



## **INSTRUCTION AND MAINTENANCE MANUAL**

We recommend reading this manual before installing or using the engine

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Modifications or different mountings Compared to original model	Date



## PRESENTING THE MZ201 ENGINE

Congratulations on having chosen the MZ201 engine. The special design of the various components makes this a particularly light-weight, sturdy and reliable model.

If it is installed correctly and serviced regularly, your engine will last for a long time and meet your requirements in full.

Avant-garde technology was employed to manufacture this engine which is unique in its kind. The light alloy cylinder has been treated with Nikasil and is light-weight, reliable and has a virtually endless life-span. The crankshaft is made of nickel-chrome-molybdenum steel and built to high standards of resistance. Numerical control equipment and CAD-CAM technology have made it possible to build ultra-light crankcase and radial elastic mounting without jeopardising the resistance level. Furthermore, the crankcase incorporates the silent-block engine mountings and electric starter motor.

A 12 volt, 180 Watt alternator serves the ignition system and is used to re-charge the starter battery. Electronic ignition and variable automatic timing guarantee reliability, safety and optimum engine performance.

The above features ensure the MZ201 is a complete, light-weight and reliable propulsion system. Like all high-performance engines, the MZ201 demands care and maintenance. It is vitally important to use suitable fuel and a good blend of synthetic oil for two-stroke engines with a **50:1 ratio**. Proper servicing and appropriate use are essential requisites.

This manual aims to explain as clearly as possible how to install and get the best out of your engine.

## WARNING

### **This is not an aeronautics approved engine.**

This engine has not been subjected to durability and safety tests in compliance with aeronautical standards. It is designed to be used in paramotors and ULM or aeroplanes where engine failure will not produce serious consequences.

The user must assume responsibility for all risks deriving from the use of this engine and must understand that this engine is subject to sudden failure.

Engine failure may result in an emergency landing. Such accidents may cause serious material damage and injuries.

Never use an aircraft fitted with this engine in areas or at conditions and altitudes which may cause problems if forced to land as a result of sudden engine failure.

## INTRODUCTION

Like all high-performance engines, the MZ201 demands care and maintenance. It is vitally important to use suitable fuel and a good blend of synthetic oil for two-stroke engines with a 50:1 ratio. Proper servicing and appropriate use are essential requisites.

## ENGINE DELIVERY

Upon delivery of the MZ201, check that the components were not damaged during transportation.

Free the engine from any pieces of packaging materials which may still be trapped between the cylinder head cooling fins or cylinder; check that the exhaust manifold and carburetor are not obstructed.

## GUARANTEE

### **- Duration:**

This guarantee is valid for a period of six months or 200 hours from the date the end user purchased this engine from a distributor. The invoice is used as proof of purchase.

### **- Conditions:**

The warranty will only be in effect when the purchase was made through FIATE or an authorized dealer issued by FIATE.

The manufacturer reserves the right to modify dimensions and materials without prior warning. The guarantee covers faulty components or manufacturing defects.

### **- This guarantee does not cover:**

- The normal wear and tear of components.**

- The piston seizure and drilling.**

- The electric starter motor and electric components.**

- Damage produced by transporting the engine, accidents, fire, improper use, negligence, infiltration of external agents, premature wear or corrosion as a result of the engine being immersed in water or other causes.**

- Labour charges and the cost of lubricants needed for repairs are to be paid by the customer.**

## IMPORTANT SAFETY TIPS

Safety is everybody's concern. We set out here below an incomplete list of the main safety precautions to be taken when using the MZ201. It would be impossible to list all the circumstances which may occur when you use this engine, but by being aware of the potential dangers, you will also reduce the risks.

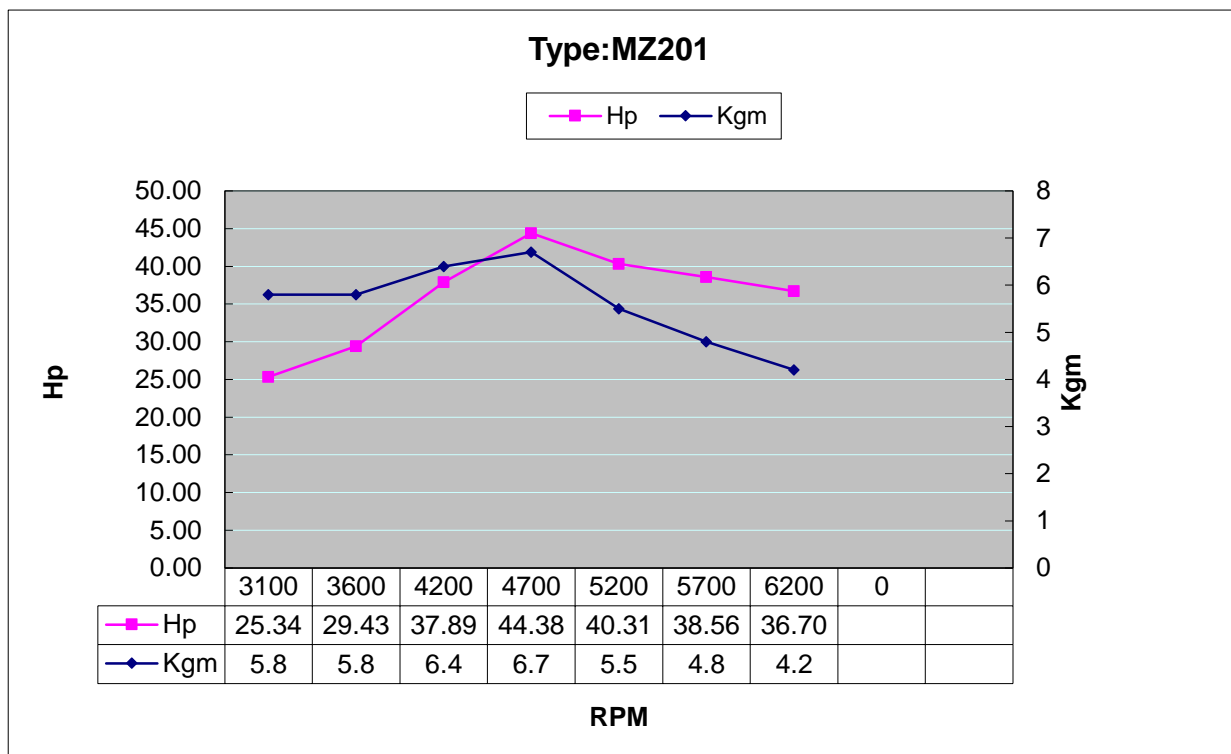
### Nonetheless, here is some useful advice

- Never blend fuel in a closed environment where the vapours could cause an explosion.
- Ensure all the engines controls are fully functioning and that you are able to locate the START-STOP switch. Make sure you can activate all the controls easily and that you can therefore use them instinctively and without hesitation.
- Never re-fuel if there is a chance of the fuel dripping onto the hot engine. Use only approved containers and ensure you comply with the relevant safety regulations when transporting fuel.
- Before each use, check the engine's attachment points, propulsion components, fuel lines, wiring and fuel and air filters.
- Use only clean fuel and blend immediately before using the engine. Check the intake and exhaust ports. When not in use, protect the engine to prevent impurities from entering the fuel lines or fuel itself. **Ensure everything is correctly done before starting the engine.**
- The engine must be always serviced regularly in order to foresee engine failure at all times.
- Never run the engine on the ground when the propeller is rotating unless the aircraft is located in an area where you can check that nothing and no-one can access the danger zone.
- Never abandon your aircraft with the engine running.
- If the engine behaves unpredictably, keep a written record. In the event of any problems, do not take to the air before solving the problem and making a record in the engine logbook.

## TECHNICAL SPECIFICATIONS

Model	MZ201
Type	two-stroke, two-cylinder, reed valve engine
Cooling system	air cooling system, by means of forced air (fan) or a propeller, depending on the type of installation
Direction of rotation	Counter-clockwise seen from the PTO
Capacity	626cc (Nikasil cylinder)
Bore x stroke	76 mm x 69 mm
Compression ratio	9.6 / 1
Power output	45 hp at 4700 rpm
Peak torque	67 Nm at 4700 rpm
Lubrication	Fuel / oil blend 50 : 1
Fuel type	Super 95 RON
Ignition	Magneto flywheel with electronic transducer with variable timing. Electric regulator and battery charger output: 180W 13.8 Volt
Carburetor	Tillotson HR197A with diaphragm pump.
Spark plug	NGK-CR8HSA Spark gap: 0,7mm
Operating cylinder head temperature	CHT max. 260 °C (500 °F) EGT max. 680 °C (1250 °F)
Starting	By hand, by means of an automatic re-winder and 450 W electric starter motor
<b><u>Weight</u></b> GMP	31 kg engine complete with, starter motor, manual starter, speed reducer and silencer.

## MZ201 PERFORMANCE DIAGRAM



## MAIN TORQUE SETTINGS

Name		Nm
Cylinder head screws	M6	16
Crankcase screws	M6	16
Magneto flywheel nut	M10 x 1	70
Cylinder nuts	M8	26
Spark plug	M10 x 1.5	16
Wooden Prop fastening screw	M8	5 + 2
Other screws or nuts	M8	20 + 2
Other screws or nuts	M6	10 + 2

## OIL AND FUEL

Whichever blend of oil and fuel you use, there follows some advice that will help you keep the engine in perfect running order.

- The presence of impurities in the fuel is the main cause of engine failure. To prevent the fuel from being contaminated, it is necessary to take action at source, because the potential risk increases if impurities enter the fuel tank. Always use a clean fuel container that complies with safety standards. Always filter the fuel when you fill or change the container. Do not fill the container to the brim; never forget that fuel may increase in volume.
- Do not use blends which have been stored for a long time or which have been exposed to sunlight in a translucent container. Blend the fuel and oil thoroughly before filling the fuel tank because there is a risk of the two liquids separating in time.
- Choose the same type and brand of oil and stick to it unless it causes problems. By doing so, you will get to know the product well and you will be able to assess whether it suits your engine. If you change the type of oil frequently and your engine has problems, you will never know which type of oil is responsible.
- It is extremely important to avoid switching from synthetic oil to traditional oil. The two types are not always compatible and, if blended, it is possible that a film may form and obstruct the engine's components or cause other problems. As a rule of thumb, 20% of cases where the user has switched from a synthetic oil to a traditional oil has resulted in problems with the engine.
- If the engine has been installed the opposite way up (with the spark plug pointing downwards), choose an oil that leaves few carbon deposits. Oil deposits tend to build up in the lowest parts, for example, in the spark plug cavity. If these deposits do not burn during normal use, the sparkplug is fouled and this may result in self-ignition. Manufacturers of top brand lubricants guarantee the quality of their products.

Oil specifications: **synthetic oil for two-stroke engines: 50: 1 ratio**

Fuel specifications: the octane rating should be minimum: R.O.N.95 or more.



## **How to prepare the blend**

A good method for preparing the blend could prevent a good deal of problems. By adopting the same method every time, the preparation will become an automatic process that will simplify matters no end.

1. Always use a suitable container: ensure it is clean, free of condensation and that you know the exact capacity. To dilute the oil more easily, pour a small amount of fuel into the container.

2. Pour in the required amount of oil. Shake slowly to blend the oil and fuel.

3. Add sufficient fuel to obtain the prescribed blend. If you use a filter at this stage, it should have a very fine mesh in order to filter any water or foreign particles.

4. Screw the lid back onto the container and shake vigorously. Pour the blend into the fuel tank of your aircraft. Use a funnel with a filter that is fine enough to prevent any impurities from entering the fuel tank whilst allowing the oil to pass through.

## **GROUND CHECKS TO BE CARRIED OUT BEFORE STARTING UP THE ENGINE FOR THE FIRST TIME**

Before starting up the engine for the first time, carry out a general inspection, checking in particular:

Ensure the carburetor and fuel feed circuit are securely installed.

Check the suction pressure piping between the crankcase inlet and the fuel pump on the carburetor, also check the decompression valve and carburetor inlet.

Check the condition of the electric cables and that the spark plug's high tension lead has been fitted correctly.

Check that the two black cables going from the engine shut-off control to the switch have been connected correctly

Ensure the silent-block engine mountings are properly installed and that the locking bolts have been tightened sufficiently.

Check the reducer, the belt tension and the fastening screw on the eccentric.

Never run the engine without the propeller; this is particularly important for the model without forced air cooling.

Ensure the propeller and locking bolts are in good condition. Check that the propeller is suitable for the engine as well as the latter's direction of rotation.

**(Only good quality balanced propellers must be used)**

## **STARTING UP THE ENGINE FOR THE FIRST TIME AND RUNNING IN**

The first time you start it up, run the engine at 2000 - 2500 rpm for the first 15 - 20 seconds, then run it at the lowest revs (1500 rpm) for a few seconds, before stepping up the revs to 3000 - 3500 rpm. At this point, we recommend running in the engine before using it, pushing the engine to its full potential. Part of the running in process can be carried out in flight. If you choose to do so on the ground, ensure the engine is bolted securely in position.

- Start the engine and run it at 2500 to 3000 rpm for 5 minutes, then step up the revs to 4000 rpm for one minute before dropping to 3000 rpm.
- Repeat the process, increasing the revs to 4000.
- Settle at 4500 rpm for 5 minutes, then drive the engine to the maximum revs for 10 seconds before returning to 3000 rpm.
- Repeat the above process, running the engine at maximum revs for 20 seconds.
- Repeat the above process, running the engine at maximum revs for 30 seconds.
- Settle at 3000 rpm for 5 minutes, then at 4000 rpm for 5 minutes, then run at the maximum revs for one minute and return to 3000 rpm.
- Run for 2 minutes at max. revs, then drop to 3000 rpm.
- Run for 5 minutes at 4000 rpm, then 3 minutes at max. revs, return to 3000 rpm for 2 minutes, then cut off the power supply and stop the engine.

During the above operations, check that the temperature of the cylinder head never exceeds 260 °C (500F)

During the running-in, it is particularly dangerous to increase the quantity of oil if you are using Castrol TTS. An excessive amount of oil will cancel the benefits of running-in the engine.

During the first few hours of use, never apply full power for prolonged periods, but just for a few minutes during take-off. By running-in the engine thoroughly, you will prolong its life-span. The engine will loosen up and function at full power after approximately five hours.

Any irregularities in the engine speed may be caused by a badly adjusted carburetor.

After the first hour of use, check that all bolts are tightly fastened in accordance with the torque settings given in the table on page 5.

## **FINAL CHECK**

After having inspected all the bolts, there is one final and extremely important component to be checked: the spark plug. The spark plug is a sufficiently reliable indication of the carburation.

Remove the spark plug and check the colour of the ceramic insulator at the electrode end. If it has turned a mid-brown colour, the carburetor has been adjusted correctly. Conversely, if it has turned black or dark brown, the fuel is too rich. If the ceramic is a light brown or sand colour, it means the fuel is too lean.

Adjust the carburetor accordingly (see ADJUSTING THE CARBURETTOR)

Remember that an excessively rich blend will not cause any immediate problems to the engine except that carbon deposits will form prematurely.

Too weak or lean a blend, however, may cause irreversible damage to the cylinder and piston

Always use a spark plug with an adequate heat rating

## **START UP PROCEDURE**

Press the primer bulb 3 or 4 times to induce a small amount of fuel into the carburetor when the engine is cold.

Check that the throttle is in the starting position (no intake or too much intake will hinder the starter motor and cause problems in starting up the engine).

Ensure the contact is on “start” and that you are able to disconnect the circuit immediately, if necessary.

- a) To start manually: pull the manual recoil starter handle slowly until it begins to offer resistance, then pull hard.
- b) To start electrically: following the instructions given above, press the start button until the engine starts (press no more than 4 to 5 times, taking care not to overheat the starter motor).

After starting the engine, reduce the intake gradually and disengage the starter as soon as possible (prolonged use of the starter may damage the motor).

If the engine does not start, check the fit of the spark plug caps and that the switch is on “start”. If nothing still happens, remove and inspect the spark plugs.

- If the spark plugs are damp, the engine is flooded. With the sparkplugs removed and ignition turned off and throttle wide open crank the engine to discharge any excess fuel. Replace the spark plugs after having dried it carefully and repeat the starting procedure.

## **ADJUSTING THE CARBURETTOR**

Please see the separate “Tillotson” manual for high and low speed carburetor adjustment.

### Throttle cable

- Once the throttle cable has been fitted, adjust the freeplay between the carburetor and the throttle lever by adjusting the tensioning device.
- Set the throttle lever to minimum.
- Check that the throttle lever is free to move unimpeded and that the cable sheath has less than 1 mm of freeplay (check by pulling the sheath). Adjust if necessary

## THE REDUCER

### Function of the speed reducer

Two-stroke engines are designed in such a way as to generate full power at a high number of revs, namely, 5000 rpm or higher. At these speeds, the performance of the propeller would be unsatisfactory on account of its small diameter and would produce an unacceptable amount of aerodynamic noise on account of the speed of rotation.

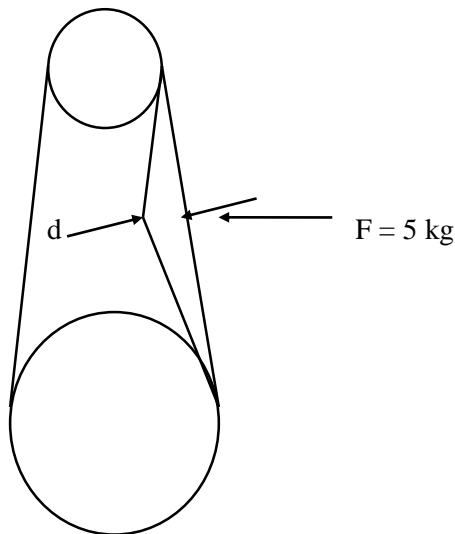
The only way of reducing the noise and boosting performance is to fit a speed reducer between the engine and the propeller.

### Choosing the right reducer.

In view of its simplicity, weight and manufacturing costs, we recommend fitting a belt-driven reducer. It also has the additional advantage of being quieter than a model with metal gearing.

Various types of belt-driven reducers are available. The choice depends on the weight of the reduction unit, the external dimensions and the power to be transmitted. Belts may be Polyflex or Poly V.

### Adjusting the belt tension.



The belt should not move by more than 2 mm if a pressure of 5 kg is applied.

When the MZ201 leaves the factory, it is already fitted with a speed reducer and the belt tension is adjusted correctly. However, during the first few minutes of use, the belt “settles” into position and loosens slightly. It is therefore essential to **re-adjust the tension after the first half an hour** of operation when the belts are new and as necessary to comply with the above drawing.

Furthermore, during each preliminary inspection before taking flight, we recommend checking the tension and condition of the belt. The drawing above shows how to regulate the tension.

## **ALIGNING THE PULLEYS**

When replacing one of the two pulleys in order to change the reduction ratio and adapt it to the propeller diameter, always check that the two pulleys are perfectly aligned. A misalignment of over 0.5 mm, could shorten the life-span of the belt. If the secondary pulley is misaligned, adjust by tightening or loosening the supporting shaft. The eccentric shaft has a left hand screw thread, thus the propeller axis should be rotated clock-wise; insert a 12 mm Allen wrench in the hexagonal cavity in front of the driven pulley axis to move the pulley outwards.

The screw thread has a lead of 1.25 mm; this means it will advance by 1.25 mm at each turn of the wrench.

**In the event of any difficulties, contact us.**

## **TROUBLE-SHOOTING**

Whatever model you choose, the engine will only function if:

- good spark is produced,
- there is a proper air/fuel mix.

Often, the majority of problems arise when one of the above conditions is lacking. Get organized and follow a strict procedure in order to identify the problem. Fault finding must be a logical process. There follows a brief trouble-shooting guide.

### 1. THE ENGINE WON'T START!

<b>Probable cause:</b>	<b>Remedy:</b>
Ignition failure.	Turn the switch to ON.
The fuel flow valve is closed or the filter is blocked.	Open the valve, clean or replace the filter and check the fuel lines for any leaks.
The fuel tank is empty.	Re-fuel.
You have not followed the start up procedure correctly.	Repeat the process, following the instructions carefully.
The spark plug is flooded as a result of supplying too much fuel when starting up the engine.	Remove and clean the spark plug, crank the engine to expel any excess fuel, Replace the spark plug and start the engine.
The spark plug is damp on account of excessive condensation.	Dry the spark plug carefully.
The spark plug electrodes are further apart than the recommended distance.	Adjust electrodes so that the distance is 0.7mm as indicated in the technical specifications.
The electrodes are worn away.	Replace the spark plugs.
The spark plug is dirty (oil and lead deposits on the insulator).	Clean the spark plug carefully using a metal brush or replace, as necessary.
The high tension lead is badly connected, loose or damaged.	Connect the cable or check it is in good condition, as appropriate.
The engine turns too slowly when starting-up on account of the electric starter motor battery is low or defective.	Re-charge or replace the starting battery.
There is water in the carburetor (carburetor with float) or at the bottom of the fuel tank.	Change the oil and clean the carburetor, the carburetor piping, filter and fuel tank.
Insufficient compression or damaged engine.	Contact us or your local dealer.

## 2. PROBLEM: INCONSISTENT IDLE

Probable cause	Remedy
The starter motor is switched on.	Switch off the starter motor.
Badly adjusted carburetor/s.	Adjust the carburetor/s.
The inlet manifold is leaking.	Tighten the joint, replace any faulty parts.

## 3. PROBLEM: THE ENGINE IS RUNNING IRREGULARLY

Probable cause	Remedy
Defective spark plug.	Check the spark plug, clean it inside and out, adjust the distance between the electrodes. Replace if necessary.
Defective or damp high tension lead.	Dry any damp cables or replace the damaged cable if it cannot be repaired.
Faulty spark coil.	Replace with an identical coil; do not change model.
Fuel or air filters are obstructed.	Clean or replace the filters.

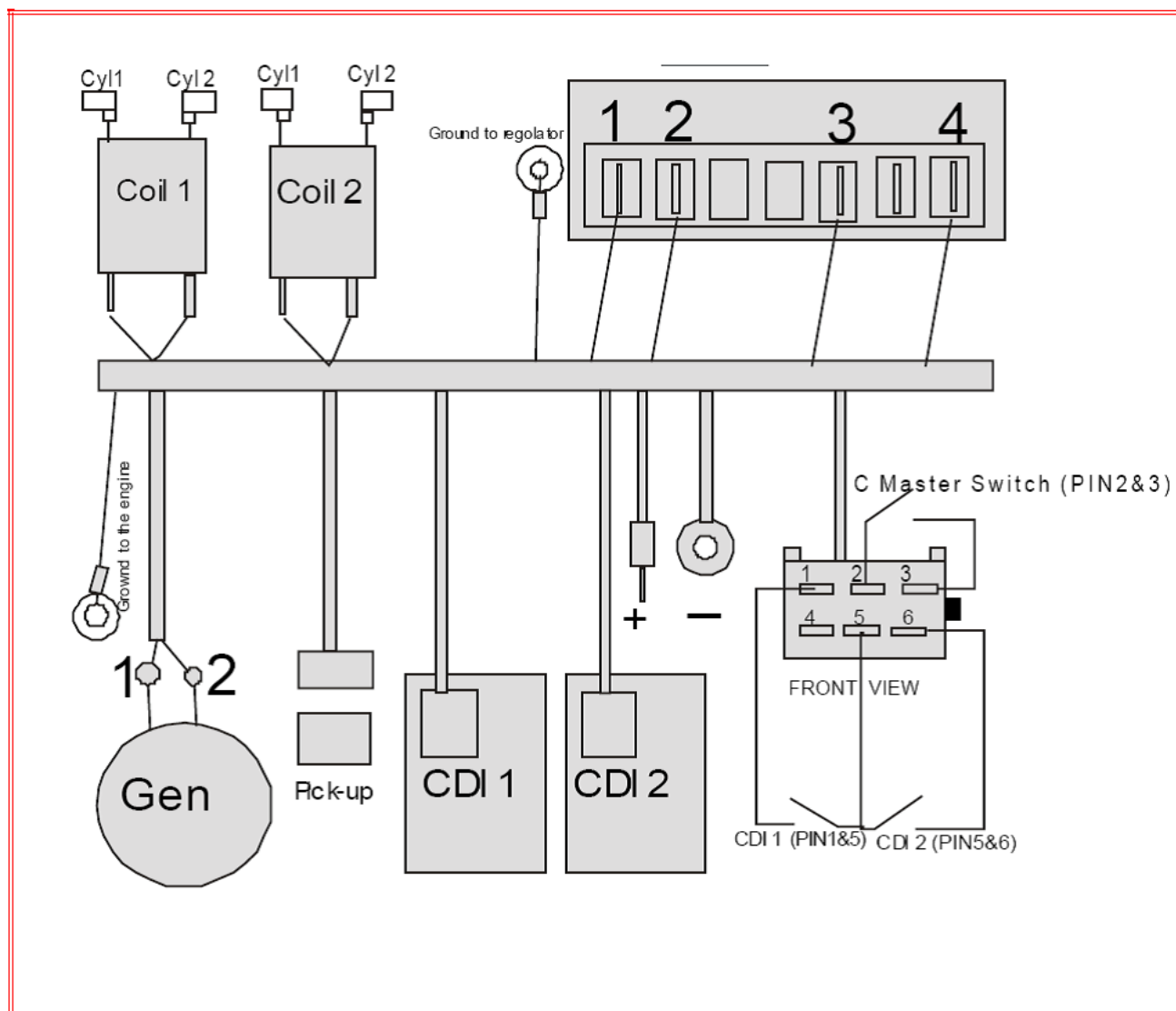
## 4. THE ENGINE HAS STOPPED

Probable cause	Remedy
The fuel tank is dry.	Re-fuel.
The fuel lines are blocked.	Clean the fuel filter.
The ignition is cut off after contact has been made.	Check the wiring system and the stop switch.
The engine will not start up again.	See point 1. Alternatively, the spark coil is completely unusable. Replace.



## 5. PROBLEM: THE PERFORMANCE OF THE ENGINE IS UNSATISFACTORY

Probable cause	Remedy
The recommended fuel mix has not been used.	Check the fuel mix.
Insufficient fuel feed.	Check the fuel feed and clean the fuel filter if necessary.
The air filter is dirty.	Clean or replace the air filter.
The air inlet is leaking.	Tighten all joints, check the carburetor joints for air-tightness.
Carburetor diaphragm (for engines fitted with diaphragm carburetors).	Replace the diaphragm.
No ignition.	The ignition system is faulty. Check the ignition circuit. Adjust the ignition.
Bad carburation.	Check the carburetor adjustments.



**The white connector must be connected as shown in the drawing:**

**No.2 with No.3**

**No.5 with 6 and 1**

**Connect one ground cable to the engine**

**One ground cable to the regulator**

**One ground cable to the battery**

**Connect the "+" wire directly to the battery**

**Engine must run with the switch closed - Regulator must charge with the switch closed**

## **WARNING**

**Ensure the battery cables are securely soldered to the terminals.**

Bad connections will lead to over-heating and irreversible damage to the battery. If you wish to be able to disconnect the battery, cable connectors of the right size may be used.

When connecting the battery and start-up motor, always ensure the cross-section of the cables is adequate; if the cables used are too small, this could lead to a drop in voltage which will make it more difficult to start up the motor and cause the cables to over-heat and melt.

**MZ201 ENGINE  
MAINTENANCE SCHEDULE**

Checks and work to be carried out (hours)	1	9	12	25	50	75	100	125	150	175	200	225	250	275
1) Tighten the cylinder head screws	X				X		X		X		X		X	
2) Check the starter cable			X											
3) Check the starter ring gear			X		X		X		X		X		X	
4) Check the spark plug			X											
5) Replace the spark plug				X	X	X	X	X	X	X	X	X	X	X
6) Check and clean the spark plug cap			X											
7) Check the ignition alternator						X			X			X		
8) Check gearbox oil	X				X		X		X		X		X	X
9) Replace exhaust springs							X		X		X			
10) Grease control cables				X	X	X	X	X	X	X	X	X	X	X
11) Check balance and tracking of propeller				X	X	X	X	X	X	X	X	X	X	X
12) Replace propeller fastening screws							X				X			
13) Clean air and fuel filters, lubricate air filter				X	X	X	X	X	X	X	X	X	X	X
14) Replace fuel filter (do not use paper filters)							X				X			
15) Check the carburetor, adjust idle setting and cable tension	X			X		X		X		X		X		X
16) Clean carburetor and check the condition of the idle pipe					X		X		X		X		X	
17) Replace float pointer									X					
18) Clean and check the fuel pump						X			X			X		
19) Check the cylinder head and piston (remove encrustation if thicker than 0.5 mm), replace gaskets.					X		X		X		X		X	
20) Check wear and freeplay of components					X		X		X		X		X	
<b>THE ENGINE SHOULD BE GIVEN A COMPLETE OVERHAUL EVERY 500 HOURS (CONTACT YOUR DISTRIBUTOR)</b>														



<p align="center"><b>Daily checks</b></p> <p align="center"><b>(To be carried out as part of the preliminary flight inspection at the beginning of each flying day)</b></p>	
Check the electrical contact is on “stop”.	
Remove any water contained in the fuel tank.	
Check the inlet manifold and the carburetor are securely fitted. <b>Warning: a cracked inlet manifold may perforate the piston.</b>	
Check the conditions, secureness and cleanliness of the air filter.	
Check the cylinder head and the cylinder housing for leakages.	
Check that the fixing components for the ignition coil and electrical connections are secure.	
Check the electric starter motor is secure (cracks, screws and connections ...).	
Check the engine is attached securely to the frame (silent block mountings and screws).	
Check the drive pulley (if necessary check the fastening screws of the starter motor ring)	
Check the driven pulley	
Check that the spindle of the driven pulley and the reducer plate are secure	
Check the condition of the belts	
Check the fuel lines for cracks and/or abrasions	
Turn the engine manually and listen for any unusual noises (to be carried out with the electrical contact switched off)	
Check the bearings of the driven pulley by rotating the propeller by hand (to be carried out with the electrical contact switched off)	
<p align="center"><b>Inspection to be carried out prior to flying (Before every flight)</b></p>	
Check the ignition switch is on off	
Check the fuel level	
Check the fit of the spark plug cap	
Check that there are no screws, nuts or other components missing from the engine and speed reducer	
Check the propeller (repair or replace if cracked or chipped)	
Check the propeller fastening screws	
Check that the choke and contact block controls are locked well into place.	
Check the exhaust and muffler system for security (cracks, bolts, springs, brackets...)	
Start the engine only after having checked that there is nobody in the vicinity	
Check the idle contact	
If the engine has two ignitions, check each individually	
If necessary, check the instruments whilst the engine is warming up	
Inspect the engine and exhaust for vibrations whilst the engine is warming up ( <b>this is also a sign of a unbalanced propeller</b> ).	

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