... the art to fly

minari engine

# STRATOS 400

## USER'S GUIDE

www.minari-engine.com

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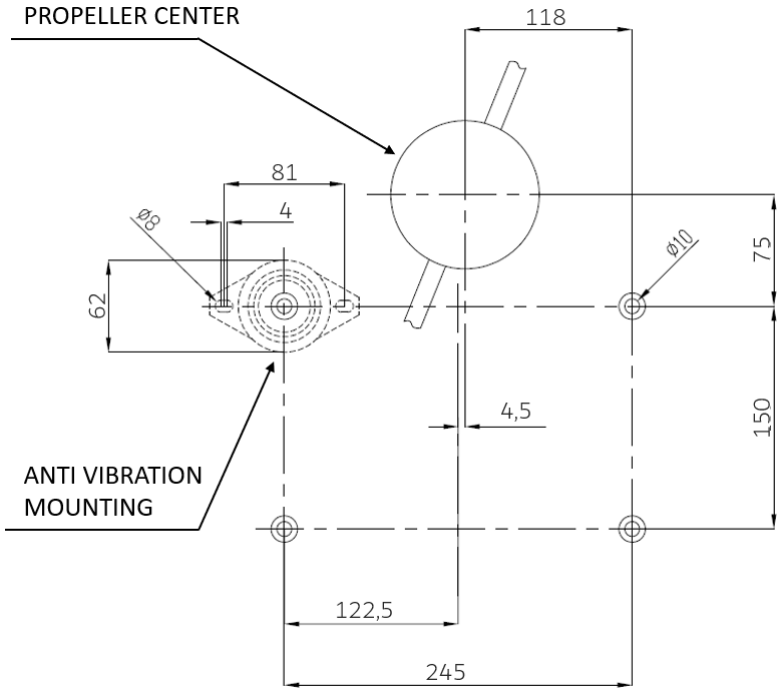
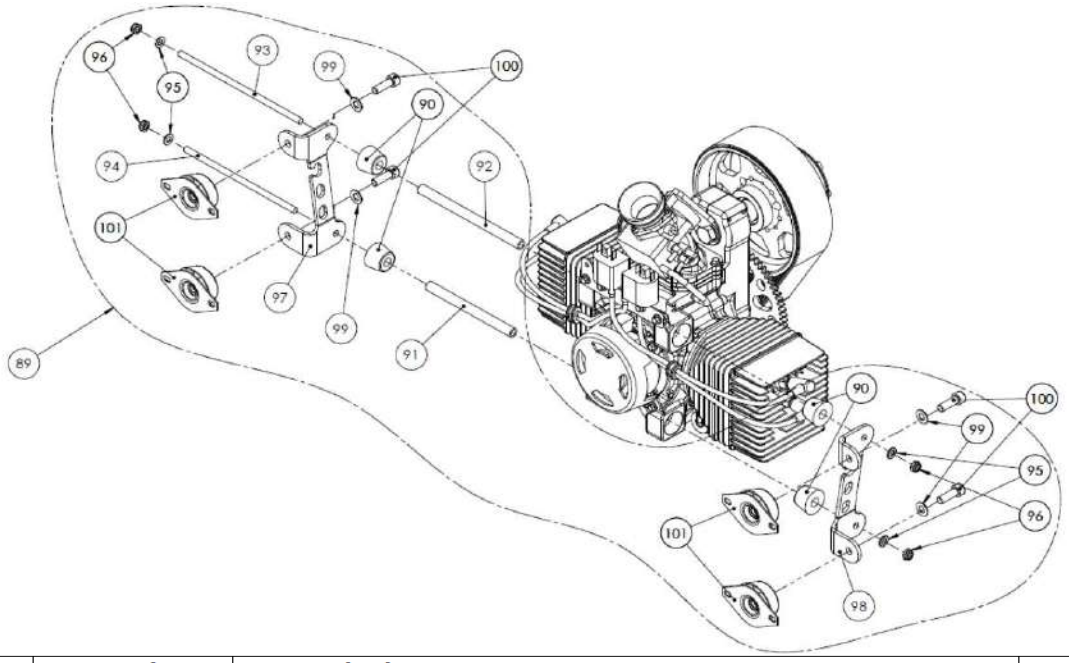
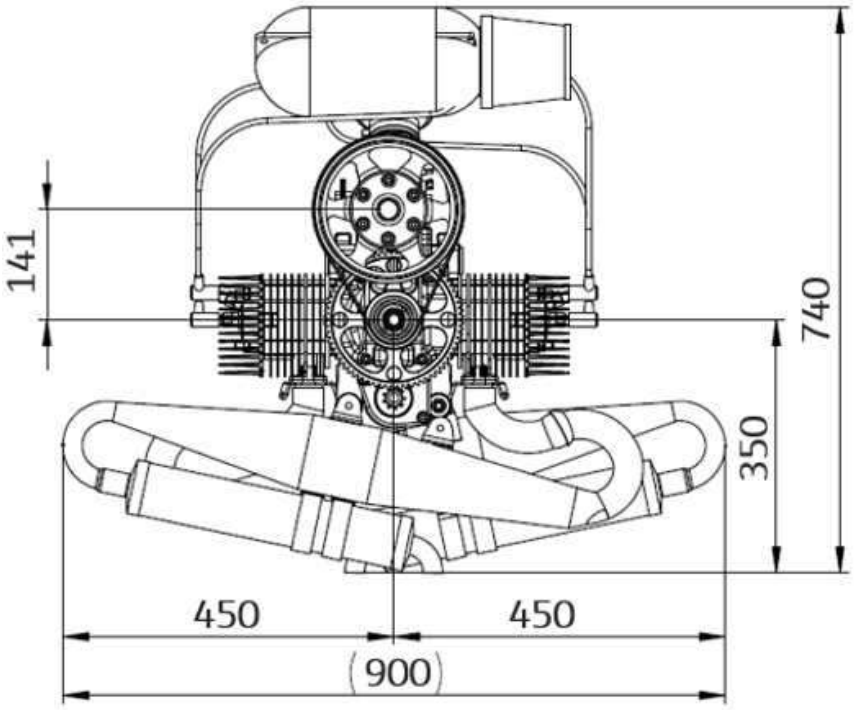
# FASTENING POSITION & ENGINE MOUNTS

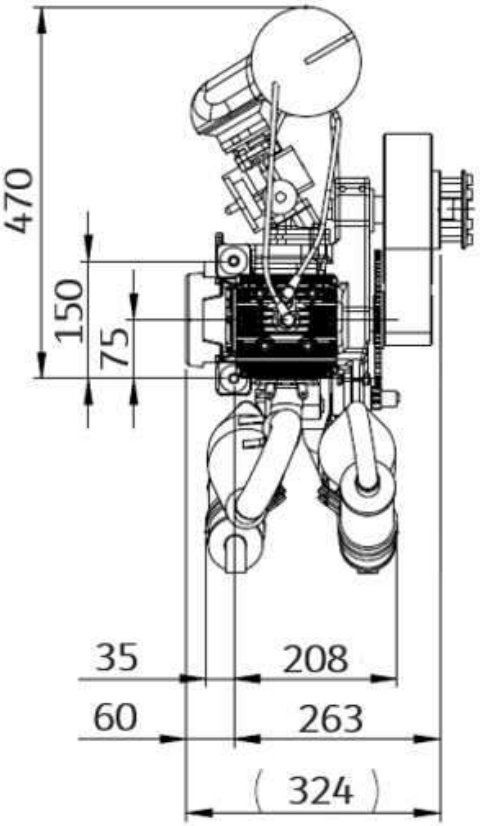


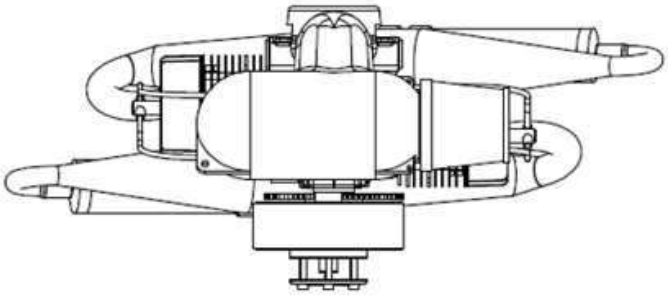



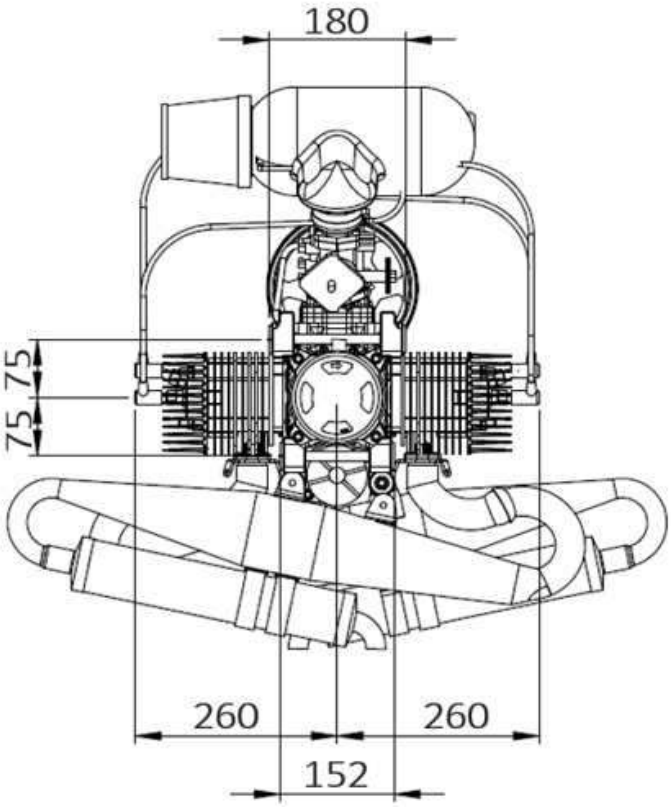

| N° | Cod. | Description | Q.ty |
|---|---|---|---|
| 89 | | GRUPPO SUPPORTI MOTORE | 1 |
| 90 | S002.85 | SILENT BLOCK MOTORE STRATOS | 4 |
| 91 | S014.96 | DISTANZIALE SILENT BLOCK INFERIORE STRATOS | 1 |
| 92 | S015.96 | DISTANZIALE SILENT BLOCK SUPERIORE STRATOS | 1 |
| 93 | S016.96 | BARRA FILETTATA SILENT BLOCK SUPERIORI | 1 |
| 94 | S017.96 | BARRA FILETTATA SILENT BLOCK INFERIORE | 1 |
| 95 | S007.98 | ROSETTA d.8 mm GRADO A | 4 |
| 96 | S009.86 | DADO AUTOBLOCCANTE M8 | 4 |
| 97 | S008.96 | SUPPORTO MOTORE STRATOS SX | 1 |
| 98 | S007.96 | SUPPORTO MOTORE STRATOS DX | 1 |
| 99 | S006.98 | RONDELLA Ø10 | 4 |
| 100 | S008.86 | VITE BRUGOLA M10x50 mm | 4 |
| 101 | S004.95 | SILENT BLOCK ANTISTRAPPO | 4 |

## OVERALL DIMENSIONS





# TECHNICAL DATA

| | |
|---|---|
| EG size | 388 cc |
| Type | 2 stroke, twin cylinder boxer |
| Bore | 66 mm |
| Stroke | 56,8 mm |
| Compression Ratio | 11 : 1 |
| Rotation | Counter-clockwise (looking from propeller side) |
| Power | 50 hp @ 7800 rpm |
| Maximum revolutions | 8000 rpm (allowed for max 60 seconds) |
| Optimal cruising speed | From: 5000 rpm To: 6000 rpm |
| Weight | 37,9 kg<br>included:<br>- 4 anti vibration mounts, anti-tearing type<br>- 2 mounting stays<br>- electrical component – excluded battery |
| Static thrust | 135 kg @ 8000 rpm (*) |
| Transmission ratio | 1 : 3,1 |
| Belt | Poly -V |
| Carburettor | Mikuni BN38 |
| Starter | Electric |
| Ignition | Electronic with double signal and 4 spark plugs |
| Output current | 3,5 A 14,5 V 50 W @ 5000 rpm |
| Recommended battery | 12 V min 10 Ah (Pb) – 12 V min 5 Ah (LiFe)<br>only for engine function, excluded other electric devices |
| CHT<br>(under spark plug temperature) | @ cruising speed: 250 °C ±15 °C<br>@ max speed: 280 °C ±15 °C |
| EGT<br>(exhaust gas temperature) | @ cruising speed: 590 °C ±15 °C<br>@ max speed: 700 °C ±15 °C |

* with Helix H40F 1,50 L-M-07-3. Trans. ratio 1:3,1 – 10°C temperature, standard pressure & humidity

## INTRODUCTION

Dear customer, thank you for purchasing a product from the Minari Engine line.
This manual aims to provide all the information necessary to use the engine safely and to carry out a correct maintenance. The manual must be kept and handed over with the engine should it be given to a new user.
We invite you to consult our minari-engine.com website to read or download the most updated version of this manual.

All our motors are tested before delivery, passing a complete and accurate check-up in order to verify the correct functioning of all parts.

**Note:**
the reliability and duration of the engine depend mainly on correct use and regular maintenance.

## GENERAL WARNINGS

The user is invited to read and comply with what is written in this manual for his/her own safety and that of others.

This engine is intended for use in the Sport and Recreation aviation.
Never use an aircraft equipped with this engine in circumstances or areas where a safe landing is not possible if the engine is shut down.
The user assumes all risks deriving from the use of this motor and from the possibility of sudden functional anomalies.
Parmakit and its distributors decline any responsibility, direct or indirect, relating to the use of Minari Engine branded engines and to any damage they may cause. This engine is not covered by any liability insurance for breakage, injury or death.

Should the aircraft be used with a passenger on board, the passenger is also considered a user, for this reason he/she must be informed of every point of these general warnings:

- carry out maintenances constantly and keep a report of each operation;
- always keep the air filter clean and in optimal conditions;
- always keep the engine perfectly clean; in the event of leaks around the cylinder, exhaust or carburettor body, do not only clean it, but fix the leakage immediately;
- always fully complete the checks and verifications;
- make sure that every component of the engine is always in perfect state of efficiency;
- NEVER use the engine if only one ignition system is working;
- NEVER start the engine if all the spark plugs are not connected to the connectors: this could irreparably damage the ignition systems;
- NEVER use the engine above the prescribed maximum rpm limit;
- NEVER mix fuel directly in the tank; this could affect correct mixing;
- refrain from refueling with the engine is hot: any fuel leak or vapors could catch fire;
- always filter the fuel mixture before filling the tank;

- do not use a fuel mixture older than one month;
- always store the fuel mixture in a cool place away from light sources;
- NEVER use fuel that contains traces of water, even to a small extent;
- NEVER use the engine without suitable control instruments (rev counter, EGT and CHT probes) correctly installed and working;
- NEVER run the engine without the propeller;
- NEVER use the engine in such a way as to compromise even partially the safety.

**Warning:**
Modifications to the engine or removal of original parts can make the engine a danger!

## WARRANTY

The warranty is valid for 12 months from the date of the purchase invoice.

▪ **What the warranty covers**
- conformity and operating defects of all parts of the engine, except the belt and the spark plugs; these parts are normally subject to wear and it is the customer's responsibility to replace them.

▪ **What the warranty does NOT**
- malfunctions and / or damage to the electrical system caused by incorrect assembly or lack of maintenance;
- malfunction and breakdown of the engine, or of one of its components, caused by impacts, lack of or incorrect maintenance;
- seizure of the piston in the cylinder, and possible consequences, caused by: wrong carburation, incorrect quantity of oil in the mixture, unsuitable fuel, overheating, aspiration of dust or debris;
- damages to people, things or animals caused by using the engine or by any part which detaches;
- expenses of any nature that do not concern the replacement of the component or components we consider to be defective.

▪ **Forfeiture of the guarantee**
The warranty is void in the event of:
- exceeding the period of validity of the guarantee;
- lack of or incorrect maintenance;
- serious damage to the engine and its parts caused by impacts;

- application of unsuitable components;
- improper use of the engine or with excessive load;
- modifications made to the engine or its parts not by us or approved by us;
- immersion of the engine or its parts in water or other liquids;
- alteration or cancellation of the engine serial number.

▪ **How to use the guarantee**

Contact your local Authorized Dealer, explaining the nature of the problem.
In the event of a repair or replacement of any component of the engine, where required by the warranty, deliver the engine to the Dealer providing the copy of the proof of purchase and the warranty coupon validated by the Dealer.
If your local Minari Engine Authorized Dealer is not known, please contact Minari Engine directly to be directed to the nearest Dealer or Repair Center.

**Warning:**

Parmakit does not assume responsibility for the work of the Dealers and Repair Centers as they act in their own name and on their own behalf.

## ENGINE INSTALLATION

For your safety and that of others, please read these instructions carefully

▪ **Fixing of the engine to the frame**

Always refer to the location of the engine mounts (page 2) and the overall engine dimensions (page 3) specified in this manual.
To fix the engine to the frame, use the antivibration supports and the support brackets supplied.
Fit the supports on the crankcase as shown on page 2 and tighten the M8 self-locking nuts to the pins to 35 Nm.
Fasten the 4 antivibration supports to the frame using 8 M8 bolts (2 bolts for each antivibration support), tightening them to 25 Nm.
Fasten the engine with the support brackets to the antivibration supports positioned on the frame and secure it with the 4 self-locking M10 nuts, tightening them to 35 Nm.

**Warning:**

We invite you to use only the anti-tear vibration dampers supplied, calculated to withstand the stresses produced by this motor. The use of other systems can cause the supports to break and the engine to detach.
We accept no liability for damage caused by fastening the engine to the frame that does not comply with the instructions described above.

**Note:**

When installing the engine, make sure that no objects obstruct the airbox air intake and that no cables or pipes are pinched, especially during normal flight operations.

**▪ Connecting the throttle**

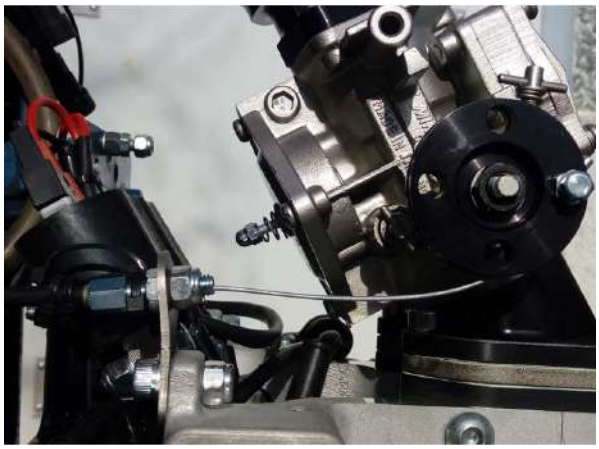
Place the clamp supplied in the seat located in the throttle wheel as in Pictures n°1 & n°2, pass throttle inner wire, from the side without end barrel, into the hole of the clamp and into the adjuster on the crankcase, pulling up until end barrel contacts the throttle wheel on the carburetor, then firmly tighten the clamp screw.

Pass the inner wire through the throttle control outer cable and let the outer cable enter the adjuster on the engine crankcase, making sure that it is in contact with the adjuster.

Secure the outer cable firmly to the register using a steel cable or zip ties.

Fasten the inner wire coming out of the outer cable to the throttle control making sure that the lever has about 10 mm of free play, without the throttle wheel operating, then firmly fix the wire to the lever (making sure that there is still play on the lever).

Picture 1



Picture 2

**Warning:**

If the throttle cable is accidentally pulled, the engine must not accelerate!

The outer cable must be fixed firmly and without play to the adjuster both on the motor side and on the control side.

After having mounted the throttle control to the engine, make sure that the inner wire moves without friction and that it is able to return autonomously to the idle position; the engine must not remain accelerated.

**▪ Electrical connections**

Refer to the wiring diagram with all the wiring, illustrated on page 26.

Don't interpret the drawing! If in doubt, please contact Minari Engine directly.

**Note:**

Always protect the electric cables with suitable outer insulating and protective sheaths; check that no cables remain taut.

Place cables away from: moving parts, sharp surfaces, abrasive surfaces and hot surfaces.

**Warning:**

Contact between unprotected wires or plugs can cause a short circuit and fire.

▪ **Battery**

Recommended battery needed to operate the engine correctly (without additional electrical components) is 12V 10Ah (if the battery is Pb), 12V 5Ah (if the battery is LiFe type).
In case of addition of electrical instruments, we recommend a 12V 15A battery (if the battery is Pb), 12V 7Ah (if the battery is LiFe type).

**Warning:**

Battery should be placed away from heat sources and far from the tank to avoid fire risks.
Before connecting the battery to the electrical system, use a tester to make sure that there are no short circuits.

**Note:**

In case you want to recharge the battery with an external charger, disconnect the battery from the electrical system to avoid damaging the electronic components of the system during charging.
Use only motorcycle type battery chargers with electronic current control to avoid damaging the battery.
Always refer charging method recommended for the type of battery used.

▪ **Fuel pipes**

Always use pipes made of suitable material for fuel system application; fasten firmly the fuel lines to the carburetor and tank fittings using specific clamps.

**Note:**

Place fuel lines away from: moving parts, sharp surfaces, abrasive surfaces and hot surfaces.

**Warning:**

The detachment or breakage of a pipe will cause a fuel leak that could catch fire.

## PROPELLER

**Warning:**
Never start or use the engine without the propeller to avoid damaging it!
In any condition, the engine must never exceed 8000 rpm (maximum speed) in order not to be irreparably damaged
Never keep the engine at full speed for more than 60 seconds.

To fully exploit the potential of this engine, we recommend the use of the following propeller, selected and tested for this engine:

*Helix H40F 1,50 L-M-07-3 (triple-blade, 150cm diameter, 7°, M profile)*

In the case of using a variable pitch propeller, make sure that the maximum speed reaches the recommended value of 7800 rpm and never exceeds the maximum allowable limit of 8000 rpm.

**Note:**
Failure to comply with the recommendations related to propeller specification may reduce engine performance, compromise safety and lead to warranty void.
It is extremely dangerous to use an unbalanced or damaged propeller, because it can cause severe stresses that can break the motor and cause the pulley to detach from the motor and / or other possible breakages.

## FUEL

This engine runs on a mix of 95 octane or higher gasoline and a good quality synthetic oil with a 2.5% ratio.

To ensure a correct running-in, the mixture ratio must be increased to 3% for the first 20 liters of fuel.

**Note:**
A higher quantity of oil will not extend the life of the engine; on the contrary, it will lead to a reduction in performance and an increase in carbon deposits (harmful to the engine) and air pollution.

**Warning:**
The use of gasoline with a lower octane number or a percentage of oil lower than the one prescribed can cause the engine to break down.

Gasoline is extremely flammable! Carry out the refueling and mixing operations away from heat sources, sparks and in a well-ventilated area.

# ENGINE BREAK-IN

Proceed to engine break-in only after it has been correctly installed, complete with propeller. During the first tests, regularly check the correct tension of the transmission belt. For the first hour of operation, the engine must not reach the maximum rotation speed, in order to allow the settling of all the moving parts.

IMPORTANT: at the first start-up, carry out a preliminary adjustment of the idling rotation speed, which must be between 2300 rpm and 2500 rpm.

After setting the engine idling speed, smoothly accelerate until reaching 2800 rpm and hold them for 10 minutes. After ten minutes, bring the engine back to idle speed to allow the engine to cool properly, then bring the engine speed to 3500 rpm for another 10 minutes. After ten minutes at 3500 rpm, bring the engine back to idle speed to cool it, then repeat the operation for another ten minutes at 4300 rpm. After ten minutes at this speed, bring the engine back to idle speed to allow the engine to cool properly, then repeat the operation bringing the speed to 4900 rpm for another 10 minutes. After ten minutes, bring the engine back to idle speed to allow it to cool properly.

During all the first stages of running-in, the CHT and EGT temperatures must be constantly monitored, in order not to exceed the following thresholds:

EGT: 590°C @ intermediate speed; 700°C @ maximum speed
CHT: 250°C @ intermediate speed; 280°C @ maximum speed

If the temperatures exceed the indicated thresholds, stop running in immediately and identify the causes before continuing.
The two main causes to check will be lean carburation and / or insufficient ventilation of the cylinder-head units.
A correct EGT temperature combined with a high CHT is a warning signal of insufficient cylinders ventilation. In this case you will have to adopt solutions that allow better cooling of the engine (for example: air conveyors).

▪ **Verifying propeller pitch**

At this point, starting from the minimum rotation speed, bring the engine to maximum speed for a maximum of 3/4 seconds and slowly reduce the speed to idling.

The engine must not exceed 8000 rpm, and this is the indicator of the use of a correct propeller.

If the propeller pitch is not correct, the CHT and EGT values could be distorted, and compromise the reliability of the engine, also causing serious damage to it. Be sure to carry out this check carefully before proceeding with the next phase of the break-in.

At this point, start the engine again and allow it to warm up to idle speed. Bring the speed to 6000 rpm for 10 minutes. After ten minutes, bring the engine back to idle speed to allow it to cool, then bring the engine to 6500 rpm for another 10 minutes. After ten minutes, bring the engine back to minimum rotation speed to allow it to cool, then bring the engine to maximum speed for 1 minute.
If before the completion of the minute the CHT temperature reaches the limit of 250°C, reduce the speed to idle for a short cool down and then complete the minute at maximum speed. During this last test, the EGT temperature should not exceed 590°C.
If temperatures exceed, stop running in immediately and solve the problem.

**Note:**
After completed the running-in phases, let the engine cool completely, check the tightening torque of the engine screws (referring to the table on page 24) and check the belt tension (referring to the procedure on page 18).
Do not tighten the nuts while the engine is still hot. Complete cooling of the engine can take a few hours. If it is not possible to carry out the check immediately after the break-in, it is absolutely necessary to do it within the first 10 hours of engine operation.

## PREFLIGHT SAFETY CHECKS

**to be carried out always before each flight**

**Safety first!**
Keeping the engine in perfect maintenance condition will drastically reduce the chances of failure. If you carry out the checks continuously, on each engine component, without giving priority to only some parts, in a short time you will have a greater awareness and knowledge of it and you will be able to quickly recognize any signal of arising problems. Carefully inspect possible leaks, the operation of moving parts, the safety wires, taking care to keep the engine and all its components perfectly clean. This will make the checks extremely simple and any leakage or damage immediately visible.

A few points to keep in mind:

- check that the main switch is in the OFF position;
- check that the rubber manifold of the air filter is intact and does not show cracks or signs of leaking fuel and that it is firmly fixed;
- check that the carburetor calibration is adequate for the atmospheric conditions and the altitude from which you will take off;
- check that there are no sediments or water residues in the tank or in the fuel lines (if present: remove them);
- if existing, open the tank breather: running the engine with closed breather leads to lean fuel/air mixture, with possible engine stop and / or engine failure!
- check that the fuel system is not leaking and that it is securely fixed, away from heat sources or moving parts;
- check the condition of the fuel filter, which must be clean and free from leaks;
- check that the engine has no fuel or air leaks, especially around the intake, exhaust,

cylinder base and between cylinder head and cylinder;

- check the tightening of the spark plugs and any leaks under them;
- check all the ignition wiring, including the spark plug boots and their secure fastening;
- check the integrity of the electrical system, its connections and its fixing points to the engine and frame;
- check the engine supports and their fastening to the frame;
- check the operation of the throttle control, that it is able to open and close the carburettor completely, without any friction;
- manually rotate the propeller, in order to detect any abnormal noises coming from the moving parts of the engine (before this operation make sure again that the main switch is OFF, if possible remove the spark plug caps, in order to prevent any possibility that the engine could start accidentally);
- check the condition of the propeller, which is not damaged due to stones, debris or objects that may have accidentally reached the blades during the previous flight; NEVER use a damaged propeller! provide for repair and balancing before use;
- check the exhaust system, the fixing and safety wirings, paying attention to any leaks or cracks;
- check the reduction belt, that it is in perfect condition and correctly tensioned;
- check that there are no animals, sand or residues in general throughout the engine area;
- check that all the safety marks on the bolts and nuts are intact and in place;
- inspect any other part of the engine not listed above, which is intact and free of leaks and in any case appears in normal conditions;
- check that there is sufficient fuel in the tank for the intended flight mission;
- carry out the pre-start checks, and the correct warm-up of the engine before flying.

# ENGINE USAGE

## STARTING THE ENGINE

▪ Pre-ignition checks:

Before starting the engine, always make sure:

- to have carried out the **daily safety checks**;
- that all planned maintenances has been carried out;
- that no one is nearby and that the area around the aircraft is safe.

Check for any weather changes compared to the last operations carried out. Barometric, humidity and temperature variations may require new carburettor settings. Keep these variations in mind as you complete the engine warm-up, combining them with controlling EGT and CHT temperatures.

Pump the fuel until the air is completely removed from the delivery pipe that reaches the carburetor; press the vent button on the carburetor (Picture n°3, page 15), pump the fuel mixture again for about 1 second, so that a small quantity of fuel enters the engine, then release the button.

▪ **Starting procedure**:

- main switch ON;
- throttle control to IDLE position;
- shout "Away from the propeller!"; a person, if present, might reply "wait!" or "free!";
- press the start button and release it once the engine has started.

Do not keep the start button pressed for longer than 6 seconds.

If the engine does not start, turn the main switch back to OFF and pump a further small amount of fuel before repeating the starting procedure.

## WARMING UP

After starting the engine, you need to warm it up before putting it under load to take off.

**Note**:
running the engine without having reached the optimal temperature can cause damage or breakage of the same.

To warm up the engine to the correct operating temperature, proceed as follows:

- keeping the aircraft braked, accelerate slowly until the engine is between 3500 rpm and 4000 rpm (no more) and keep it at this speed for 5 minutes;
- check that the correct operating temperatures have been reached;
- let the engine slow down to idle speed (2300 rpm / 2500 rpm);
- operating the two switches, check the correct functioning of each of the 2 ignition systems. In case one of the two systems has anomalies DO NOT PROCEED TO

TAKE OFF, otherwise continue with the following operations;

- keeping the aircraft braked, bring the engine speed to maximum for 1 or 2 seconds, in order to check the maximum power available.

**It is now possible to take off.**

**IN FLIGHT**

- take off and climb at full throttle until cruising altitude is achieved; Remember that maximum power cannot be maintained for a long time;
- once cruising altitude has been reached, reduce the engine revs to level flight speed;
- adjust the engine speed to the required flight speed, keeping in mind that the engine must never exceed the maximum operating speed.

**SWITCHING OFF THE ENGINE**

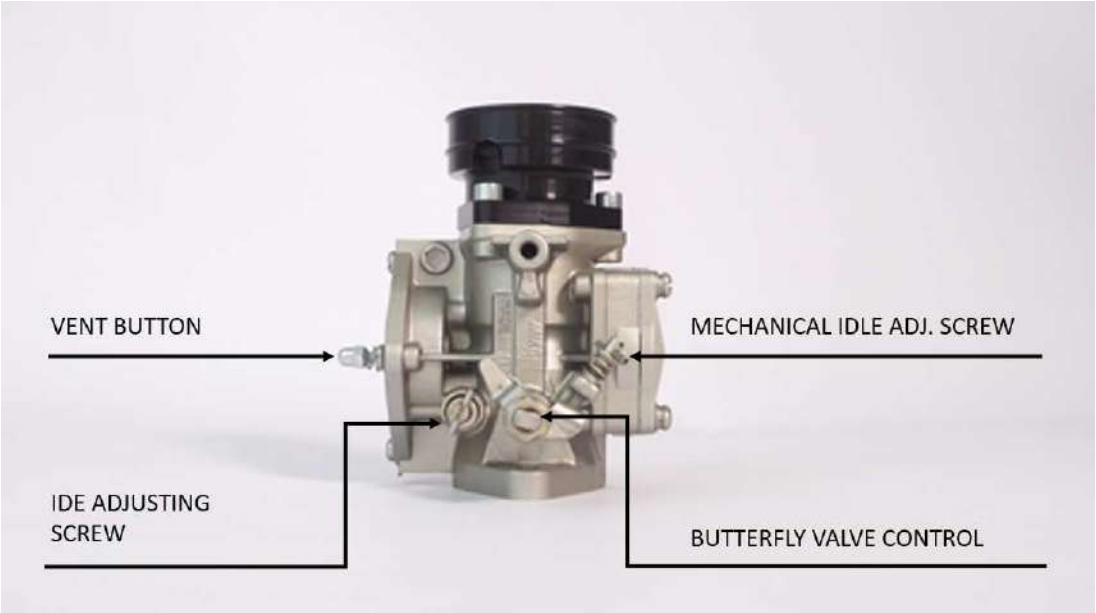
Once landed and reached the "parking" area, adjust engine speed to idling and let the temperature reduce and stabilize.

Now you can proceed with the shutdown using "Master" switch.

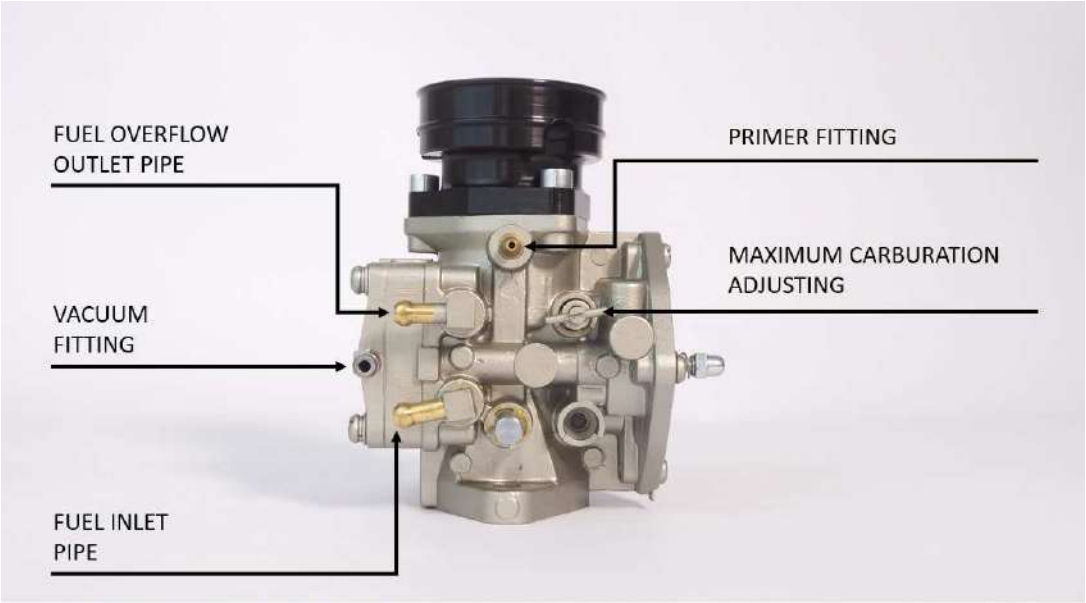
Visually check for any leaks or air suctions from the inlet system, the air filter, the crankcase, the cylinder head and the exhaust, as well as the correct state of the wiring harness, and the condition of the drive belt.

## CARBURETTOR

**Mikuni BN 38**




Picture 3



Picture 4

**ICING or CARB ICE**

WARNING!!! The carburettors installed on aircraft engines are subject to the risk of CARB ICE, which means the accumulation of ice in the carburetor, which occurs in particular atmospheric conditions of humidity and temperature, caused by the strong cooling of the air / fuel mixture due to the Venturi effect. When this occurs, carburetion can be compromised, throttle control can stall, and the engine loses power.
The formation of ice in the carburetor is always a very serious event and in the worst conditions it can cause the engine to shut down.
It is the owner / user responsibility to take all possible precautions to minimize the risk of CARB ICE, for example by installing carburetor heating systems, to prevent icing or to eliminate it before it becomes dangerous to engine operation.

## CARBURETION

**Note:**
The engine you purchased has a carburation adjusted during engine final inspection test and may not be correct for the temperatures and atmospheric conditions present at the time and place where you want to use it.
Before take-off it is necessary to check, and eventually re-calibrate, the carburetion.

**Warning:**
The carburetion is essential for the correct engine running; incorrect carburetion can cause engine failure.
We recommend that you have the carburetor calibrated by a professional skilled in two stroke engine carburetors.

We will not be held responsible in the event of engine failure caused by a fuel/air mixture that is too lean or too rich.

**▪ Carburetion check**

To monitor that the carburetion is correct for the temperature and conditions in which you want to use the engine, we recommend to install the Cylinder Head Temperature sensor (CHT) and the Exhaust Gas Temperature sensor (EGT) on your engine.
Typical recommended values of CHT and EGT are shown in the technical data table.
In case, during running, your engine reaches temperatures below or above those indicated, the carburetion must be modified to avoid possible damage..

One method for checking carburation richness is reading the spark plugs color:
▪ Picture n°5 shows electrodes color when the fuel/air mixture is correct;
▪ Picture n°6 shows the color of the same when the carburetion is lean (not enough fuel);
▪ Picture n°7 shows the condition in case of greasy carburetion (too much fuel).

Picture 5

Picture 6

Picture 7

## FREE AIR COOLING SYSTEM

Air cooling in engines with a thrusting propeller is undoubtedly more critical than with pulling propeller. However, in most installations the *STRATOS* engine will have no problem to keep normal operating temperatures. In any case, it is the responsibility of the installer / user to verify that the engine cooling is enough for the vehicle and the conditions in which it will operate. Pay close attention to this aspect, if necessary you will have to create specific air funnels or ducts capable of increasing the cooling of the engine. In doing this, keep in mind that an air duct to be efficient must have the area of the outlet section greater than that of the inlet. In this way, the venturi effect created will increase the cooling capacity of the engine.

# ORDINARY MAINTENANCE

## BELT

**▪ Belt tensioning**

Warning:
Too big belt tension causes overheating of bearings and moving parts.
Too small tension causes slippage and early belt wear.

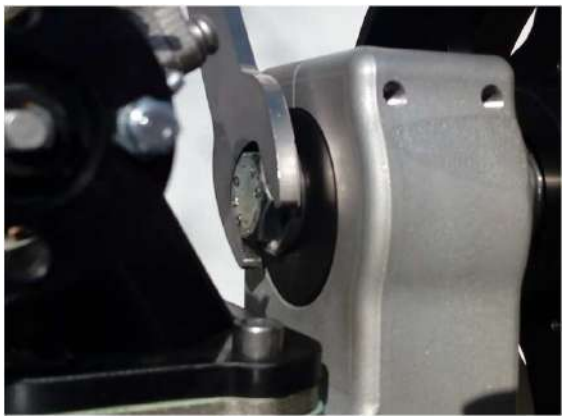
Note:
Pay attention that during the procedure, the eccentric does not come off its seat, causing a misalignment between the two pulleys. To avoid this, always keep the large pulley pushed against the support with one hand, before tightening the two Allen screws that secure the eccentric.

Required tools:

- special key for eccentric (supplied);
- torque wrench, with socket for 13mm hexagonal nuts;
- Allen key;

Procedure:

- completely loosen the two Allen screws that lock the eccentric, unscrewing them counterclockwise and make sure that the eccentric moves freely;
- place the special wrench for the eccentric supplied on the nut located behind the eccentric (Picture n°8);
- set the torque wrench to 14 Nm, apply the socket for 13mm hexagonal nuts and connect it to the special wrench for eccentric (Picture n°9);
- push the torque wrench upwards until you hear the click, then keep the position;
- tighten the two Allen screws with the appropriate wrench;
- remove the torque wrench and the special key from the eccentric;
  now tighten the two Allen screws that lock the eccentric with the torque wrench set to 16 Nm.



Picture 8

Picture 9

▪ **Belt replacement**

Note:
Pay attention that during the procedure, the eccentric does not come off its seat, causing a misalignment between the two pulleys. To avoid this, always keep the large pulley pushed against the support with one hand, before tightening the two Allen screws that secure the eccentric.

Required tools:
- special key for eccentric (supplied);
- torque wrench, with socket for 13mm hexagonal nuts;
- Allen key;

Procedure:
- completely loosen the two Allen screws that lock the eccentric, unscrewing them counterclockwise;
- place the special wrench for the eccentric supplied on the nut located behind the eccentric, then turn it clockwise until the two pulleys are as close as possible;
- remove the used belt;
- clean the pulley grooves from rubber residues and any dirt (never use oily substances);
- fit the new belt;
- by turning the eccentric pin counterclockwise, return the large pulley to its position;
- tension the belt following the procedure in previous paragraph (Belt tensioning).

## SPARK PLUGS

**Note:**
All the procedures following must be carried out with cold engine.

▪ **Spark plugs inspection**

Required tools:
- feeler gauge;

Procedure:
- remove the four spark plugs;
- using a feeler gauge, check that the gap between the two electrodes is between 0.6mm and 0.9mm;

If the gap is more than 0.9 mm, spark plugs must be replaced.
If the spark plugs have excessive carbon deposits, we recommend to replace them even if the gap between the electrodes is correct and the spark plugs do not have 50 hours yet.

▪ **Spark plugs cleaning**

Required tools:
- a sheet of abrasive paper (300-400 grit);
- a soft cloth;

- compressed air gun.

Procedure:

- remove the four spark plugs;
- with a clean cloth, dip a part of it in a drop of fuel and with that part clean the area of the electrodes;
- using a sheet of fine-grained sandpaper (300-400) slide it between the electrodes, first with the grain on one side and then on the other side;
- thoroughly clean the area with compressed air and a dry cloth.

Repeat the procedure for each spark plug. After cleaning is complete, make sure to inspect spark plug gap before reinstalling.

**CLEANING**

**▪ Cleaning and lubrication of exhaust joints**

**Note:**

All the procedures following must be carried out with cold engine.

Required tools:

- a sheet of abrasive paper (100-150 grit);
- a sheet of scotch brite type abrasive cloth;
- anti seize copper grease;
- a brush;
- a 13mm spanner;
- a 6mm Allen key.

Procedure:

- disassemble the two expansions and remove them from the engine;
- remove the steel cables in the joints;
- remove the springs and disassemble the manifolds;
- thoroughly clean the joints from carbon residues using abrasive paper and scotch brite, making sure that the contact surfaces of the joints are smooth and clean;
- grease the contact surfaces of the joints with copper grease, using the brush;
- reassemble the manifolds with the springs;
- re-set the steel cables in the joints, passing them through the springs and into the spring hooks;
- tighten the ends of the cables using new clamps;
- refit the two expansions on the engine.

**▪ Cleaning the air filter**

**Note:**

The original equipment conical filter a metal grid that contains a washable reusable fabric. Never use chemical or petroleum-based solvents to clean it.

Required tools:

- alkaline degreaser;
- a basin or bucket with clean, lukewarm water;
- spray oil for washable fabric filters.

Procedure:

- cut the tie that holds the conical filter to the airbox;
- while keeping the airbox still with one hand, with the other unscrew the conical filter anticlockwise;
- spray a generous amount of degreaser on the filter, inside and out. Leave for 1 minute;
- immerse the filter in the basin containing lukewarm water (35-40 ° C) and shake it;
- repeat the procedure 2-3 times, then rinse the filter with clean water;
- let the filter dry completely (do not use compressed air to avoid damaging the fabric);
- once dry, spray the filter oil on the fabric outside the cone then screw it back onto the airbox and secure it with a tie.

**▪ Cleaning heads, cylinders and pistons**

**Warning:**
The following procedure requires some experience and skill in engine assembly and maintenance in order not to damage any component.

**Note:**
All the procedures following must be carried out with cold engine.
Refit the cylinders, pistons and heads respecting the original positions (do not swap the components).

Required tools:

- a sheet of abrasive paper (300-400 grit);
- a sheet of scotch brite type abrasive cloth;
- a 13mm spanner;
- torque wrench, with socket for 13mm hexagonal nuts;
- 1 liter of gasoline (or white oil);
- a cutter;
- compressed air gun;
- Ø2 drill bit;
- A small drill-screwdriver;
- N002.03 cylinder gasket kit (q.ty:2).

Procedure:

- remove the four spark plugs and disassemble the two expansions;
- loosen the head nuts crosswise until they are completely removed;
- remove the heads and the cylinders from the block;
- place clean rags inside the crankcase so that nothing can enter the crankcase bearings and inside the crankshaft;
- remove the O-Rings from the heads, the gaskets from the cylinders and any residues of the gaskets;
- remove the rings from the pistons, clean the seats of the rings from carbon deposits, using a cutter (taking care not to scratch any surface);
- clean the rings from carbon deposits (without scratching or rubbing the shiny surface that contacts the cylinder liner) by placing them on a sheet of abrasive paper and rubbing them with a rotary motion, both on one side and on the other;

- clean the piston crown (the rounded upper part) and the combustion chamber of the head using scotch brite and abrasive paper;
- hold the cylinder firmly, hold the drill fitted with a 2mm bit and insert the bit into the decompressor hole to clean it, being careful not to scratch the cylinder barrel;
- carefully wash all clean parts (cylinders, pistons, segments, heads) with petrol using a brush, then blow them with compressed air and make sure no debris is left;;
- remove the cloths from the crankcase, making sure that no debris enters inside it;
- fit the new cylinder and head gaskets, making sure that the O-Rings remain in their seat when positioning the heads on the cylinders;
- oil the cylinder and piston;
- refit the rings on the piston, mount the cylinders on the engine and the heads;
- tighten the head nuts crosswise with a torque wrench set to 19 Nm;
- refit the spark plugs and expansions to the engine.

**▪ Cleaning the carburettor and replacing the membranes**

Required tools:

- a brush;
- compressed air gun;
- membranes overhaul kit.

Procedura:

- remove the airbox;
- remove the throttle wheel and the fuel pipes from the carburettor;
- remove the carburettor from the engine;
- remove the upper and lower carburettor covers;
- remove the membranes;
- clean the carburetor inside and out with petrol and a brush, then remove the petrol from the carburetor with compressed air;
- fit the new membranes and refit the carburettor covers;
- refit the carburetor to the engine, the fuel pipes, the throttle wheel, and the air box.

## MAINTENANCE SCHEDULE

| Operation Description | Frequency (Hours) | | | | | | | | | | | Pag. |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 5 | 25 | 50 | 75 | 100 | 125 | 150 | 175 | 200 | 225 | 250 | |
| Head Cylinder nut torque check | X | X | X | X | X | X | X | X | X | X | | |
| Exhaust System nuts torque check | X | X | X | X | X | X | X | X | X | X | | |
| Small pulley nut torque check | | | X | | X | | X | | X | | | |
| Belt tension and wear check | X | X | | X | | X | | X | | X | | 18 |
| Spark plugs torque check | X | X | | X | | X | | X | | X | | |
| Spark plugs cleaning and inspection | | X | | X | | X | | X | | X | | 19 |
| Exhausts joints cleaning and grasing | | X | X | X | X | X | X | X | X | X | | 20 |
| Exhaust system anti-vibration mounts inspection | | X | | X | | X | | X | | X | | |
| Airbox joint inspection | | X | X | X | | X | X | X | | X | | |
| Complete engine torque check | X | | | | | | | | | | | |
| Air filter cleaning | | X | X | X | | X | X | X | | X | | 20 |
| Belt replacement | | | X | | X | | X | | X | | | 19 |
| Spark plugs replacement and boot inspection | | | X | | X | | X | | X | | | |
| Fuel filter replacement | | | X | | X | | X | | X | | | |
| Spark plugs replacement and boot replacement | | | | | X | | | | X | | | |
| Air filter replacement | | | | | X | | | | X | | | |
| Cylinder, exhaust and reed valve gaskets replacement | | | | | x | | | | X | | | |
| Engine and exhaust anti-vibration mounts replacement | | | | | X | | | | X | | | |
| Exhaust springs and safety cablers replacement | | | | | X | | | | X | | | |
| Reed valve replacement | | | | | | | | | X | | | |
| Carburettor cleaning and membranes replacement | | | | | | | | | X | | | 22 |
| Heads, cylinders & pistons cleaning | | | | | X | | | | X | | | 21 |
| Piston rings replacement | | | | | | | | | X | | | |
| Pistons replacement (selection to be defined using a cylinder bore gauge) | | | | | | | | | X | | | |
| Complete overhaul by an authorized Repair Center | | | | | | | | | | | X | |

## TIGHTENING TORQUES

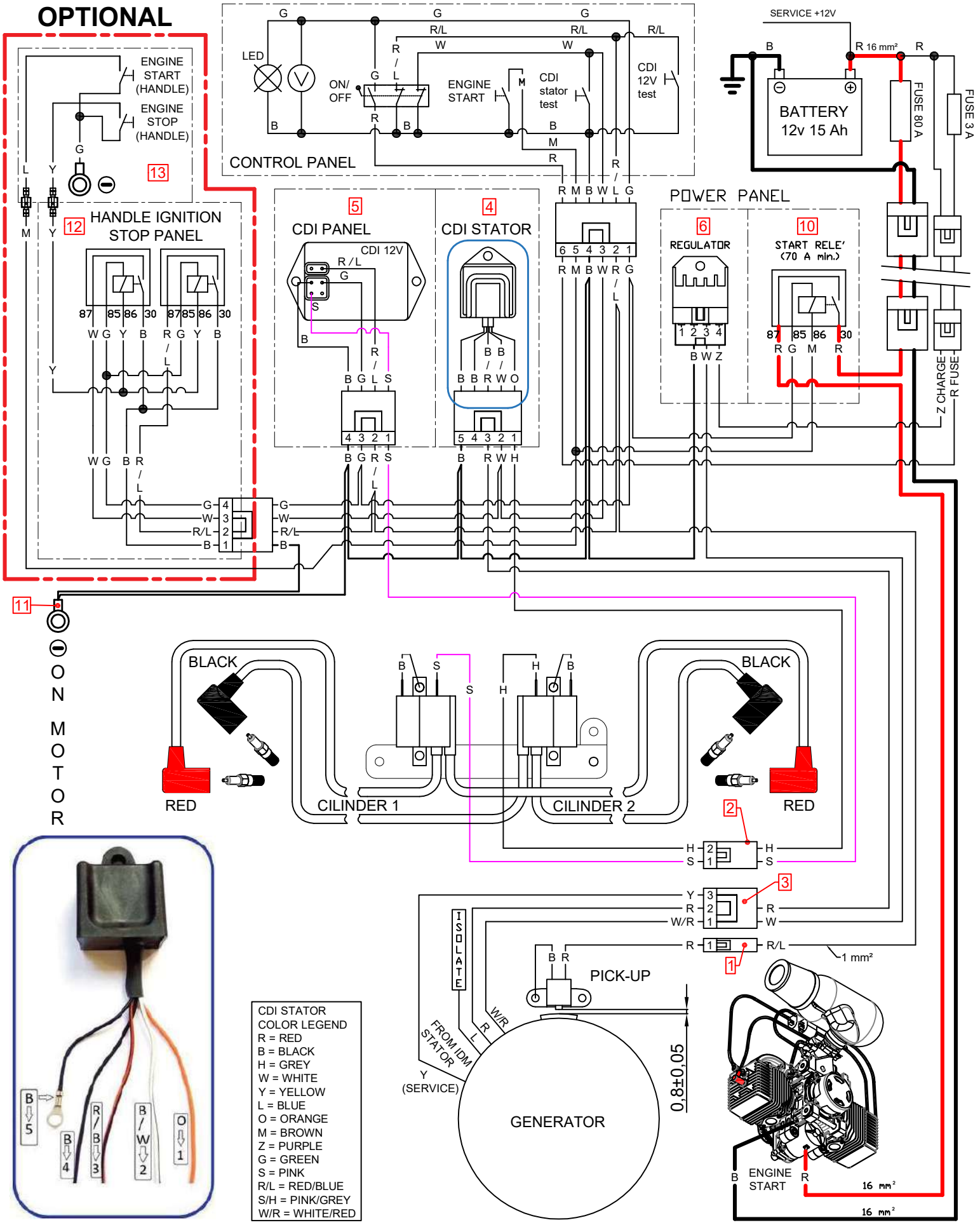
| Part | Torque (Nm) | Thread Lock Type |
|---|---|---|
| Spark plug | 20 | |
| Head nuts | 19 | |
| Pulley nut | 50 | |
| Fastener bolts of pulley's eccentric support | 16 (*) | |
| Pulley pin ring nut | 50 | |
| Exhaust manifold nuts | 35 | |
| Exhaust anti-vibration mounts bolts | 30 | |
| Exhaust bolts | 30 | |
| Engine mount M8 bolts | 35 | |
| Engine anti-vibration mounts M10 bolts | 35 | |
| Starter motor M8 bolts | 25 | |
| Starter motor bracket M6 screws | 12 | Medium |
| Carburettor nuts | 20 | |
| Airbox support M6 screws | 12 | |
| Reed valve plate screws | 13 | |
| Flywheel cover screws | 12 | |
| Flywheel nut | 45 | Medium |
| Pick-up screws | 11 | |
| Stator screws | 14 | |
| Stator plate M5 screws | 8 | |
| Stator plate M6 screws | 12 | |
| Other M6 screws | 12 - 14 | |
| Other M8 screws | 25 - 30 | |

All torque values are intended in cold engine condition.

* tightening method: tighten both clamp screws, then double check the first, finally the second.

## PROBLEM DETECTION & TROUBLESHOOTING

| PROBLEM | POSSIBLE CAUSE | SOLUTION |
|---|---|---|
| ENGINE DOESN'T START | Not enough fuel reaches the engine | Press the carburettor vent button again and pump more fuel (for 1 second, no more) and try again. |
| | Flooded engine | Remove the spark plugs, dry them with a clean cloth or compressed air, reassemble them and try again. |
| | Dirty spark plugs or with worn electrodes | Disassemble and clean them or replace them. |
| | Issues in the electrical system | Disassemble the spark plugs, insert them in their respective connectors (boots), rest them on the engine heads and operate the engine starter, if there is no spark then there may be a wire (or more) detached in the electrical system, an exposed wire in contact with metal, or a defective switch to be replaced. |
| | Depressor pipe detached<br>Torn depressor pipe | Reattach the pipe to the fittings.<br>Replace the pipe. |
| ENGINE OUTPUT IS POOR OR IRREGULAR | Wrong carburetion | Follow the instructions on page 17. |
| | Dirty or worn spark plugs | Replace the spark plugs. |
| | Clogged fuel filter | Replace the fuel filter |
| | Problems with the system that carries fuel to the carburettor | Check the fuel lines for cuts, leaks or blockages. Check that the pipes adhere well to the fittings. |
| | Dirty carburettor | Disassemble and clean it |
| | Dirty air filter | Disassemble and clean it following the instructions on page 20. |
| | The engine sucks in air | Check that there are no leaks from the gaskets of the cylinders, heads and the reed valve pack, check that all the pipes are intact and tight on the fittings. |
| | Belt too tight | Loosen the belt and tension it following the instructions on page 18. |
| | Piston or cylinder damage | Remove the engine heads and check that the cylinder liners are not damaged or out of tolerance. |




**!!!ATTENZIONE!!! PRIMA DI ESEGUIRE QUALSIASI PROVA, CONTROLLARE CHE IL CAVO DI MASSA (-NEGATIVO 11 ) SIA CORRETTAMENTE COLLEGATO AL MOTORE**

**!!!ATTENTION!!! BEFORE CARRYING OUT ANY TEST, CHECK THAT THE GROUND CABLE WIRE (-NEGATIVE 11 ) IS CORRECTLY CONNECTED TO THE MOTOR**

## DOUBLE SPARK PLUGS STRATOS 400 IGNITION WIRING SCHEMA

IL PRESENTE DISEGNO E' PROPRIETA' DELLA PARMAKIT, E SENZA PERMESSO SCRITTO DELLA STESSA NON POTRA' ESSERE COMUNQUE UTILIZZATO PER LA COSTRUZIONE DELL'OGGETTO RAPPRESENTATO, NE' VENIRE COMUNICATO A TERZI O RIPRODOTTO. L'AZIENDA PROPRIETARIA TUTELA I PROPRI DIRITTI A TERMINI DI LEGGE.

AGG. 16/01/2025

## WARRANTY CERTIFICATE

This warranty certificate must be stamped by the retailer and sent to PARMAKIT by email, fax or ordinary post, no later than a maximum of 60 days together with the copy or original of the proof of purchase issued by the retailer (invoice or till receipt).

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## WARRANTY CERTIFICATE

Customer's name and surname ……..

Company name of the customer ……..

Customer address ……..

……..

……

Engine serial number ……..

Date of purchase of the engine ……..

**OFFICIAL STAMP OF THE RETAILER**

**SIGNATURE OF THE RETAILER**

**SIGNATURE OF THE CUSTOMER**

…… ……..

**Warning!**

This is not a certified aircraft engine! It has not undergone safety and durability tests according to aircraft standards. It is only for use on non-certified experimental aircraft or vehicles when there is no safety risk due to an engine failure. Never use the aircraft or vehicle equipped with this engine in circumstances or areas, in weather conditions or at altitudes where there is no possibility of a successful landing after an engine failure. The user assumes all the risks arising from the use of this engine and is aware of the possibility of sudden functional anomalies.

By signing this form, the customer confirms that he/she has read, understood and accepted all the terms and conditions of the warranty (see page 6) of this manual. The data will be recorded in a protected paper and/or electronic archive and will be treated totally confidentially by Parmakit in compliance with Legislative Decree 196 dated 30 June 2003 on the protection of personal data.

...the art to fly

minari engine

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