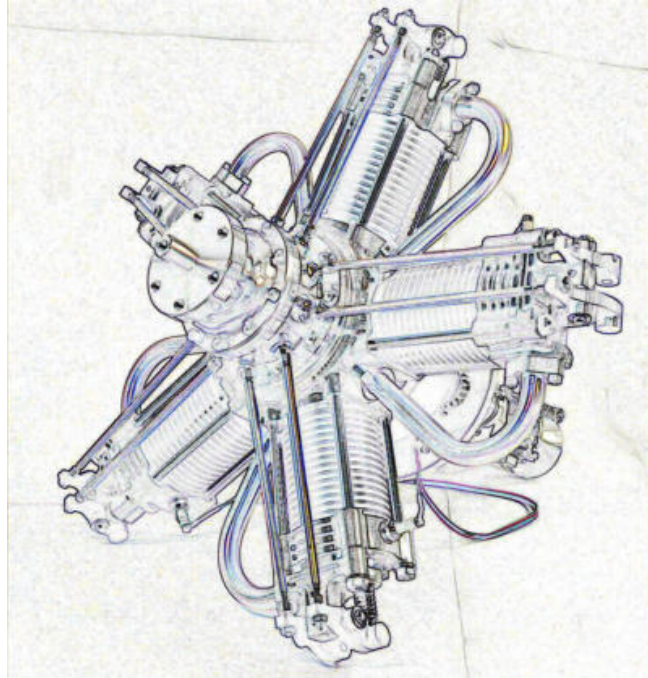


## Operating instructions

### UML 160 Rotary engine



- 1 Technical data UML 160
- 2 Use of the motor
- 3 Description of the engine
- 4 Fuel
- 5 Engine installation
- 6 Fuel tank
- 7 The ignition
- 8 Carburetor
- 9 Propeller
- 10 Tighten the propeller screws correctly
- 11 Starting the engine
- 12 Safety shutdown of the ignition
- 13 The running-in process
- 14 Engine maintenance
- 15 Adjusting the valve clearance
- 16 Scope of delivery

-1-

## Technical data UML 160

Design: Four-stroke rotary engine OHV, 2 valves per cylinder, mixture lubrication.

Displacement: 160 ccm

Power: approx. 6 hp

Bore: 32 mm

Stroke: 40 mm

Diameter: 290 mm

Length: 165 mm (engine mount to propeller support)

Propeller bolt pitch circle: 40 mm

Propeller screws: 6 pieces M5

Motor mounting: With 4 M4 Allen screws and 2 X M4 on the carburetor flange

Weight: Engine with ignition 3860 g

Idle speed: 800 1/min

Maximum speed: 3000 1/min

Optimum speed range: 2500 to 2700 rpm on the ground (!)

Fuel mixture: 8% oil (10% oil for running in)

Gasoline: At least 95 octane, optimally Aral Ultimate 102

Oil: Castor oil

Running-in time: 4 hours, the first 3 hours with 10% oil

*Jet needle setting: idle needle (L) 0.5 turns, full throttle needle (H) 2 turns*

*Ignition: Rcexel.*

*Voltage : 6 V- 14,4 V (2s Lipo) oder 2S LiFe*

*Sparkplug: 1/4 X 32G*

*Electrode distance: 0,4 mm*

*Valve clearance: 0,2 mm*

*Service intervals:*

Check valve clearance: Every 2-3 hours, every 30 minutes during the running-in period. Lubricate rocker arm bearings: Every 2 hours

-2-

## **Range of application of the engine**

The UML 160 is intended for use in model aircraft. Any other use, especially in man-carrying flight, is not permitted!

-3-

## **Description of the motor**

The UML 160 is a gasoline-powered four-stroke rotary engine based on the OHV principle.

The main difference compared to a radial engine is that the crankshaft is firmly connected to the aircraft fuselage and the complete housing and cylinders rotate. The gas-air mixture is sucked in through the hollow crankshaft.

-4-

## **Fuel**

The fuel is mixed from unleaded gasoline with at least 95 octane and castor oil. We use ourselves and recommend

**ARAL Ultimate 102** or **Shell V-Power**. It contains no bio-alcohol. alcohol, the mixture produced with it can be stored for a long time and the odor is less unpleasant.

The fuel should always be mixed with castor oil. Long series of tests with almost all two-stroke oils on the market have shown that castor oil is the only oil that guarantees reliable operation of a rotary engine, as was the case with the original rotary engines. The reason for this is that the oil separates very quickly from the gasoline in the crankcase and adheres better to the parts to be lubricated, such as pistons and cylinders, than all other types of oil.

-5-

## **Engine mounting**

Installing the motor is very easy with the drilling template supplied. The drilling template is aligned with the motor bulkhead so that the propeller comes out of the cowling exactly in the center. Now drill the four 4.2 mm holes and mark the cut-out in the motor bulkhead with

the drilling template and then finish it with a lathe or a Proxon grinder.

Fasten the motor with M4 screws of sufficient length as directly as possible

directly to the motor bulkhead or motor dome. Now install a hardwood beam approx. 12mm x 20mm exactly under the carburetor flange with the fuselage. Once this is done, drill the two 4.2mm holes and fasten the flange with two sufficiently long screws. Check the tightness of the screws regularly.

Do not use rubber washers! They are not necessary with this motor necessary with this motor and you will avoid all the disadvantages of incorrectly adjusted elastic incorrectly adjusted elastic suspensions. The smooth running of the UML 160 can almost be compared with an electric drive

-6-

## **Fuel tank**

A 750 ml tank lasts for a good 15 minutes. Be sure to use a felt pendulum filter or, even better, a ceramic pendulum in the tank! Secure Tygon® F4040 fuel hoses at the connections with 1 mm copper wire or suitable hose clips

-7-

## **Ignition**

Install the ignition protected against vibration! Everything else can be found in the ignition enclosed operating instructions.

***Never switch on the ignition or connect it to the battery without the spark plug connector plugged into the ignition finger!***

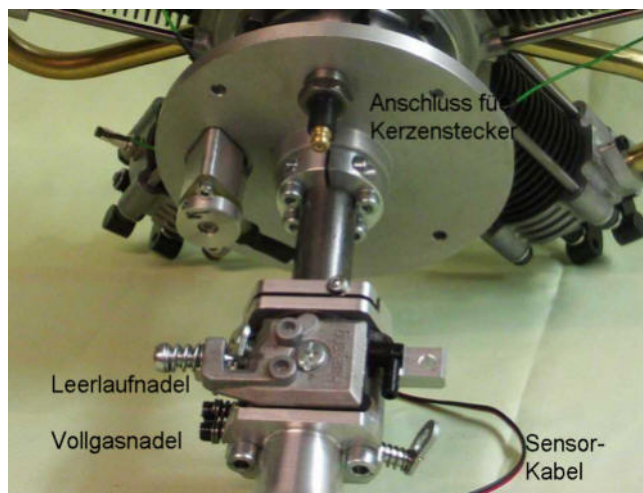
## Carburetor

A preset pump carburetor of the same design as a Walbro carburetor is fitted.

carburetor is fitted. This has two jet needles (L-low: idle needle and H-high: full throttle needle). The idle needle also has an influence on the throttle response from idling to approx. 40% of the maximum speed.

The basic position for the idle needle is 1 1/2 and for the full throttle needle 2 turns up (carefully turn all the way in and then two turns to the left). The fine adjustment for optimum running characteristics is carried out with the engine mounted in the model.

As the engine cannot provide the carburetor with pulse pressure, the engine has a mechanically driven diaphragm pump (pulse pump) which supplies the carburetor with pulse pressure.



-9-

## **Propeller**

Drill propellers from both sides, first from the rear, then also from the front.

from the front. This reduces the effect of possible tilting of the hole. Do not drill the holes with a hand drill.

Simply use the propeller disk and a piece of round material d-10mm or a 10mm drill shank as a drilling template.

-10-

## **Tighten propeller screws correctly**

Insert all six propeller screws and then always tighten the opposite screws

screws until they all have the same tightening torque.

Tighten all 6 propeller screws again. Not in a clockwise direction but Always tighten the next screw that is furthest away from the last tightened screw.

## Start the Engine

Put on a work glove when starting the engine. Never start the engine alone! Ask a reliable and strong (!) helper to hold the model. The model should be tilted slightly forward so that the fuel can enter the crankcase more easily due to the gradient created.

### *The coldstart:*

1. close the choke completely.
2. set the carburetor throttle to normal idle.
3. have the model held by an experienced helper.
4. switch on the ignition.
5. start the engine immediately without priming it first! The engine will start as soon as the carburetor has drawn in enough air by starting with the choke closed and stops again after the first few ignitions.
- 6 Open the choke.
7. start the engine until it starts and continues to run.
8. allow the engine to run for approx. 10 seconds at a slightly increased idle speed.
9. apply approx. 1/4 throttle to allow the engine to warm up for approx. one minute, before taxiing the model to the start.

If the engine has been running for the last hour:

1. close the choke completely.
2. open the carburetor throttle slightly wider than for normal idling.
3. have the model held by an experienced helper.
4. start the engine once with the ignition switched off.
5. open the choke.
6. switch on the ignition.
7. start the engine, it will usually start immediately and continue to run.
8. allow the engine to warm up again as described above.

## **Safety shutdown of the ignition**

The ignition is **not** automatically switched off by a safety circuit after one minute of standstill (no rotation of the propeller)! Such a safety circuit **can quickly become a trap** if you are held up by any circumstances during start-up and the propeller stops turning for a minute. If you then continue and forget to switch the ignition off and on again beforehand, the engine will stall more and more with each start attempt...

The safest option is an electronic ignition switch!

-12-

## **The running-in process**

The engine was tested and preset at the factory. When running in, there is increased (desirable) abrasion in the engine. Always use gasoline with 10% castor oil.

The maximum speed should not exceed 2400 rpm for the first 30 minutes. After that, the speed can be increased to 3000 rpm (for a few seconds). Keep changing the speed for the first two hours. Then change to 8% castor oil and load the engine normally.

load the engine normally. The running-in process is completed after approx. 3 hours.

I always run in my engines in the air or while flying, after I am sure that the engine is running smoothly. The advantage of this is that the engine does not suck in any swirled-up dirt particles and the engine runs smoothly under real operating conditions.ft.



## **Maintenance of the engine**

After running in, the valve clearance only needs to be checked every two to three (2-3) operating hours and adjusted if necessary.

Lubricate the rocker arm bearings at this time. Atlantic chain spray with Teflon has proved very effective for this.

During the running-in phase, the valve clearance should be checked at shorter intervals (every 30 minutes)

The valve clearance should not be less than 0.2 mm and not exceed 0.25 mm

The electrode gap of the spark plugs should be 0.4 mm.

If the spark plug electrodes are worn, the plugs must be replaced.

## **Adjusting the valve clearance**

The valve clearance should be 0.2 mm when the engine is cold.

The setting is made with

using a feeler gauge, an SW 5 open-end wrench and a small screwdriver

1. turn one cylinder so that the cylinder points 90° to the right.

Both valves should be closed. (ignition OT)

2. first measure the valve clearance with the feeler gauge

feeler gauge (0.1 mm). The valve clearance is

valve clearance is OK if the gauge moves with little

resistance between the valve stem and rocker arm.

with little resistance. The valve clearance is too

large if there is no noticeable friction at all

the gauge has "air". If the gauge is

tight and can only be moved with significant

resistance, the valve clearance is too small.

is too small.

3. now loosen the lock nut and

place the feeler gauge between the valve stem

and the rocker arm.

4. turn the adjusting screw in small steps with the Allen key

steps with the Allen key until the feeler gauge

feeler gauge can be moved with slight resistance between the

valve and rocker arm with slight resistance.

5. tighten the lock nut again

and check the correct distance again with the feeler gauge.

distance with the feeler gauge. The distance

may have changed as a result of the

may have changed.

6. now turn every 2nd cylinder upwards and repeat points 1-5

until the valves of all 5 cylinders are adjusted.

## Scope of delivery

Engine  
Prop Screws  
Propdisk  
Ignition system  
Drilling template

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