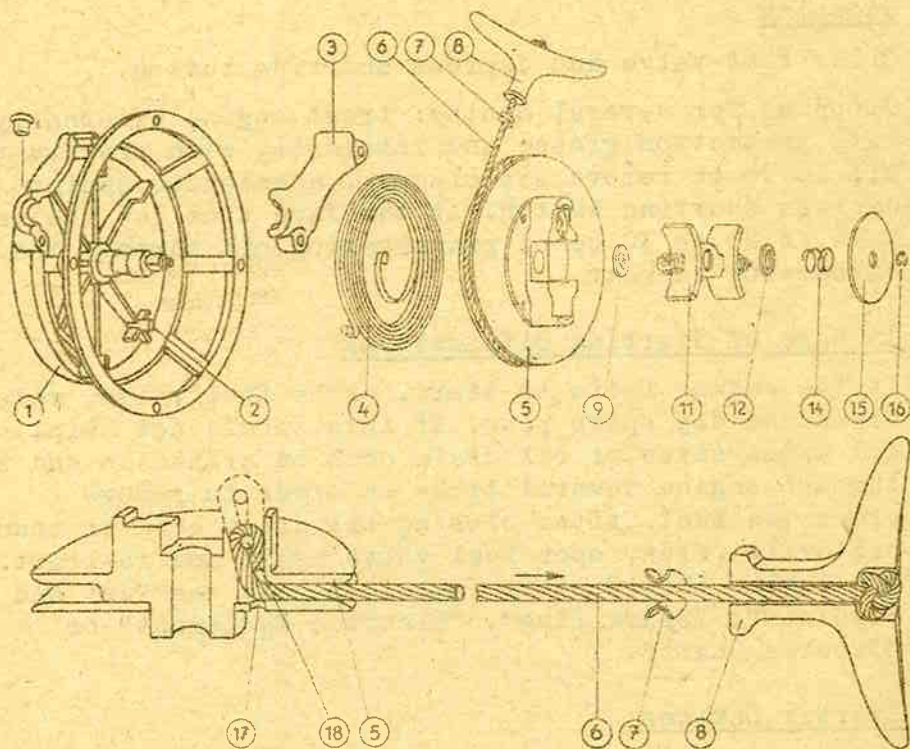
If the engine fails to start, close fuel valve, remove, clean and dry spark plug. If this should not help, open oil drain screw or oil drain cock on crankcase and crank through engine several times in order to remove excessive fuel. After closing oil drain cock or mounting oil drain screw, open fuel valve again and re-start. If the engine should still fail to start, see "Jet and Fuel Strainer", "Spark Plug", "Electric Equipment" or "Trouble Chart".

### Starter Devices

1. Starting pulley: wrap starter rope around pulley in direction indicated by arrow, then pull vigorously.
2. Re-wind starter: pull out slowly until resistance is felt, then pull out vigorously, but not fully up to the end. As far as possible pull in the direction the rope comes out of the sheave. The re-wind starter may be dismantled by the removal of 4 screws after which the engine may be started by means of the starting pulley that lies beneath the starter (see no. 1).
3. Lever starter: depress lever slowly until resistance is felt, then depress vigorously. After starting, the lever is returned to its original position by a



starter spring. After removal of the lever starter the engine can be started by means of a starting pulley lying beneath it.



#### Dis-Assembly of Re-wind Starter

The re-wind starter can be removed from the fan cowl by taking off 4 screws. After taking off 2 more screws the cover (3) or the starter stop can be removed. After pressing out the circlip (16), the washer (15), the friction spring (14) and the friction washer (13), the pivot arm with pawls (11) and the "D"-washer (9) can be dis-mounted. Now lift the rope sheave slightly or put rope into slot of rope sheave and let re-wind spring relax. Now remove rope sheave, taking care to leave the

re-wind spring in the starter housing.

### Changing the Starter Rope

There is an opening (17) at the bottom of the rope sheave, where the rope end and the bolt fixing the rope can be pressed out by means of a pin. Insert new rope through rope sheave into clamping bore, wind around fixing bolt and draw into bore (see illustration). Do not forget rope guide (7) or starter stop.

### Re-assembly of Re-wind Starter

Mount re-wind spring taking care that bolt (2) is engaged in outer spring end and that spring winds when starting (do not mount it the other way round). The groove on the starter spindle serves to take up a suitable lubricant (Molykote).

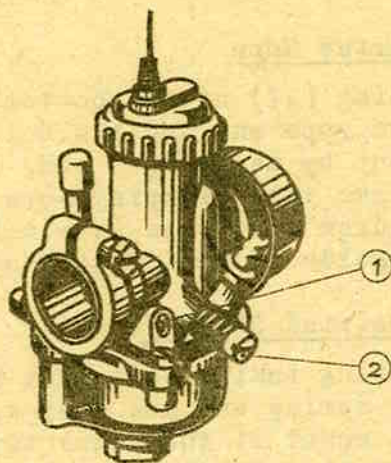
Mounting the rope sheave the inner spring end must engage in the slot of the rope sheave. Wind rope sheave 2 to 4 times to achieve proper spring tension.

Mount remaining parts in same position and sequence as they were mounted before.

### Carburetor

Engine performance and engine speed are governed by opening or closing the carburetor piston. This is done either automatically by the speed governor or by means of a hand lever.

Laterally on the carburetor there are carburetor piston adjustment screw (2) and air regulating screw (1).



### Idling Adjustment

Must be made with warmed up engine only. Set carburetor piston adjustment screw (2) to keep engine running at lowest possible speed. Idle air regulating screw (1) should be open by approx.  $1\frac{1}{2}$  turns.

### Wet Air Cleaner

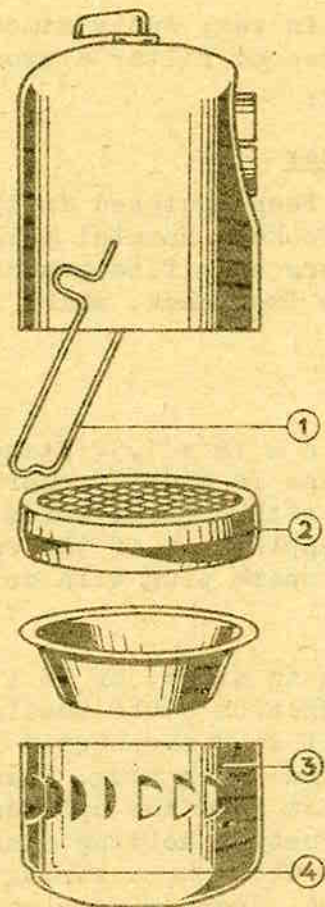
The air cleaner is equipped with a choke which should be closed when cold engine is started.

Periodically, depending whether the engine is operated in a more or less dusty atmosphere, the air cleaner must be thoroughly washed in fuel or kerosene. Then shake it, in order to completely remove fuel or kerosene. Now moisten filter element with engine oil; let any excess oil drip off and re-mount air cleaner.

Dust is extremely harmful to the engine and shortens its life. We recommend, therefore, that you clean the air filter often and thoroughly. A soiled air cleaner will not only permit unclean air to penetrate into the



engine, it will also cause fuel consumption to rise substantially, and result in engine troubles caused by moist and soiled spark plug.



#### Cyclone Air Cleaner with Oil Bath

After the fastening clip (1) is loosened and the filter cap (3) removed, the filter element assembly (2) can be dis-mounted. This assembly should be carefully cleaned with gasoline or kerosene and then moistened with motor oil (see preceding paragraph).



Before re-mounting the filter cap (3) fill motor oil up to the mark (4).

If engine operates in very dusty atmosphere it will be helpful to have a second filter element on hand for a change if necessary.

### Jet and Fuel Strainer

The carburetor has been equipped in the factory with the suitable jet. To keep harmful pollutions away from the carburetor, there is a fine-meshed sieve incorporated in the fuel cock, which should be cleaned from time to time.

### Spark Plug

Spark plug thread is M 18 x 1,5. Standard caloric value is 145, if the engine is usually operated under full load, a spark plug with caloric value 175 may be used; if little load is applied or if the engine is idling most of the time a spark plug with caloric value 95 may be used.

If the engine fails to start, or if it stops without afternoises, the ignition cable should be checked to determine whether it is disconnected from the spark plug protector or from the spark plug. Then check the spark plug by unscrewing it from the cylinder head, connecting it to the ignition cable, holding spark plug to ground and cranking engine through; a strong blue spark should jump. If it does not, spark plug electrode gap (0,4 to 0,6 mm) should be checked, or whether electrodes have been bridged.

If spark plug caloric value and jet are correct, the plug looks brownish. with too high caloric value it looks black and sooty. With too low caloric value, and if the jet is clogged, the spark plug will be burned white, and the electrodes will be covered with melt drops.

If even after cleaning or changing the spark plug a spark should not jump, spark plug protector, ignition cable, and finally ignition unit should be checked; the latter should be done by a skilled mechanic.

### Electric Equipment

The engine is equipped by a BOSCH flywheel magneto, which produces the current necessary for the spark. The ignition unit has been set most carefully and precisely by the factory. Make no changes unless necessary. In case of troubles observe the following:

If the ignition fails intermittently, or if there are other troubles that are due neither to spark plug, nor jet, nor carburetor, the contact breaker may be the cause. Contacts must be clean and must not be burned. With new engines, the little slip block of the contact breaker must still adjust itself; re-setting of contacts may therefore be necessary after some time. Breaker contacts are accessible after removal of the re-wind starter or of the lever starter, and of the starting pulley. The magneto housing need not be removed.

The ignition is properly set if the contact breaker starts opening at the moment when the piston is:

with 100, 125, 150 and 165 cc engines:  
3 - 3,5 mm B.T.D.C.;

with 200 and 250 cc engines:  
3,5 - 4 mm B.T.D.C.

At the same time the pole shoe of the magneto ring must have passed the coil shoe in the sense of rotation:

with 100, 125, 150 and 165 cc engines:  
by 7 - 11 mm;

with 200 and 250 cc engines:  
by 8 - 12 mm.

To adjust the ignition turn flywheel until the contact breaker is accessible through one of the slots and breaker contacts are fully opened. Now loosen fastening screw, securing breaker contact to the armature plate and, by means of a screw-driver, move the contact, until the gap is 0,3 - 0,4 mm with the contacts fully opened.

Rechecking of ignition timing is facilitated by a mark both on the flywheel and the crankcase. With these marks in correspondance, the piston must be on the ignition point.

Timing, adjustment and repair of the ignition unit should best be left to a skilled mechanic. Improper handling can easily cause more troubles with such delicate parts.

### Shorting Button

By depressing the shorting button, the ignition current is interrupted. Care should be taken that the button does not stick but returns into original position; otherwise the engine would be short-circuited and could not be re-started.

### Speed Governor

A speed governor is indispensable when constant speed is required or where engine over-speeding is possible.

The hand-lever operating the carburetor can be used independently from the governor. The governor only operates automatically, when the hand-lever is fully opened.

It is important to clean and lubricate the governor lever and ball joint frequently so that they will move easily.

### Centrifugal Clutch

A centrifugal clutch is necessary for machines that can



not be easily started when coupled to the engines, that do not easily reach their required speed, or that have to take shock loads in operation.

The centrifugal clutch consists of a hub bearing the centrifugal weights, and a drum.

with engine idling, the centrifugal weights are retained by springs. With increasing speed, the weights engage the drum. If the driven machine is to be stopped, reduce engine speed by closing carburetor hand lever and centrifugal weights and drum will be dis-engaged. Take care that under load engine runs at normal speed. With too low speed, the clutch would slip and soon be worn.

The design of the centrifugal clutch permits clutch drum to be removed. Engine must by no means be run with clutch drum removed, since centrifugal weights, which are held by the drum, would be thrown off with explosive force and might cause damage.

### De-carbonizing

Carbon deposits in engine and muffler must from time to time be removed, particularly when engine performance decreases. Dis-mount cylinder head and remove carbon by means of a tool without sharp edges (wire brush). In the case of the piston remove brown scales only. Do not scrape hard carbon film since that is a desirable protection against over-heating.

### Trouble Chart

ROTAX engines are of simple and rugged construction. Operation therefore is easy and with proper maintenance, troubles are unlikely to arise. If any troubles should after all arise, the following may be the cause:

#### Engine does not start

Fuel valve closed.

No fuel in tank.

Engine too cold: depress tickler, close choke.



Ignition wiring loose or defective.  
Spark plug soiled or defective: clean or renew.  
Spark plug electrodes bridged or gap too large.  
Breaker contacts soiled or burned: clean and re-adjust.  
Fuel line obstructed or strainer clogged.  
Carburetor jet clogged: blow out or clean with bristle;  
do not use hard object like wire.  
Carburetor loose or leaking.

#### Engine stops

No fuel.  
Ignition trouble: check spark plug and ignition wiring.  
Fuel flow obstructed.  
Engine too hot and piston seizing: jet obstructed,  
cooling fins or protection shield on fan cowl heavily  
soiled.

#### Engine working irregularly

Spark plug loose, defective or soiled.  
Ignition wiring loose or defective.  
Carburetor troubles: clean carburetor, tighten bolts,  
renew flange gasket.  
Incorrect ignition timing: check according to paragraph  
"Electric Equipment".

#### Engine Four Stroking

Fuel too rich: choke closed, air cleaner soiled.  
Carburetor flooded: Float leaking, seat of float needle  
soiled.

#### Engine Losing Power

Cylinder and muffler clogged by carbon: de-carbonize.  
Bad compression: engine leaking, tighten all screws.

Ignition trouble: check on ignition timing.

Carburetor trouble: loose or leaking.

### Engine Backfiring

Jet clogged: blow out or clean with bristle.

Improper spark plug.

### Engine Running Hot

Advanced ignition insufficient: see paragraph "Electric Equipment".

Fuel too poor: jet or fuel flow obstructed.

Unsuitable oil mixed with fuel: see paragraph "Engine Lubrication".

Muffler clogged.

Cooling fins or protection shield on fan cowl heavily soiled.

### Excessive Fuel Consumption

Carburetor, fuel line or tank leaking.

Air cleaner soiled: see paragraph "Wet Air Cleaner".

Jet needle or needle jet worn: replace by new parts.



**ROTAX-WERK AG.**

**Gunskirchen / Wels - Austria**

**Phone : (07246) 271**

**Cables: ROTAXWERK WELS**

**Telex: 025-546**