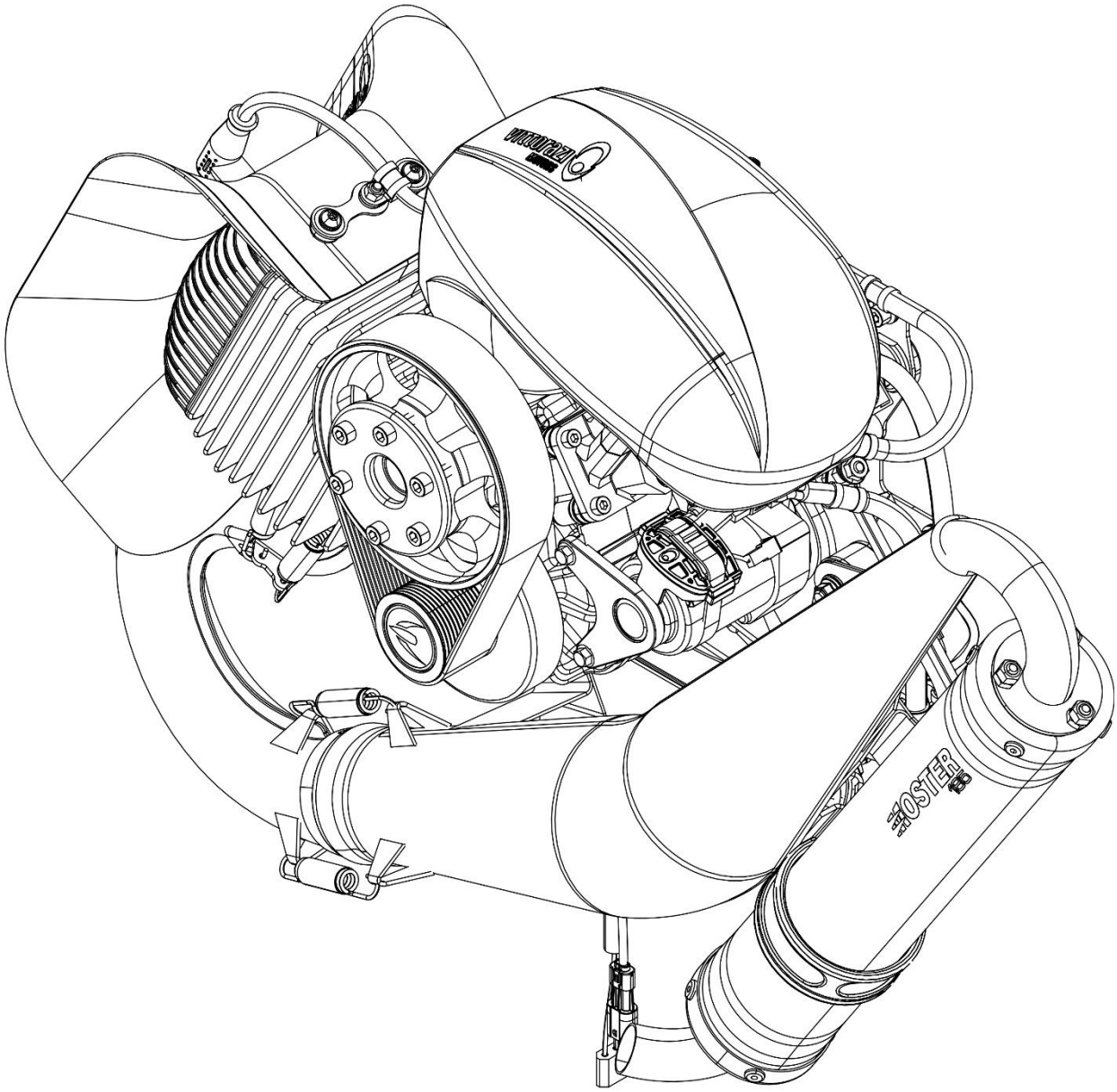
MOSTER 185 EFI

User manual

Release V1/2025.
Valid for MY25 version.



vittorazi MOTORS

Contents

1 Introduction

Congratulations and thanks for choosing a Vittorazi Motors engine.

The User Manual is part of the engine and must be preserved and attached to the engine if the engine is transferred to a new user. The purpose of this manual is to provide all the necessary information to the user in order to enable a proper use of the engine, carried out autonomously and in total security. The User Manual includes: technical descriptions of the operating modes, scheduled maintenance table and reference values; suggestions and safety measures to which the user is subjected are also included.

All the components of Vittorazi Motors are checked and tested in a process of industrial quality control before the assembling. Then by sampling the complete motors are checked to assure the functionality of all the parts through a complete test of twenty minutes on the bench. Note that the reliability, performance and durability of the engine also depend on proper use of the engine during time. Vittorazi Motors is always improving its engines and reserves the right to change in any moment and without notice, drawings, specifications, components and details of the models in production without any obligation towards the user.

In case you need further explanations, you can contact the authorized dealer of your country. Please include in the request, the six-digit serial number that identifies the motor (read 3.2 “Engine serial number”) and a photo of the item in question.

Also take into account the availability of Illustrated Parts Catalogue (IPC), manual updates, service bulletins, FAQs, other documents in our official website. The video tutorials are available on the Vittorazi Motors official YouTube channel. Below the links.

Find the nearest dealer

www.vittorazi.com/en/dealers/

IPC, manuals, bulletins, newsletter, warranties, FAQ

https://www.vittorazi.com/en/services/

Vittorazi Official YouTube channel: video and free tutorials available

https://www.youtube.com/user/VITTORAZIMOTORS

Reading tips:

Attention, warning, danger, risk
Any situation or condition which may result in a serious danger

Recommendation, caution, important advice

2 Be careful! Read it completely

To fly in total safety, you must read the following recommendations:

- This engine is not certified. This engine does not fulfil airworthiness regulations. The products are dedicated to non-certified aircraft and flying as a recreational or sporting activity.
- Final-user must be aware that the engine can stop, break or shut down at any time. Such an event may require an immediate and forced landing in inadequate, congested or impervious areas, with the possibility in the end of causing the death of the pilot or other persons involved.
- The aircraft equipped with this engine must be conducted in full compliance with rules and regulations in force relating to the activity of leisure and sport aviation, with regard to the country in which the operations are carried out.
- Vittorazi Motors and its distributors decline any direct or indirect responsibility related to this kind of activity. By using a new engine, the owner agrees that these terms and conditions have been accepted at the time of purchase of the product.
- The engine is not covered by any liability insurance. The use of the engine automatically determines the assumption of all risks and personal liability for personal injury or damage to third parties resulting from the activity.
- Improper use of the products or improper technical service (in relation to the specifications contained in the user, installation and maintenance manual) will held harmless the company from any liability for any damage due to the malfunctioning and immediately void the warranty of the product. So, do not use the motor if it has not been properly maintained or if it has not been used correctly over time.
- Vittorazi does not assume any responsibility for those engines that are used with parts that are not original, not approved, modified or that have suffered an improper use. Use of spare parts not original and not recognized by Vittorazi, can make the engine dangerous and will void the warranty.
- Unauthorized modifications to the motor, to the reduction, to the propeller can invalidate the warranty of the motor and can compromise the reliability of the aircraft and its safety. In case it is necessary to intervene, we invite you to contact an authorized dealer Vittorazi.
- Some geographical areas, due to particular weather conditions such as pressure, temperature and humidity can affect the performance of the engine. Before taking off, test the engine on the ground and make sure it does not behave abnormally.
- Always start the engine on a flat and clean surface, without stones or sand. During all phases in which the engine is kept running near the ground (such as heating, take off, landing) it is necessary to maintain a safe distance from the engine. A good safety distance is 100 meters in every direction.

The following engine speed limits must be respected to avoid engine failures, to keep the warranty valid and to have a correct maintenance scheduling according to the Vittorazi program:

- Do not keep the engine at full revs for more than 60 seconds.
- Do not keep revs higher than 7.000 RPM during long cruising flights or long climbs. The average power delivered by the engine during a flight should remain below the indicated threshold. Contact the aircraft manufacturer for further clarification.

The temperature limit of CHT is 208° Celsius. Do not persist above this temperature threshold, engine overheating and irreversible damage could occur.

When the CHT exceeds 208°C, the ECU system generates a small engine speed reductions that last a fraction of a second, without compromising the flight dynamics, just to call the pilot's attention. This safety function disappears when the speed is reduced below 7400 rpm.

Exceeding the EGT limit is shown on the display with the word "Temp" flashing in the top right corner. Proceed at reduced power and once on the ground contact your dealer

LiPo batteries are high-tech products but potentially dangerous, especially if used improperly or without experience. It is strongly recommended that you carefully read the dedicated section of this manual about battery use and handling.

3 Moster 185 EFI: What is it?

Moster 185 EFI is a single cylinder, two-stroke piston engine, indirect fuel injected type, air-cooled and fuelled with a mixture of gasoline and oil.

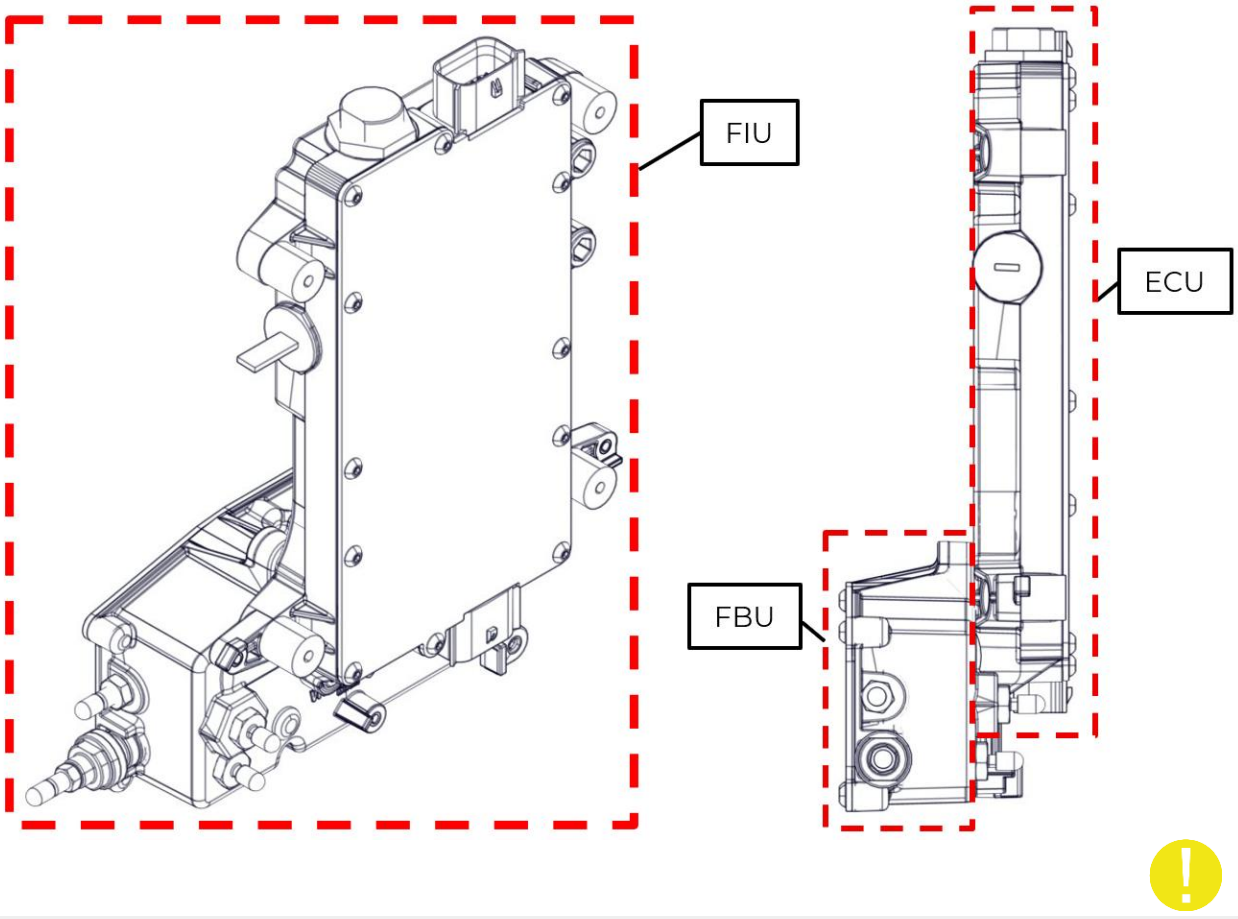
Power is transmitted from the crankshaft to the propeller shaft through a reduction ratio with poly V-belt system. The air inlet system consists of an airbox and a filter. Mixture of gasoline and oil is introduced in the cylinder through an electronic fuel injection system. The air/fuel has been calibrated before delivery in combination with this engine.

This manual is intended for the engine Moster 185 EFI MY25.

The Full Integrated Unit (FIU) is the combination of:

- Electronic Control Unit (ECU)
- Fuel Box Unit (FBU).

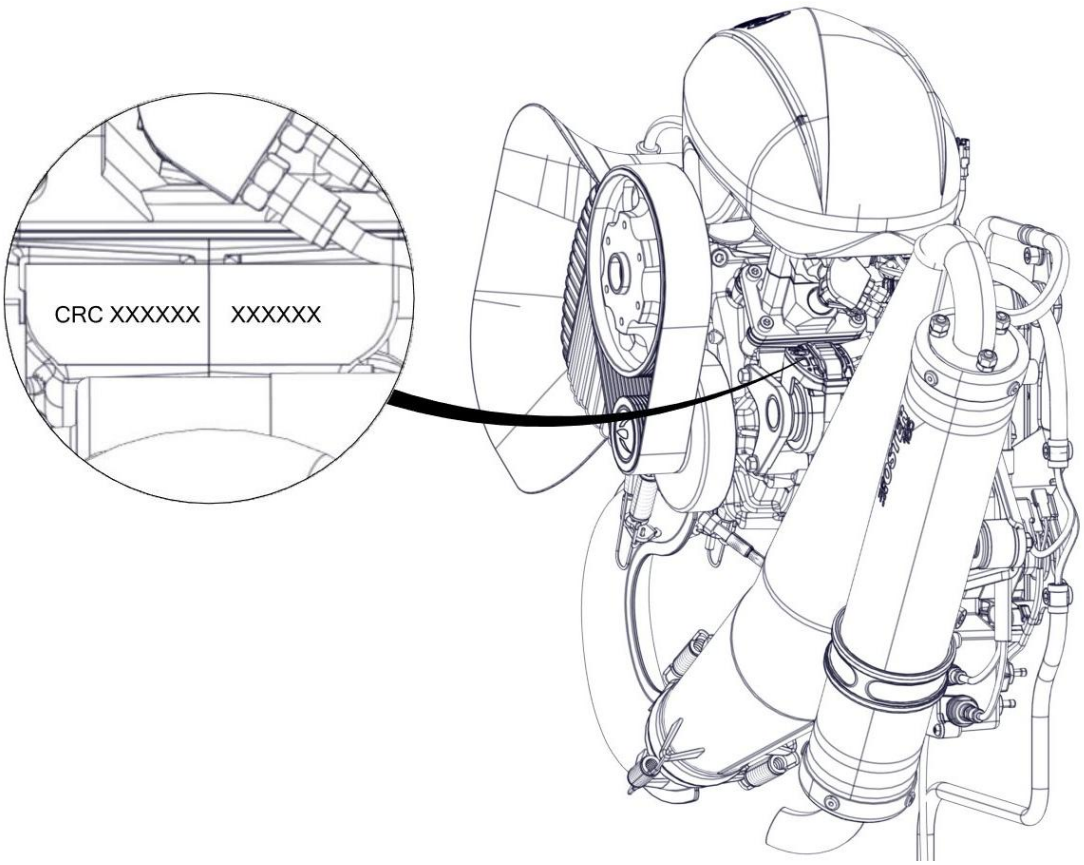
The components inside are sealed to ensure maximum reliability through the use of Vittorazi-approved and tested components, which are installed by competent personnel and also to facilitate the replacement of the entire FIU.



Breach of the seals invalidates the warranty of the entire engine and relieves dealers and Vittorazi of any responsibility.

3.1 Engine serial number

The serial code of your engine is located under the air rotary valve.



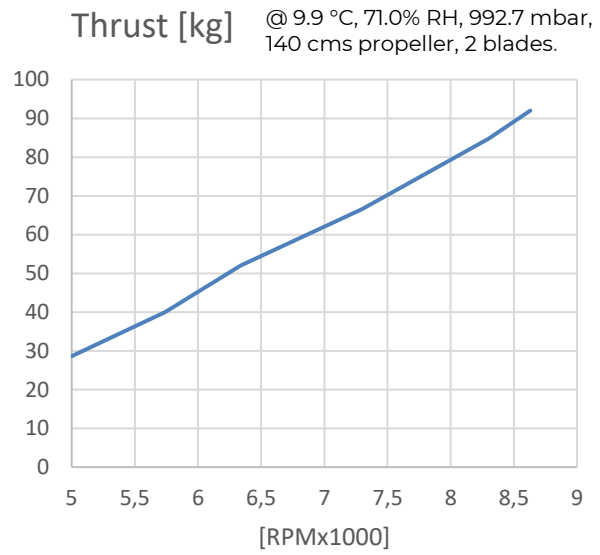
3.3 Technical data

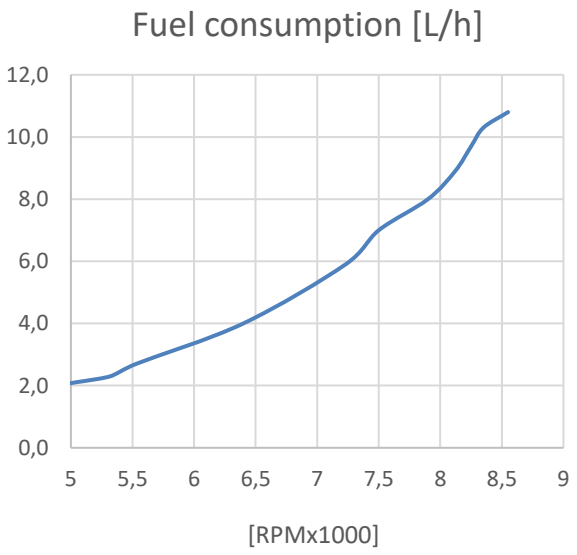
	Moster 185 EFI
Cycle	2 strokes
Stroke	54 mms
Displacement	184,7 cc
Bore	Ø 66 mms
Power	26 HP at 8.600 RPM
Cylinder	Single cylinder in aluminum; electroplated with hard coating Nikasil® technology
Piston	Casting piston, diamond profile, Molybdenum Disulphide (MOS_2) coating on the piston skirt, 2 rings chromed
Air intake	Reed valve intake, throttle body CNC diameter 22 mm machined from solid, magnetic valve position sensor, airbox intake
Cooling system	Air cooled, flow extraction from propeller, cooling shroud included
Starter	Electric Starter only
Transmission	Poly V-belt system with centrifugal clutch
Reduction	1/2,68 – 1/2,87
Ignition	Single Spark
Spark plug	NGK BR9EIX (Iridium)
Max. CHT (Cylinder Head Temperature)	CHT 208 °C (type K thermocouple)
Maximum RPM	8.400–8.700 RPM
Engine idle	2.000-2.200 RPM.
Static thrust	92 kgs prop. 140 cms at 8.600 RPM (2 blades Vittorazi Approved Prop.)
Exhaust pipe	Tuned exhaust system, ceramic powder coating Double joint system with bronze bushings, double rib reinforcement system, “Db-killer” chamber and silencer pipe in carbon fibre
Propeller rotation	Counter-clockwise
Weight	16,9 kgs - Including: FIU, electrical wiring, airbox, temperature sensors and cooling shroud; - Excluding: battery, joystick, display and RJ45 cable.

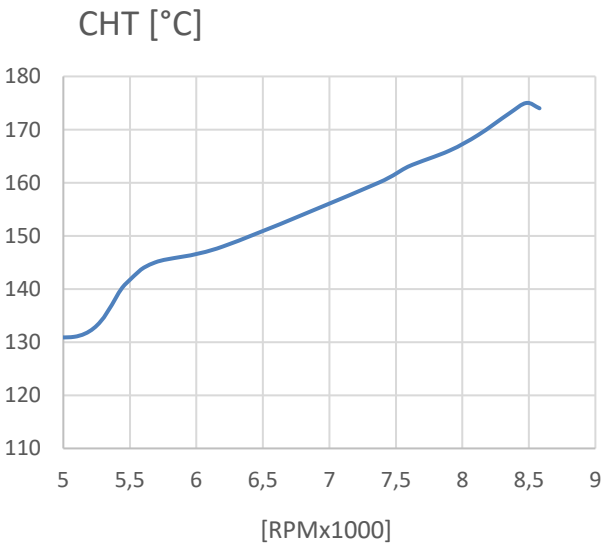
The table follows in the next page

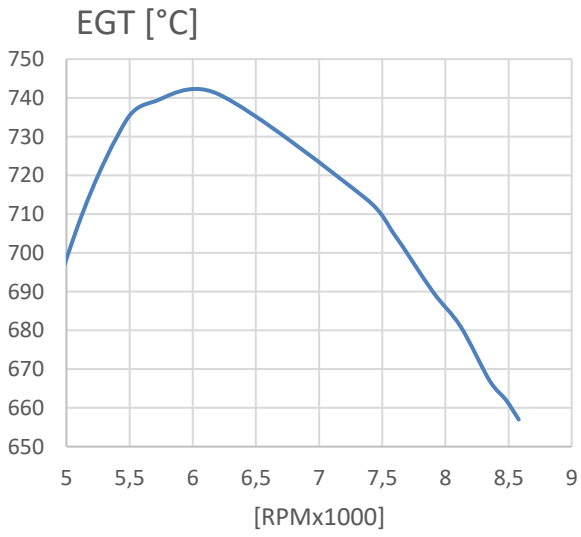
Fuel	Unleaded gasoline with 1,8 % synthetic oil (Motul800)
Fuel consumption	2,5 liters/hour, at 30 kgs of static thrust, prop. 140 cms at 5.250 RPM (2 blades Vittorazi Approved Prop)
Battery autonomy	5 ÷ 7 hours with fully charged battery and cruising speed flight (5000 ÷ 6500 rpm).
Accessories (included)	Display, display support, RJ-45 cable Vittorazi battery Battery charger

Example curves of performance follow (data are taken at temperature, pressure and relative humidity shown in the graph). Propeller used is an approved Helix propeller, 140 cms diameter, 2 blades.









3.4 Battery

The Vittorazi battery is composed by 4 LiPo cells connected in series, with a capacity of 3300 mAh and a voltage of 14.8 V, contained inside an aluminum box.
The electrical circuit is protected by two fuses, a 15 A pico-fuse and a 60 A fuse.
There are two cables coming out of the battery: the ECU power supply cable (SQUBA 3.6 connector) and the starter power supply cable (XT60 connector).

The battery is turned on and off by the switch located on the top front.
When the battery is switched on, a green flashing LED lights up.

3.4.1 Technical data

Producer	Vittorazi Motors	**Height**	213 mm
Cell type	Li.Po.	**Width**	51 mm
Number of cells	4 S	**Thickness**	41 mm
Voltage	14,8 V	**Discharge rate**	35 C
Capacity	3300 mAh	**Max burst discharge rate**	55 C (181,5 Ampere)
Weight	0.60 kg	**Charge rate**	1C – 2C

3.4.2 Battery charging

How to charge the battery:

- Always disconnect the battery from the connectors and from the engine/aircraft.
- Make sure the battery master switch is in the OFF position.
- Use the supplied EV-PEAK E4 fully automatic charger, which brings the voltage to the correct nominal value during the charging operation.
- Connect the battery to the battery charger via the 5-pin cable provided.
- The battery charger (EV-PEAK E4) will begin charging automatically once the battery is connected.
- When charging is completed, 4 steady LEDs on the charger will light up.

The Vittorazi battery needs specific requirements for charging and only the charger EV-PEAK E4 provided should be used.

Due to the chemical content of lithium cells, there is a possibility of fire during charging.

1. Batteries should never be left unattended while charging, especially at home or in a car.
2. Always disconnect the battery from the engine before charging.
3. When charging, place the charger and battery on an appropriate surface (e.g.: brick) and not on potentially flammable surfaces (e.g.: wood).
4. Do not charge batteries near liquid or flammable material.
5. Equip yourself with a fire extinguisher to extinguish any fire start.

Lithium batteries can therefore be dangerous if not used with proper precautions.

To reduce the number of charging cycles and increase the battery lifetime, it is recommended not to charge the battery when the charge level is above 70%.

3.4.3 Battery warnings

Never put the battery in a pocket, bag or drawer where they can cause a short-circuit.
Never lay the battery on electrically conductive surfaces (metal benches, etc.).

Always switch off the battery when refuelling.

When the motor is not in use, the battery switch should be set to OFF. In fact, the battery may be completely discharged if left ON for a few hours due to the absorption of the flashing LED. Once the voltage of the battery drops below 12 V it will no longer be usable and must be replaced because it is dangerous.
Further use of the battery after a voltage drop below 12 V will immediately void the warranty.

When a battery suffers an accident, it is mandatory to carry out complete replacement of the battery module.

Before disposing of the damaged battery in the appropriate waste, it is recommended to proceed as follows immediately:

1. Remove the battery from the frame in which it is being used.
2. Place the battery in a safe, open area away from flammable/combustible materials and monitor the battery for at least 30 minutes. Observe for any swelling of the battery and/or an unnatural increase in heat. These are signs of internal damage.
3. Damage to the battery may not be immediately apparent upon visual inspection.
4. Check the battery for short circuits and other damage carefully.

If you accidentally short the battery, it is mandatory to carry out complete replacement of the battery module.

Before disposing of the damaged battery in the appropriate waste, it is recommended to proceed as follows immediately:

1. Remove the battery from the frame in which it is being used.
2. Place the battery in a safe, open area away from flammable/combustible materials and monitor the battery for at least 15 minutes. Observe for any swelling of the battery

and/or an unnatural increase in heat. These are signs of internal damage.

When the battery is not used for a long period of time, it is recommended to bring the battery charge to storage voltage (50 ÷ 75 % charge level or two steady and two flashing leds on the battery charger).

Out of respect for the environment, old or damaged batteries for disposal must be fully discharged before being deposited at the local hazardous waste collection center or returned to the place of purchase. It is recommended that cells be packed with insulating material before discarding them.

By purchasing these products, the buyer assumes all responsibility for the risks listed below, agreeing not to hold manufacturers, distributors, or retailers in any way responsible for any accidents to property, animals or persons.

4 How to use it?

4.1 Propeller assembling

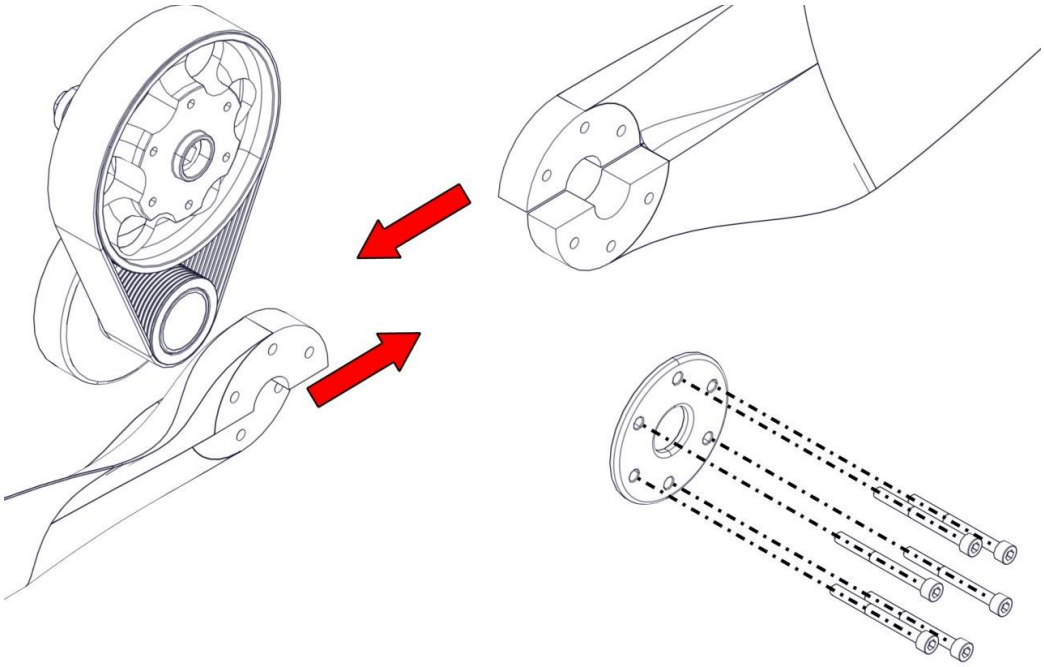
Propeller approved:

Reduction	Propeller	Fast acceleration
1/2,68	125 cms (prop. VM-MO185-125-2,68-9-2)	YES
	130 cms (prop. VM-MO185-130-2,68-8-2)	YES
1/2,87	140 cms (prop. H30F 1,40m L-NMM-05-2)	NO

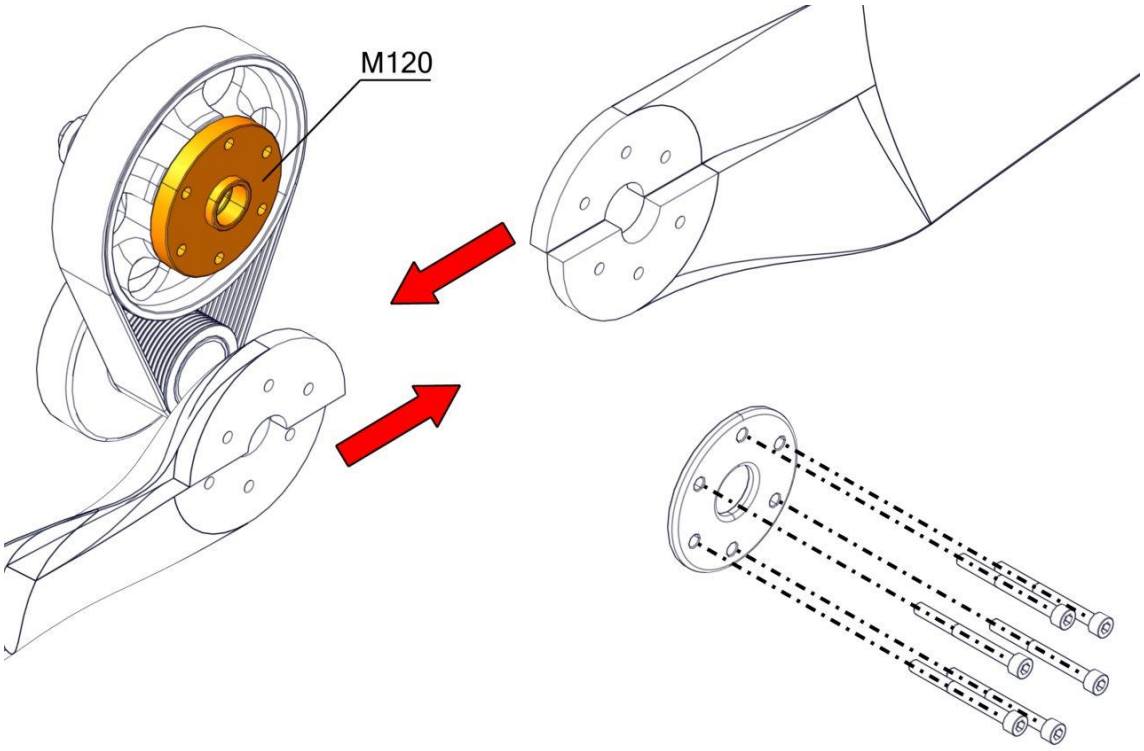
The operation of the Moster 185 EFI engine is determined by the coupling with the correct propeller. All the EFI parameters have been calibrated and optimized with the correct coupling between the engine and the approved propeller.
Failure to achieve this correct coupling can result in a series of serious engine malfunctions, even to the point of endangering the user.
Some examples of what could happen if an incorrect/unapproved propeller is used:

- poor engine power.
- engine acceleration with strong irregularity and instability.
- engine overheating due to incorrect temperature and fuel injection parameters.
- excessive vibrations.
- excessive fuel consumption.
- lack of intervention of EFI system safety devices.

Considering the rear view, the propeller rotation is counter-clockwise. As first operation, couple the two blades in the bayonet recess as shown, then add the screws and the flange. Lastly, place the bottom of the propeller on the reduction hub and tighten the screws progressively until they reach the stop.



Fast acceleration propeller approved from Vittorazi, does not require a spacer between the hub and the propeller.



The extra-cooling profile propeller approved from Vittorazi, needs a spacer between the hub and the propeller. The only spacer authorized for this motor is the one designed and produced by Vittorazi (M120 code in the Illustrated Parts Catalogue). Spacers made with wrong measures or geometries, non-compliant materials, make the engine dangerous and void the warranty.

Propeller screws tightening values:

- Carbon-fibre propeller: **10-12 Nm** on each screw M6.

Ask an authorized dealer or the instructor, if you are not sure about the propeller assembling. **It is very important to check the tightening of the propeller screws before take-off and after landing.**

Be sure that the screws are suitable to the propeller in use: the thread of the screws is inserted in the hub for at least 12 mms for carbon propellers.

The use of a propeller not approved from Vittorazi can give rise to serious anomalies and immediately voids the warranty (see also the warranty chapters).

For Vittorazi the propeller is an integral part of the engine and should not be considered an extra part of the engine. The company has decided to invest in research and study of high-tech solutions, to have an ideal combination engine-propeller in many flight conditions. All approved propellers are designed in collaboration with Vittorazi engineers, with the aim of giving maximum performance and safety. Let's see some features guaranteed in the approved propellers:

- The adequate operation in optimal RPM-Range of engine and propellers.
- The best thrust during take-off and critical flight conditions, optimizing the energy transfer in a disturbed airflow.
- The best fuel consumption in all flight conditions, thanks to the most efficient profile and angle of attack.
- The optimization of the dynamic torque effects and static torque effect, through a lightweight structure and designing low resistance profiles.
- Avoiding resonant frequencies through optimized carbon fibre structure of the propeller and avoiding annoying vibrations along the entire RPM range.
- The correct balancing of the propeller by static and dynamical procedure, combined with a safe and precise mounting by CNC machined holes.
- The reduction of noise thanks to the best profiles and the tip speed below 0,65 Mach.
- Additional design features, as the extra cooling profile to increase the ventilation of the cylinder head temperature (CHT) till the best working temperatures.
- Engine safety and reliability are given by the long endurance tests (200 hours) performed in extreme conditions with the approved propellers, to check if there are any critical issues before the production.

The engine warranty ends when the propeller, the engine or the aircraft has an accident.

After a propeller has broken, the engine is no longer safe. The engine must be completely checked by an authorized center in every part of the system before resuming flight activity. This is also necessary for the rest of the aircraft. The statistics lead to the inspection of the following engine components:

- Reduction drive unit (propeller hub, bearings, reduction cases, main propeller shaft gears, screws, others).
- Engine carter case, engine rubber mountings, main screws.
- Exhaust system and silencer unit.
- Injector pipes and electrical wiring.
- Airbox system (airbox, sleeve, safety devices).
- More.

In case of damage of the propeller, replace it immediately with a propeller guaranteed by Vittorazi Motors. Replace in any case all screws of the propeller.

4.2 Fuel

Moster 185 EFI engine requires a mixture of gasoline and oil to operate. Choose an open, ventilated, clean location away from dust, sand, grass and any foreign bodies that may come into contact with the mixture. If possible while refuelling, filter the mixture (recommended Mr. funnel fuel filter). Make sure that the fuel tank, filter and funnel, are always perfectly clean. The Moster185 EFI is a high-performance engine engineered to deliver optimal power output and fuel efficiency under well-defined operating parameters. Strict adherence to the fuel and oil specifications outlined in this manual is essential to ensure proper engine performance, safety, and warranty compliance.

Gasoline is extremely flammable and explosive. Never do the fuel-oil mixture preparation and engine refueling operations when the engine is running or near possible ignition sources.

Vittorazi engines are approved with fuel that complies with the EU regulation UNI EN 228. This fuel has a minimum Research Octane Number (RON) of 95 and contains a maximum volume percentage of ethanol of 5%. The company has tested the wear limits of the mechanical parts with this fuel and the maintenance program is calibrated on this basis.
Ethanol concentrations beyond the specified threshold can cause severe degradation of fuel system components, chemical contamination, accelerated mechanical wear, compromised engine performance and an increased risk of failure. RONs less than 95 increase the risk of self-ignition and detonation.
When the available petrol doesn't meet the required standards, we recommend the use of AVGAS 100LL (Aviation Gasoline, 100 RON, Low Lead) in order to prevent any engine damage. Continuous use of AVGAS 100LL does not affect the engine warranty.
The use of fuels that doesn't meet the required standards poses a high risk to the user and the engine and leads to the voiding of the product warranty.

The key risks and consequences of using non-approved fuels and oils include:

- Component degradation: ethanol aggressively deteriorates rubber and plastic components within the fuel system, including fuel lines, seals, and filters. This degradation significantly increases the risk of pipe cracking and loss of tightness throughout the line, consequently leading to:
    1. pressure drops that compromise engine performance and operation
    2. the entry of air bubbles within the system that can cause the engine to shut down during operation
    3. fuel leaks creating a fire hazard
- Chemical incompatibility with materials used in high-precision fuel system components: in particular, seals, bearings and sliding surfaces within fuel pumps are susceptible to deformation when exposed to aggressive or non-certified compounds. This deformation can impair the internal tolerances and mechanical operation of the pump, potentially causing increased friction, irregular flow, or even complete blockage. In the worst-case scenario, this can result in pump failure and engine shutdown, compromising system safety, performance, and long-term reliability.

- Fuel system contamination: use of fuels with ethanol content exceeding the 5% volume limit, combined with ethanol's hygroscopic nature, promotes moisture absorption, formation of aqueous emulsions, and accelerates harmful chemical reactions within the fuel system. When combined with non-approved oils, this leads to deposits, sludge, and foam accumulation in critical components such as fuel filters, calibrated nozzle, pumps and injectors. These contaminants cause partial or total blockages, reduce fuel pressure, disrupt flow, and promote microbial growth ("fuel fungus"), especially in humid conditions or during extended storage. Resulting fuel system degradation compromises engine stability, reduces power output, and, in extreme cases, engine failure.
- Performance deterioration: excess ethanol disrupts the optimal air-to-fuel mixture, resulting in lean combustion. This could lead to engine overheating, reduced power output, erratic operation and, in extreme cases, engine failure. Consistently using fuel without ethanol or with the correct ethanol content is essential to maintaining stable air-to-fuel mixture and reliable engine performance.

The approved oil for the Moster 185 EFI is **Motul800**, following extensive approval testing over years. In case the above-mentioned oil is not available, make sure to use oils with the following characteristics:

Type	2 stroke, 100% synthetic Ester oil
Density at 20 °c (ISO 12185)	0,926 g/cm³
Viscosity at 40 °c (ASTM D445)	152,0 mm²/s
Viscosity at 100 °c (ASTM D445)	18,7 mm²/s
Viscosity index (ASTM D2270)	140,0
Flash point (ASTM D92)	274,0 °C

It is advisable to use mixtures prepared at the time or very few days in advance; a mixture prepared 2-4 weeks in advance and left in a tank can separate (oil and gasoline), losing its lubricity characteristics even when mixed before use, and increases the amount of water absorbed by the mixture due to the hygroscopic nature of ethanol.

Wrong oil-fuel mixture, non-compliant oils, wrong fuel or dirty fuel, other reasons already mentioned above, lead to voiding of the product warranty (see also the warranty paragraphs).

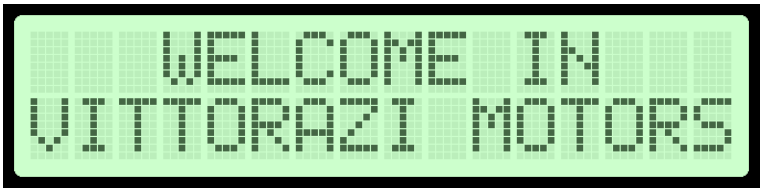
4.3 Software use and setting

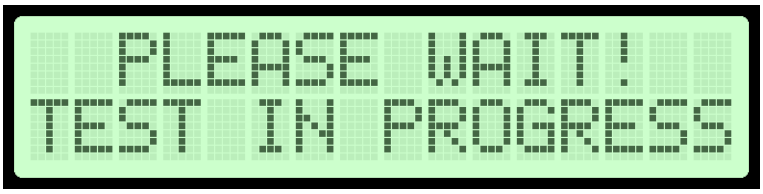
4.3.1 Preliminary operations

- Place the battery on the battery support plate.
- Secure the battery with the two Velcro straps.
- Connect the ECU supply cable (SQUBA 3.6 connector) and the starter supply cable (XT60 connector).
- Move the battery switch to ON in order to turn on the ECU.

4.3.2 Initial test operations following ECU – On

When the ECU is turned on, the display will sequentially show "Welcome in Vittorazi Motors" and "Please Wait! Test in Progress".

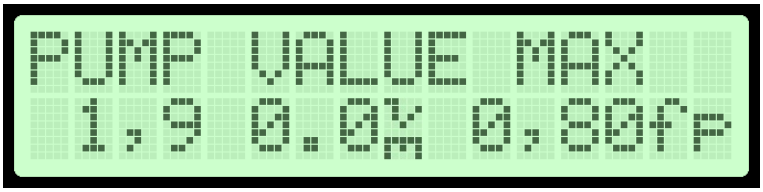




The ECU sequentially runs:
- 10 solenoid valve cycles
- 10 injector cycles
- Fill in the fuel line
- 2 internal relay cycles

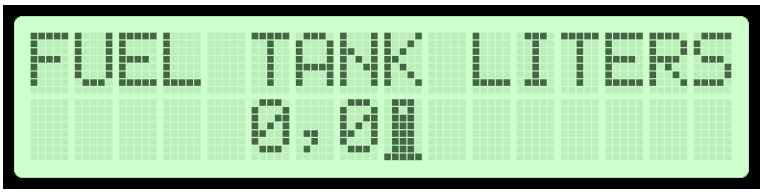
4.3.3 Fuel line filling

As the initial test is completed, the fuel line is filled.
During the filling operation, the display shows on the left the pump value max and on the right, alternating every 6 seconds, the reference and the actual fuel pressure value (in bar).



4.3.4 Fuel quantity setting operation

At the end of the fuel filling operation, the display shows the request to insert the fuel on board.



It is possible to:

Confirm the amount of fuel stored in memory	simultaneously press the "Enter" key and bringing the stick to full throttle.
Increase the amount of fuel	simultaneously press the "Enter" and "▲" keys.
Decrease the amount of fuel	simultaneously press the "Enter" and "▼" keys.

The fuel quantity can range for 0.0 to 80.0 L.
If neither of these operations to confirm or change the amount of fuel on board is performed, the next time the engine is started, the amount of fuel on board will be reset to zero and the fuel warning message will flash in the top right corner of the display on the “Run” screen.

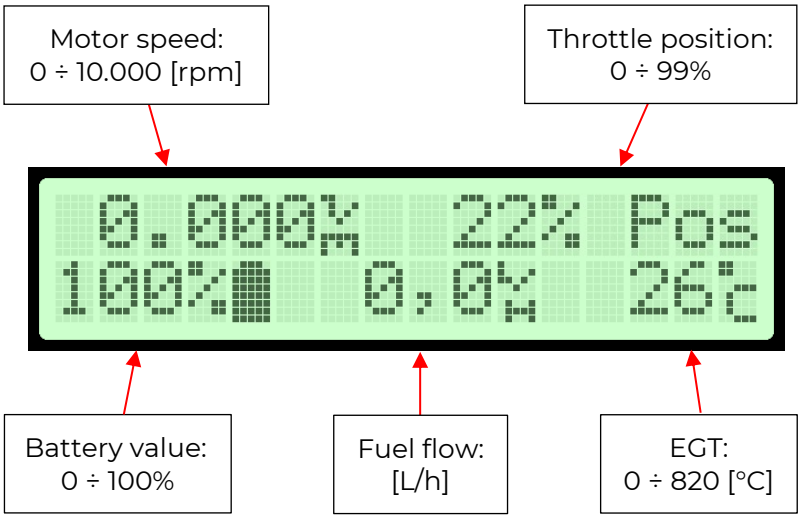
It is recommended to measure the amount of fuel before introducing it into the tank for greater accuracy.

The message “FUEL TANK LITERS” disappears when the selected fuel quantity is greater than 1.4 liters or the engine is turned on, and the “Run” screen appears instead.

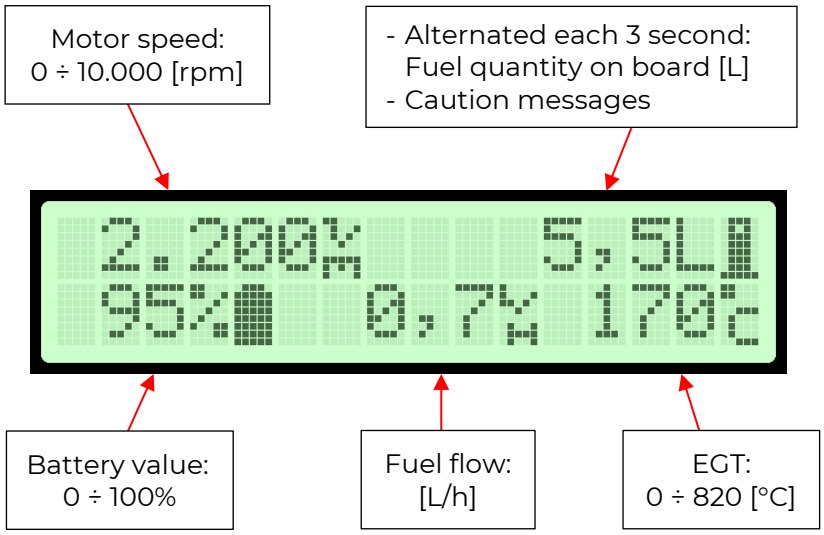
Even with the engine running and the “Run” screen in view, it is possible to change the amount of fuel on board by simultaneously pressing the "Enter" and "▲" or "▼" keys.

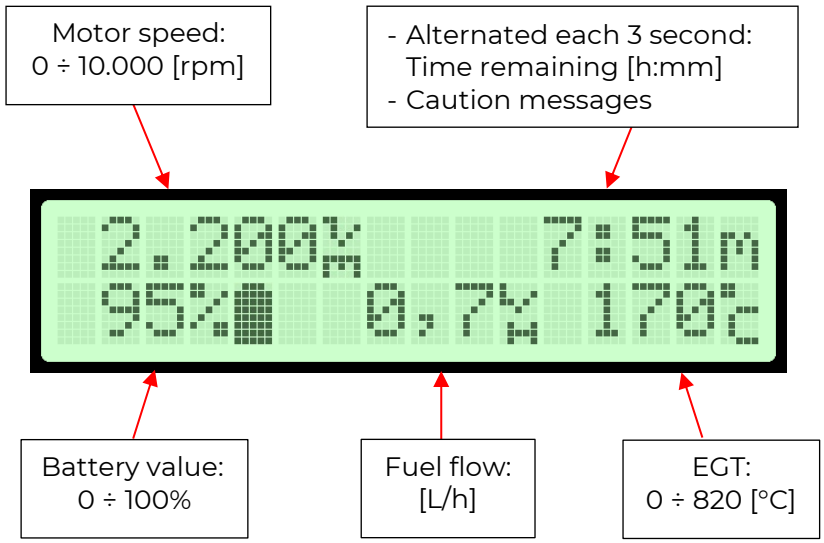
4.3.5 Basic "Run" screen

With engine Off:



With engine On:





When CHT temperature exceeds 168°C it is shown every 3 seconds alternating with EGT temperature. This advice should be considered just a caution message.

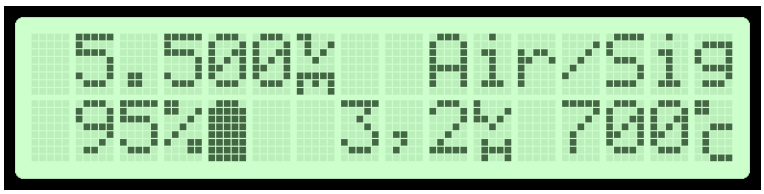
The time remaining is based on the estimated amount of fuel on board and the average consumption during the last 3 minutes of operation.

An accurate measurement of the fuel placed in the tank results in a better estimate of the fuel remaining in the aircraft during the flight. The system has a calculation accuracy of fuel used by the engine of 5%, which must be taken into account during use.

It is always recommended to use a visual control system to check the amount of fuel remaining in the tank.

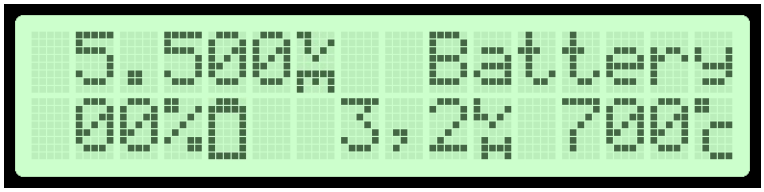
Caution messages:

- Air/sig: indicates no signal coming from the air rotary valve.



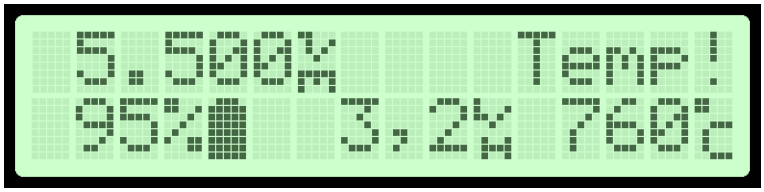
Although shown on the "Caution" page, this is to be considered a "Warning". The pilot must land as soon as possible, because the ECU is not able to read the throttle position.

- Battery: warns the pilot that the battery has reached its minimum voltage level. Since this warning is shown, there are still a few minutes of flight time left to land.

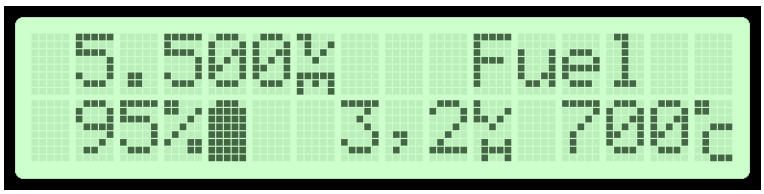


Once the "BATTERY" signal appears on the display, the system will continue to operate properly until the battery charge is completely depleted. When the battery voltage drops below 12 V, it will no longer be usable and will have to be replaced because it is dangerous. Further use of the battery after a voltage drop below 12 V will immediately void the warranty.

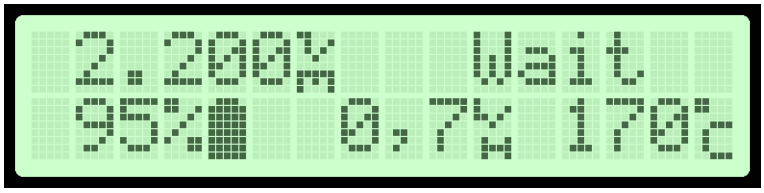
- Temp: indicates that the EFI has reached the maximum level of additional fuel compensation injected in order to keep the EGT within the limit value. It is suggested to fly at reduced power. Once on the ground report the problem to your dealer.



- Fuel: is shown when the estimated amount of fuel inside the tank is less than 0.5L.

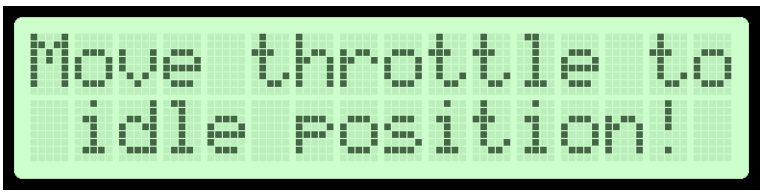


- Wait: is shown for 2 seconds after the engine is started. During this waiting time, if the engine speed exceeds 3.700 rpm or the throttle position is higher than the idle position, the engine is switched off for safety reasons.



4.3.6 Full screen messages

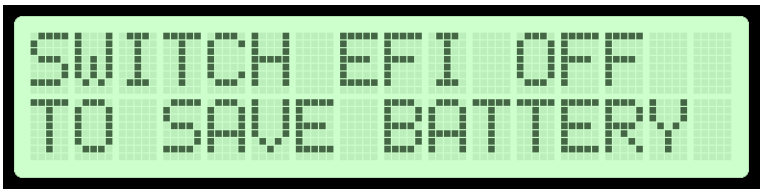
1) Move throttle to idle position!



This message is shown, with the engine off, if the throttle position is higher than the idle position memorised by the system.

With the engine off, if the idle position of the air rotary valve is modified (via the Allen screw of the air rotary valve), the system will memorise the new idle position at the next engine start.

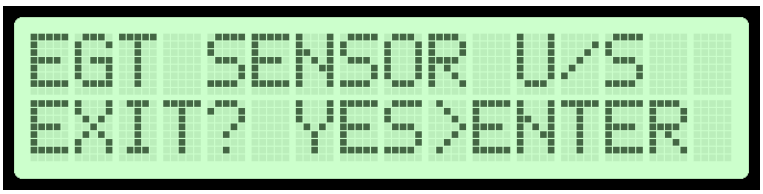
2) Switch EFI off to save battery



This message is intended to preserve the battery life. It is shown after 5 minutes of engine inactivity, with the battery on, either on the ground or in flight.
It can be muted by switching off the battery or by moving the throttle to full throttle for two seconds.

With this message on the display the Engine cannot be started.

3) EGT sensor U/S

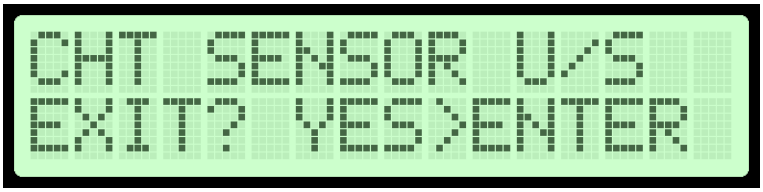


This message is shown only when the engine is off.
The EGT sensor signal is interrupted or the cable is short-circuited (U/S = unserviceable).
Press “Enter” to ignore this message.

For safety reasons, under EGT sensor U/S conditions, the control unit will operate the motor in an emergency state, increasing the air fuel mixture value by adding a percentage of fuel to the air fuel mixture set. This could cause the engine not to run smoothly.

Ones this message is shown, flight must be strictly limited to a safe return to a landing point. Further use of the engine under these conditions will immediately void the warranty.

4) CHT sensor U/S

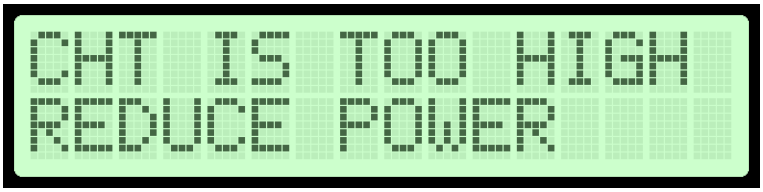


This message is only shown when the engine is off.
The CHT sensor signal is interrupted or the cable is short-circuited (U/S = unserviceable).
Press “Enter” to ignore this message.

Under CHT sensor U/S condition, the control unit is unable to manage the warm-up automatic procedure, and there are no emergency alerts when the maximum CHT threshold is exceeded.

Ones this message is shown, flight must be strictly limited to a safe return to a landing point. Further use of the engine under these conditions will immediately void the warranty.

5) CHT is too high reduce power



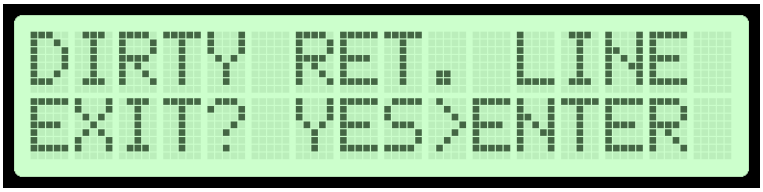
The cylinder head temperature (CHT) has exceeded 208°C, if possible, reduce the engine rpm to clear the alarm.

As a result of reducing engine RPM, the CHT temperature may initially increase due to less airflow generated by the propeller.

When the CHT exceeds 208°C, the ECU system generates a small engine speed reductions that last a fraction of a second, without compromising the flight dynamics, just to call the pilot's attention. This safety function disappears when the speed is reduced below 7400 rpm.

If the alarm persists even after reducing the engine rpm, flight must be strictly limited to a safe return to a landing point. Further use of the engine under these conditions will immediately void the warranty.

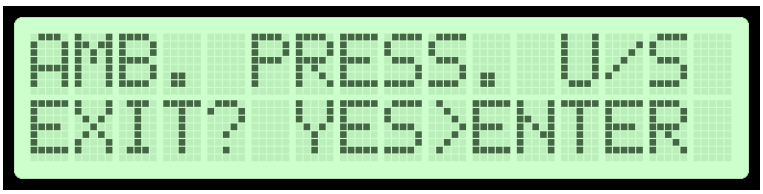
6) Dirty return line



The ECU detected high pressure on the return line.

Pressing the ‘Enter’ button confirms the warning, but attention should be paid to the fact that in this condition the system is not able to fill the fuel line correctly and there may be air bubbles in the fuel line which could cause the engine to switch off during operation. Moreover, the E.C.U. is not able to analyse the behaviour of the entire fuel line and its components, and to update the pump performance if required. Then, it is highly recommended not to fly and contact your dealer.

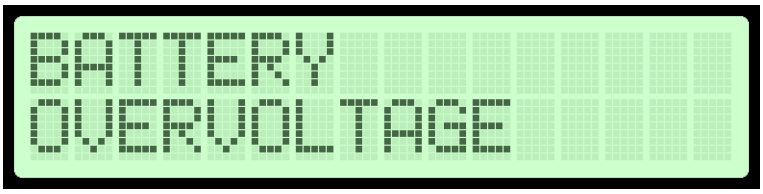
7) Ambient pressure U/S



Ambient pressure sensor faulty (U/S = unserviceable). It is highly recommended not to fly and contact your dealer.

Ones this message is shown, flight must be strictly limited to a safe return to a landing point. Further use of the engine under these conditions will immediately void the warranty.

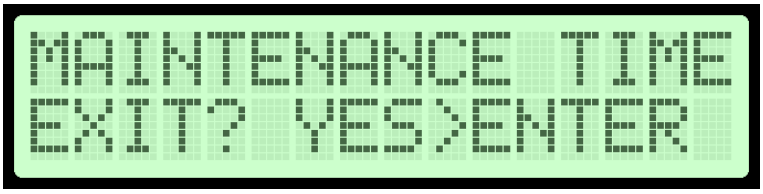
8) Battery overvoltage



The battery voltage is too high; the battery may be overcharged or may not be an original Vittorazi battery.

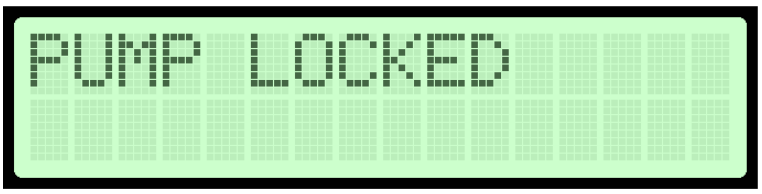
Using non-original Vittorazi or overcharged batteries can cause irreversible damage to the engine and poses a risk to the pilot.

9) Maintenance time



This Caution message is shown ones the “Time to engine service reset” have been reached since the last general maintenance. Contact your dealer to complete the maintenance and reset the maintenance time.

10) Pump locked



This Caution message is shown when the ECU receives no pump rpm signal. The pump may be locked or the signal interrupted.

Ones this message is shown, flight must be strictly limited to a safe return to a landing point. Once on the ground report the problem to your dealer. Further use of the engine under these conditions will immediately void the warranty.

4.3.7 Data menu

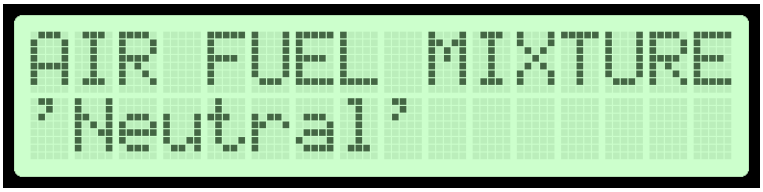
Some parameters present access restriction:

- Editable by the user.
- Editable by aircraft manufactures, dealers, professionals dealing with Vittorazi Motors and factory.
- Editable by professionals dealing with Vittorazi Motors and factory.

To change the parameters press the “Enter” and “+” or “-“ keys simultaneously.

The parameters in the Data Menu are all recorded in telemetry, including any setting changes, even temporary ones. Improper use of these parameters can cause damage to the engine, create risks for the pilot, and void the warranty. In case of doubt, contact your dealer.

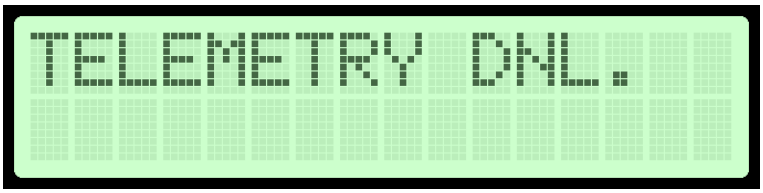
1) Air fuel mixture.



In this screen it is possible to change the air-fuel mixture that is fed into the cylinder.
The air-fuel mixture value can range from lean 10% to rich 15% in normal engine mode.
Changing this parameter varies the amount of fuel injected into the cylinder over the entire rpm range. The percentage value shown on the screen does not exactly correspond to the percentage variation in the amount of fuel injected. By default it’s set on "Neutral" (0%).

This parameter can be modified only under Vittorazi's supervision. Unmotivated changes of this parameter can cause engine damage and voids the warranty.

2) Telemetry download

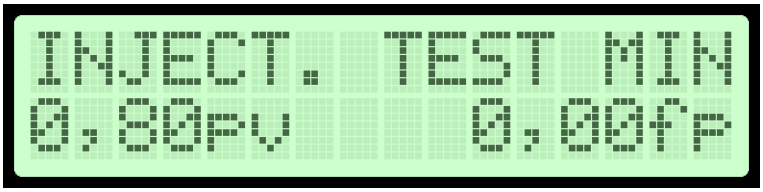


This function is available only when the engine is off.
Engine telemetry download procedure:

- Insert the SD Card (max. 16 GB) in the diagnostic telemetry.

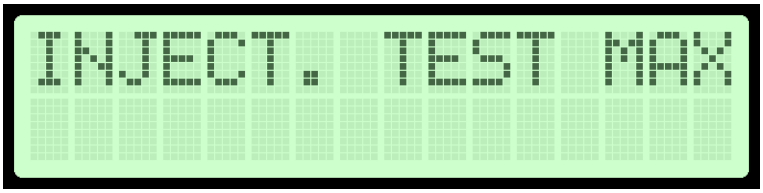
- Disconnect the RJ45 cable from the display.
- Wait for a bip after 3 seconds.
- Plug the RJ45 cable in the diagnostic telemetry.
- Turn the throttle to full throttle to start the download. The system emits two confirmation beeps when starting the download.
- Release the throttle.
- Wait for the telemetry download to be completed (approx. after 6 minutes). The system emits two beeps to confirm the end of the operation and generates a 250 ÷ 270 Kbyte txt file. If the file size is not correct, repeat the procedure.

3) Injector test min



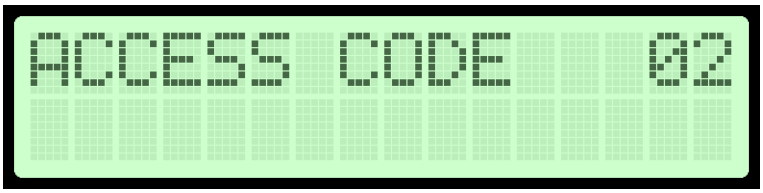
Test to check the fuel quantity injected at around 5500 rpm.
For the injector test min procedure see maintenance manual chapter 3.4.1 - Fuel Injector test.

4) Injector test max



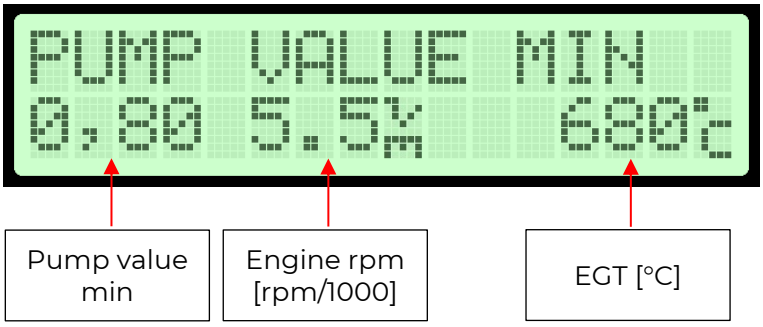
Test to check the fuel quantity injected at around 8500 rpm.
For the injector test max procedure see maintenance manual chapter 3.4.1 - Fuel Injector test.

5) Access code



Access code for restricted functions

6) Pump value min



This parameter is related to the pump value at medium rpm.

The following values are related to a check performed on the ground, with the engine warmed (CHT ≥ 80° C), at an altitude between 0 m and 1000 m above sea level and ambient temperature between 5 °C and 35 °C.

To check the pump value min on the ground, you have to be very careful. Carry out a checklist before starting the engine (chapter 5). Brake the aircraft in such a way that the thrust created by the rotation of the propeller does not cause any harm to you or other people near you. Shout CLEAR PROP! You can now start the engine. Be ready to turn off the engine at any time for safety reasons. It is recommended the presence of dealer or experienced personnel during the check.

For optimal setting of the pump value min:

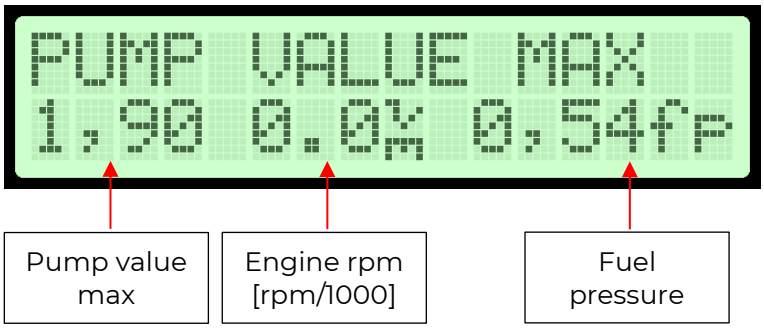
1. Turn on the engine and warm it up to 80 °C CHT.
2. Enter in the Pump value min screen on the Data menu
3. Accelerate the engine to 5.500 ± 50 rpm and keep it stable in the indicated range.
4. Wait 20 seconds and check the EGT.
5. Adjust the pump value min, based on the results:

EGT < 680 °C	Reduce pump value min until EGT is in the range 680 ÷ 720 °C
680 °C ≤ EGT ≤ 720 °C	OK
EGT > 720 °C	Increase pump value min until EGT is in the range 680 ÷ 720 °C

It is advisable to carry out this test at the end of the first 5h of engine operation, at the end of the break-in procedure, every 25h of engine operation and every time the engine behaves irregularly at medium rpm (4500 ÷ 6500 rpm)

For further information check the pump value min adjustment video tutorial:

7) Pump value max



This parameter is related to the pump value at maximum rpm.
For Moster 185 EFI the default value is currently within a window ranging from 1,6 to 2,7.
fp: fuel pressure in bar.

The following values are related to a check performed on the ground, with the engine warmed (CHT ≥ 80° C), at an altitude between 0 m and 1000 m above sea level and ambient temperature between 5 °C and 35 °C.

To check the pump value max on the ground, you have to be very careful. Carry out a checklist before starting the engine (chapter 5). Brake the aircraft in such a way that the thrust created by the rotation of the propeller does not cause any harm to you or other people near you. Shout CLEAR PROP! You can now start the engine. Be ready to turn off the engine at any time for safety reasons.

For optimal setting of the pump value max:

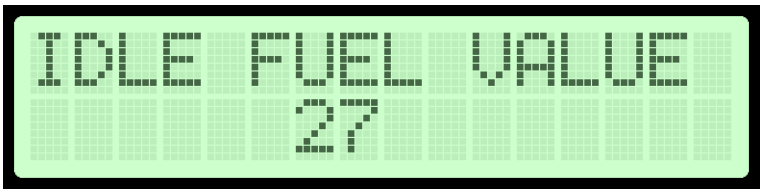
1. Turn on the engine and warm it up to 80 °C CHT.
2. Perform acceleration from idle to maximum rpm, hold for 10 seconds and check the peak value reached by EGT during the 10 seconds of stabilization at maximum rpm.
3. Enter in the Pump value max screen on the Data menu and adjust the pump value max based on the results:

EGT < 660 °C	Reduce pump value max by 0.1 and repeat the test
660 °C ≤ EGT ≤ 680 °C	OK
EGT > 680 °C	Increase pump value max by 0.1 and repeat the test

At the end of this procedure, it is necessary to update and register the new reference fuel pressure value:

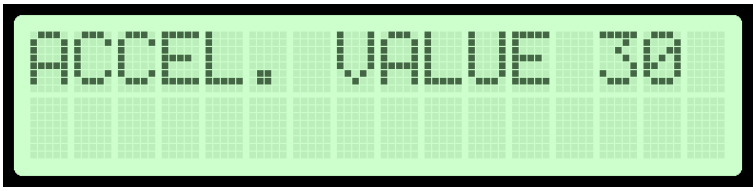
1. Turn off the engine.
2. Turn the battery off and back on.
3. During the fuel line filling, wait 25 ÷ 35 second and press simultaneously "▲" and "▼" keys for 2 seconds.

8) Idle fuel value



Numerical value related to the amount of fuel injected ad idle speed (1600 rpm ÷ 2600 rpm).
This value can range from 1 to 60.
The Moster 185 EFI default value is 27 (Two/three points up or down is sufficient to appreciate the change at engine idle speed).

9) Acceleration value

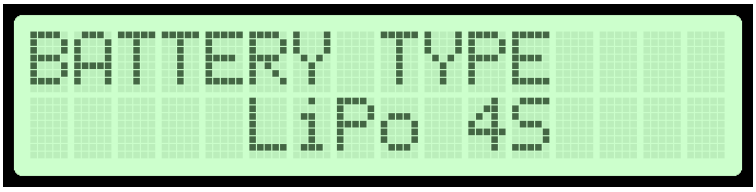


This function allows the engine acceleration to be fine-tuned by adapting the EFI system to the propeller type.

This parameter can be modified only under Vittorazi's supervision.

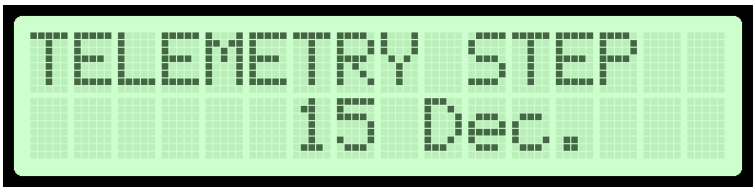
The acceleration value can range from 20 to 30 (Moster 185 EFI default value is 30).

10) Battery type



Select the type of battery used. This function, if required, should be performed within 25 seconds after the EFI system completes the test operations performed at power-up.
The Moster 185 EFI default type is Li.Po 4S.

11) Telemetry step

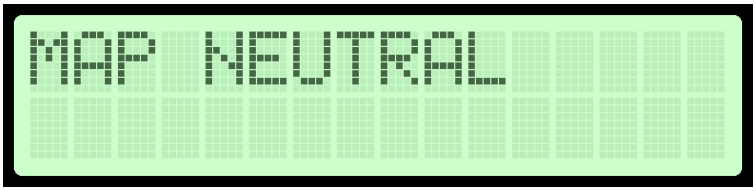


This function allows you to set the time between telemetry writes from 1 to 250 tenth of second with one-tenth increments.
The total telemetry time (t) that can be recorded based on the telemetry step (T_{step}) set can be calculated using the following equation:

$$t = \frac{T_{step} \times 400}{60} \; [min]$$

The default value is 15 tenths of second, corresponding to 100 minutes (1 hour and 40 minutes).

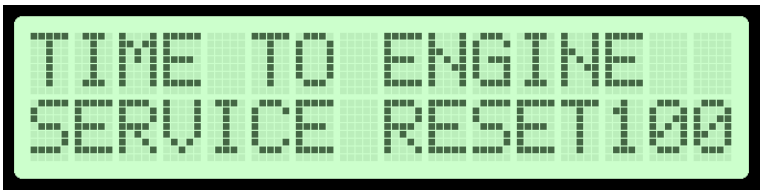
12) Map



Selection of mapping type:
- Lean
- Neutral
- Rich

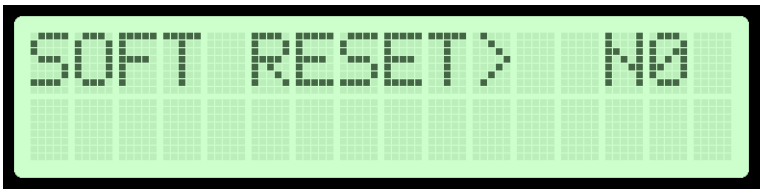
Neutral mapping is set by default.

13) Time to engine service reset



It allows to reset the engine operating hours before the next service.
Press "Enter" and "+" keys together to reset this parameter.

14) Software reset



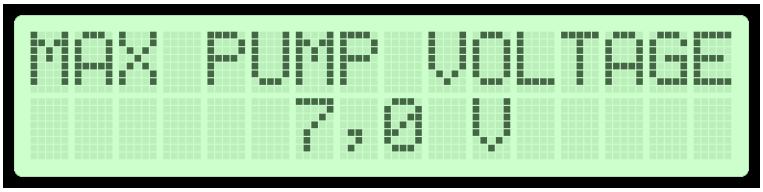
This function is pre-enabled by choosing “YES” in this screen. It becomes operational only when out of the "DATA" menu.

The following parameters will be reset to their original values:

- Air/fuel mixture: Neutral
- Pump value min: 0,4
- Pump value max: 1,5
- Idle fuel value: 27
- Accel. Value: 30
- Battery type: LiPo 4S
- Telemetry step: 15 Dec.
- Map neutral

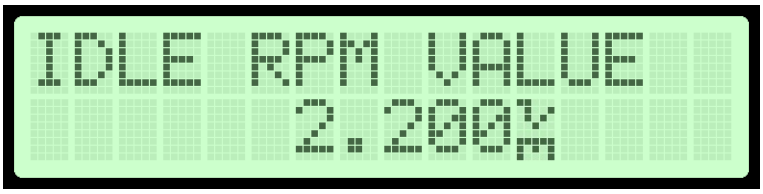
After performing the software reset, switch the ECU off and then on again, making sure to let the line filling operation run till the end (do not press the “Enter” button).
At the next engine start, let the engine idle until the "Wait" message on the display disappears.

15) Max pump voltage



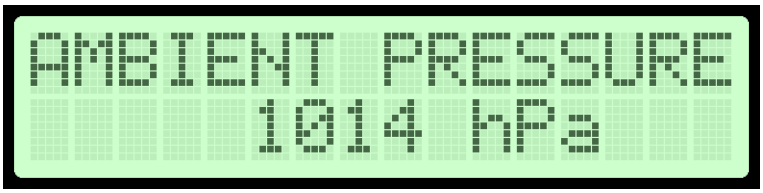
Maximum pump supply voltage allowed by the system.

16) Idle rpm value



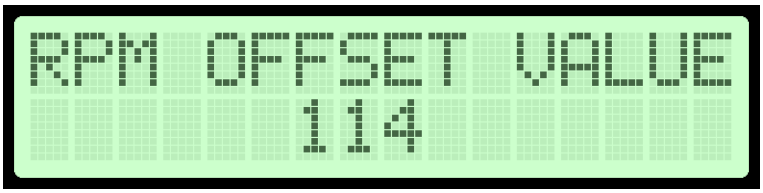
Nominal value of rpm at the minimum operating speed of the motor.
The system automatically creates a window of -600 / +400 rpm within which the engine is still considered to be at idle speed. The default value for the Moster 185 EFI is 2,200 rpm.

17) Ambient pressure



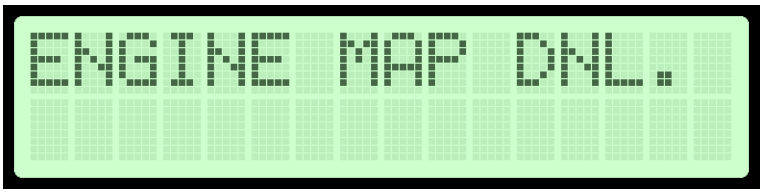
It allows to correct the value of ambient pressure currently read by the system.

18) Rpm offset value



It allows to correct the value of Rpm read by the system.

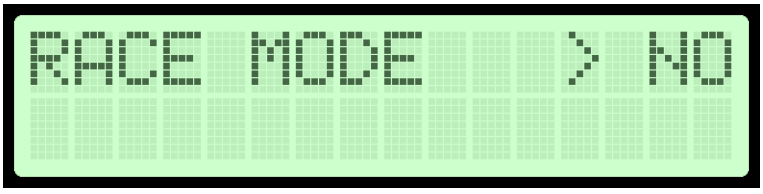
19) Engine map download



Engine map download procedure:

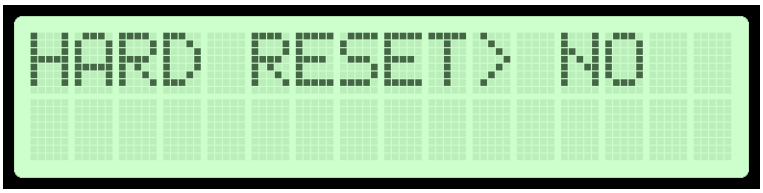
- Insert the SD Card (max. 16 GB) in the diagnostic telemetry.
- Disconnect the RJ45 cable from the display.
- Wait for a bip after 3 seconds.
- Plug the RJ45 cable in the diagnostic telemetry.
- Turn the throttle to full throttle to start the download. The system emits two confirmation beeps when starting the download
- Release the throttle.
- Wait for the map download to be completed (approx. after 3 seconds). The system emits two beeps to confirm the end of the operation and generates a 1 ÷ 2 Kbyte txt file. If the file size is not correct, repeat the procedure.

20) Race mode



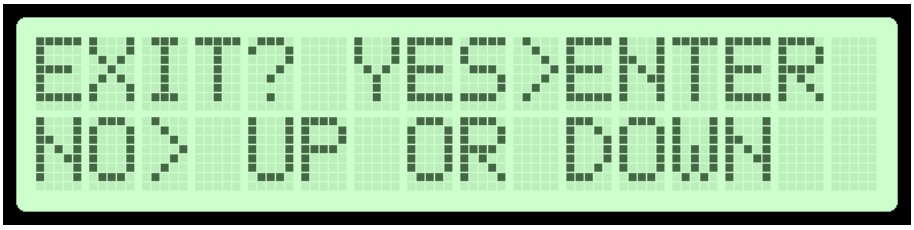
Selects the type of engine use whether normal or race.

21) Hard reset



This function is pre-enabled by choosing “YES” in this screen. All parameters will be lost and the ECU will return to the factory configuration.
It becomes operational only when out of the "DATA" menu and after turning the battery off and on again.

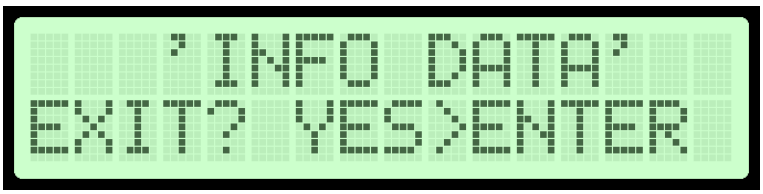
22) Exit



It allows to exit the data menu and return to “Run” screen.

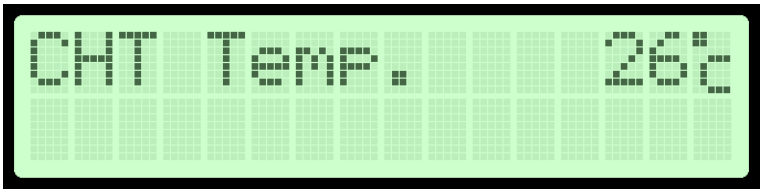
4.3.8 Info menu

1) Info data



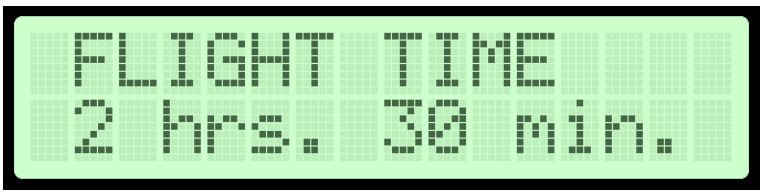
It allows to exit the info menu and return to “Run” screen.

2) CHT temperature



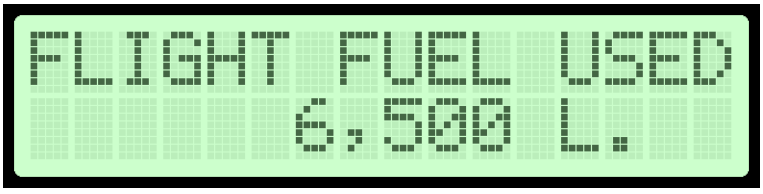
This page displays the CHT temperature in degrees centigrade.
The temperature is measured at the engine head about 3 cm from the spark plug.

3) Flight time



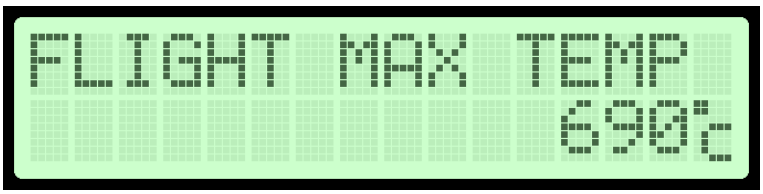
Duration of the current or last registered flight in hours and minutes.
It is reset every time the engine is started. The last recorded flight time remains in memory even after the battery is switched off and on.

4) Flight fuel used



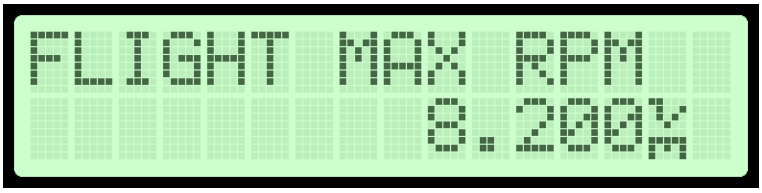
Amount of fuel used in the current or last registered flight in liters, deciliters, centiliters and milliliters
It is reset every time the engine is started. The last recorded fuel value remains in memory even after the battery is switched off and on.

5) Flight max temperature



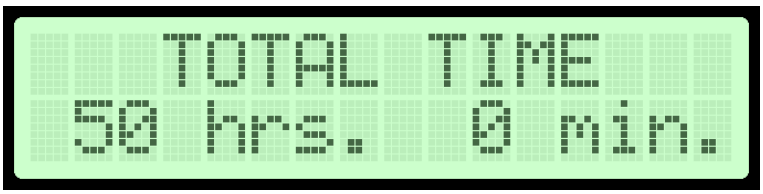
The maximum EGT value reached during the current or last registered flight.
It is reset every time the engine is started. The last recorded maximum EGT value remains in memory even after the battery is switched off and on.

6) Flight max rpm



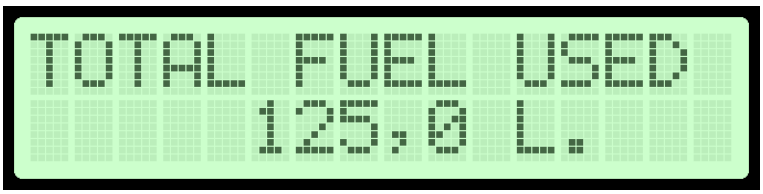
The value of maximum rpm reached during the current or last registered flight.
It is reset every time the engine is started. The last recorded value of maximum rpm remains in memory even after the battery is switched off and on.

7) Total time



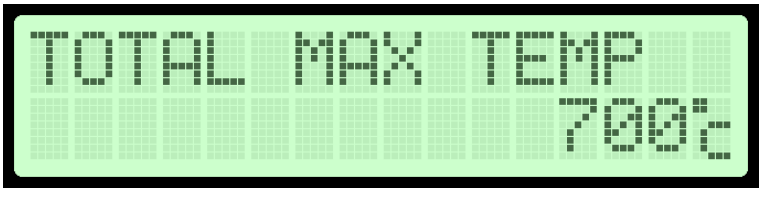
The total hours and minutes value of the engine.
Values can range from 0 to 999 hours.

8) Total fuel used



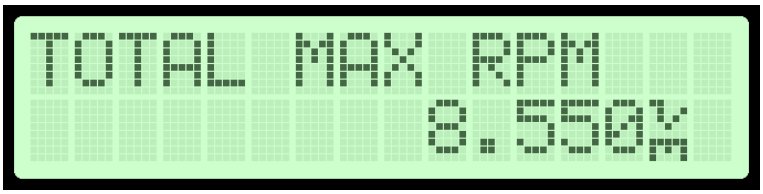
The total value of fuel used in liters.

9) Total max temperature



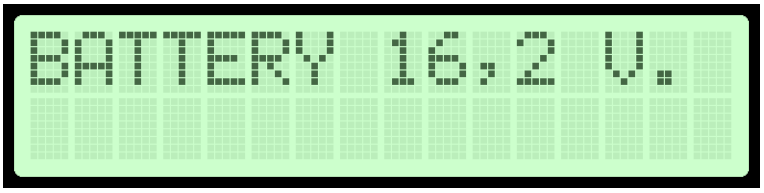
The value of maximum EGT reached during the engine life.

10) Total max rpm



The value of maximum rpm reached during the engine life.

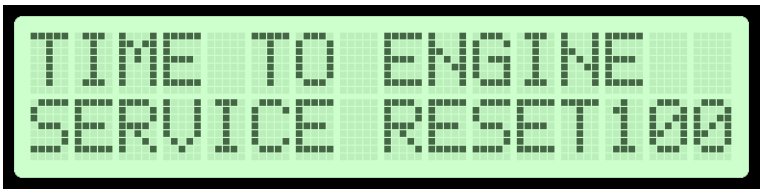
11) Battery



The battery value in volts. The Vittorazi battery voltage should range from 14.0 volts to 16.8 volts.

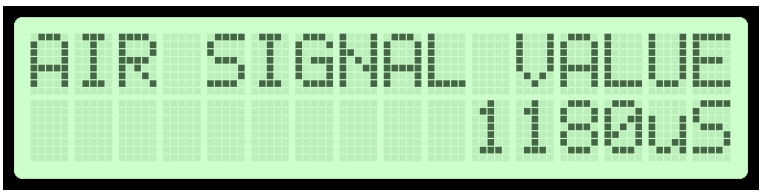
If the Vittorazi LiPo 4s battery voltage drops below 12 volts, the battery is no longer usable. Further use of the battery will void the warranty.

12) Time to engine service reset



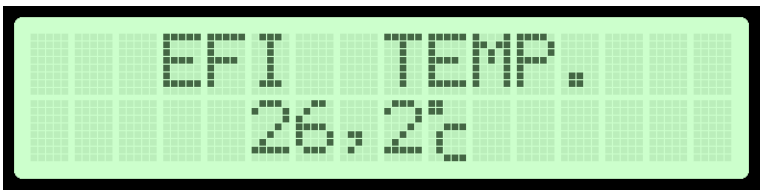
The time remaining for maintenance.
When this value reaches zero, an alarm is shown at the end of the EFI test cycle. This can be reset by pressing the "Enter" key or pushing stick at maximum.

13) Air signal value



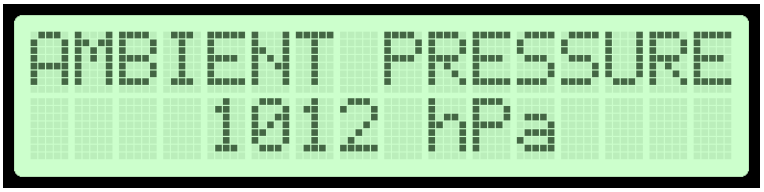
The air rotary valve position in millionths of a second.

14) EFI temperature



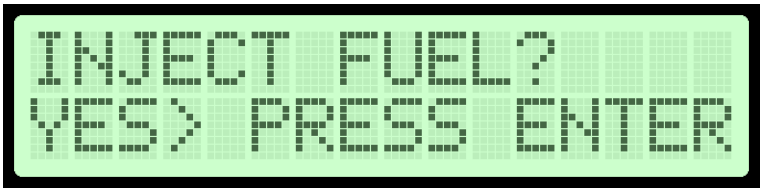
The temperature inside the ECU box in degrees centigrade.

15) Ambient pressure



The ambient pressure value in hectopascals.

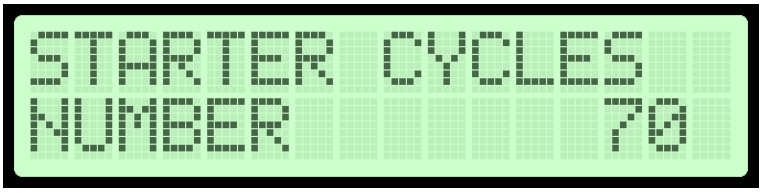
16) Inject fuel



Pressing the "Enter" key to inject fuel inside the engine. The operation is stopped by releasing the "Enter" key.

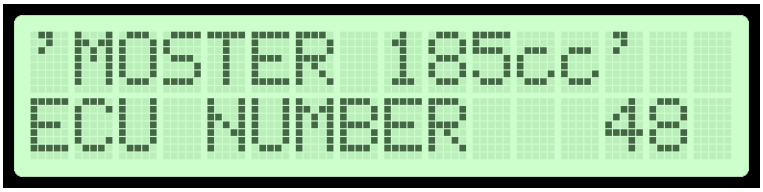
Use this function only for testing when the engine does not start or there is a problem with the ignition. Prolonged pressing of the “Enter” key may cause engine flooding.

17) Starter cycles number



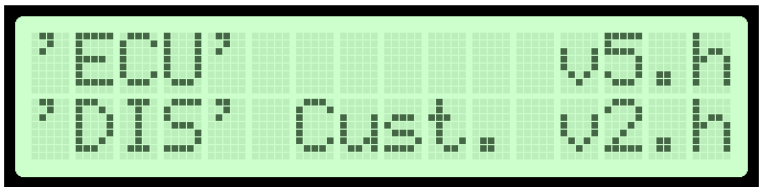
The number of starts performed by the starter with the start/stop button. The number increases even if the engine does not start as a result of double click button.

18) Engine type and ECU number



The type of engine to which the firmware refers is shown in the top row and the ECU sequential number in the bottom row.

19) ECU and Display firmware versions



In the top line the firmware update referring to the ECU and in the lower the one referring to the display. In addition, the authorised access level is shown:

- Cust. = Customer
- Deal. = Dealer
- Fact. = Factory

4.3.9 Hidden functions

1) Forced fuel line filling

With engine off and the “FUEL TANK LITERS” screen or “Run” screen showed, by pressing the “+” key, the ECU opens the solenoid valve and starts a forced fuel line filling.
The pump is progressively accelerated to the maximum allowable RPM. If the maximum line pressure value (2.5 bar) is reached, the pump maintains the rpm reached or is restarted from the minimum value.

For engines with ECU firmware version previous to “V.5.i”: when the fuel line is completely empty, it is strongly recommended to perform three forced fuel line fills, lasting at least 1 minute each, after the fuel line filling. This operation ensures that any air bubbles are expelled from the fuel line and makes the engine safe and performant for the next start-up.

2) Fuel manual injection

With engine off and “FUEL TANK LITERS” screen or “Run” screen showed, by pressing the “Enter” and the “+” keys simultaneously, the ECU will cycle the injector in order to spray a small amount of fuel inside the engine until the buttons are released. For further information please refer to “Inject fuel” in chapter 4.3.8. Info menu.

3) Buzzer alarm reset

The following buzzer alarms can be reset with the throttle lever raised to maximum:

- EFI inactivity for more than 5 minutes.
- EGT probe signal interrupted or short-circuited message.
- CHT probe signal interrupted or short-circuited message.
- “Dirty return line” message.

4) Stop initial fuel line filling

With Dealer and Factory firmware version, it is possible to stop the initial fuel line filling by pressing the “Enter” key.

It is absolutely inadvisable to stop the fuel line filling operation as during this process the ECU monitors the behaviour of the entire fuel line and its components, updating pump performance if necessary and ensuring the expulsion of any air bubbles.

4.3.10 Troubleshooting

This chapter deals with diagnosing and solving problems that may occur while using the engine. In the event of a malfunction in engine operation, certain operations could be dangerous.

➢ The ECU doesn't switch on.

The battery or the ECU power supply cable could be damaged.

1. Check that the battery is switched on and that the green LED is flashing, otherwise replace battery.
2. Replace the ECU power supply wiring.

The problem could be related to an electronic component of the ECU.

1. Contact Vittorazi support.

➢ The ECU switch on and off continuously.

The pump cloud be locked.

1. Contact Vittorazi support.

➢ After initial fuel fill in procedure the "pump locked" message is displayed for 5 seconds

The ECU does not receive the pump rpm signal.

1. Check the "Fp" (Fuel Pressure) shown on the "Pump Value Max" page of the "DATA" menu, if the Fp is greater than 0.3 bar (with engine off and ECU on), it is only a data transmission problem between the pump and the ECU.
   Contact Vittorazi support

In this condition the engine will start normally but precautionarily it is suggested to avoid flying.

➢ The automatic fuel line fill in doesn't work.

There may be bends in the pipes along the fuel line.

1. Control the entire line and arrange the fuel pipes correctly.

The pipes or some component inside the FBU could be occluded.

1. Contact Vittorazi support.

➢ The electric starter doesn't work.

Before proceeding with the tests listed below remove the propeller and the spark plug cap.

1. Check that the battery is switched on and that the green LED is flashing.
2. Check that the "Starter Cycles Number" on the "INFO" menu increases when the start/stop button is double-clicked. If no increase occurs, the problem could be the throttle cable, the signal wiring or the E.C.U.
3. Check the 60 A fuse at the top of the battery (See maintenance manual, chapter 3.10 Battery).
4. Using a multimeter, check the entire power supply line to the electric starter:
   4.1. If the power reaches the electric starter when you double-click the starter button, replace the electric starter.
   4.2. If the power does not reach the input ends of the relay, or, it reaches the output ends of the relay but not the electric starter, replace the power wiring of the electric starter.
   4.3. If the power reaches the input ends of the relay but does not reach the output ends of the relay, replace the relay.

➢ The electric starter Bendix gear doesn't engage.

1. Check that the battery is fully charged.
2. Check that the battery is not at a temperature below -10 °C.
3. Replace battery.
4. Replace the electric starter.

➢ The idle rpm is too low or too high.

1. Using a 2.5 mm Allen key, move the idle speed adjustment screw on the air rotary valve to bring the idle speed to approximately 1.800 ÷ 2.200 rpm. If the idle position is raised more than 2% from the current throttle idle position, the display will show "Move Throttle to idle position". Turn on the engine and ECU will automatically update the memorized idle position value.

To update the idle position value, engine rpm must remain stable between 1600 rpm and 2600 rpm for at least 4 seconds.

➢ The engine dies during the acceleration phase or at medium rpm.

1. Check the microfilter (See maintenance manual chapter 3.4 Fuel injection line).
2. With the engine off, enter the “Data” menu and increase the pump value min by +0.2. Exit the “Data” menu, turn on the engine and perform a pump value min check (see Pump value min in Chapter 4.3.7 Data menu).
3. Perform an injector test min and an injector test max (See maintenance manual chapter 3.4 Fuel injection line) and follow the procedures indicated based on the results.

The problem could be related to a component inside the Full Integrated Unit (FIU).

1. Contact Vittorazi support.

➢ The engine mumbles at medium rpm.

1. Check the Pump Value Min (See Pump value min at page 33)
2. Replace the microfilter (See maintenance manual chapter 3.4 Fuel injection line).
3. Perform an injector test min and an injector test max (See maintenance manual chapter 3.4 Fuel injection line) and follow the procedures indicated based on the results.

The problem could be related to a component inside the Full Integrated Unit (FIU).

1. Contact Vittorazi support.

➢ The engine does not reach maximum rpm (8400 ÷ 8700 rpm) or there is a reduction in maximum rpm when holding the throttle at full throttle

1. Replace the microfilter (See maintenance manual chapter 3.4 Fuel injection line).
2. Contact Vittorazi support.

➢ The engine doesn’t start.

1. Check that the battery is switched on and that the green LED is flashing.
2. Check that there is spark in the spark plug when double clicking the start button. If there is not, replace the spark plug, the spark plug cap (see maintenance manual chapter 3.2 Spark plug), and the coil (see maintenance manual chapter 3.15 Flywheel, coil) one at a time and repeat the test.

The spark plug is powered with high voltage during operation.

3. Extract the injector (See maintenance manual chapter 3.4 Fuel injection line) and perform a fuel injection (see Inject fuel at page 42) inside a glass precision measuring graduated cylinder to control that the injector works correctly at minimum rpm and it stops after the injection, otherwise replace the injector (See maintenance manual chapter 3.4 Fuel injection line).
4. Perform an injector test min and an injector test max (See maintenance manual chapter 3.4 Fuel injection line) and follow the procedures indicated based on the results.

The problem could be related to a component inside the Full Integrated Unit (FIU).

1. Contact Vittorazi support.

➢ The flashing message "Temp" has appeared in the top right corner of the "Run" screen during the flight.

The EGT max value is controlled by the ECU that monitors the max temperature and, if necessary, takes action to contain the limits. If the E.C.U. is unable to comply with the maximum EGT values, the flashing “Temp” message appears on the upper right corner of the display.

1. Check the microfilter (See maintenance manual chapter 3.4 Fuel injection line).
2. Perform an injector test min and an injector test max and adjust the pump value min and pump value max according to the results (See maintenance manual chapter 3.4 Fuel injection line).

The problem could be related to a component inside the Full Integrated Unit (FIU).

1. Contact Vittorazi support.

➢ The display image remains frozen

1. Check the connection of the RJ-45 cable: unscrew the base ring, push the cable forward and screw the base ring to secure the cable in position.
2. Verify the ferrite is inside the elastic support.
3. Replace the RJ-45 cable.
4. Replace the display.

➢ The display does not switch on

1. Check the connection of the RJ-45 cable: unscrew the base ring, push the cable forward and screw the base ring to secure the cable in position.
2. Replace the RJ-45 cable.
3. Replace the display.
4. E.C.U. internal communication display 2A fuse has burnt out. Replace the F.I.U.

The communication between the E.C.U. (Electronic Control Unit) and the Display of the Moster 185 EFI is made through a cable RJ-45 motor and it is not compatible with other systems or technologies. The improper use of this connection with alternative means (e.g. Ethernet cable) leads to the burning of the internal fuse of the E.C.U.; in this case the warranty will be voided since the failure is not Vittorazi's responsibility and replacement of the entire F.I.U. will be required.

➢ Occluded return line

If the warning “Dirty Ret. Line” is displayed, it means that there is an obstruction in the F.B.U. or a bend in the fuel line carrying fuel from the F.B.U. to the tank.

1. Check that there are no bends in the fuel line leading from the F.B.U. to the tank.
2. Contact Vittorazi support.

➢ Occluded fuel micro filter engine behavior

An occluded or partially occluded inline microfilter leads to abnormal engine behaviour.
The effects of microfilter occlusion may not appear immediately upon start-up, but after a few minutes the engine may become unstable in flight. This phenomenon is caused by the fact that the micropores on the microfilter tissue tend to open when the engine is off and slowly occlude during normal operation.

1. Replace the microfilter.

➢ FIU scheduled maintenance

1. Disassemble the FIU from the engine (See maintenance manual chapter 3.5 Full integrated unit (FIU)) and contact your dealer.

4.3.11 Firmware updates

ECU:

- V4.u – 01/10/2023.
  - Release version.
- V4.z – 20/12/2023.
- V5.b – 25/01/2024.
- V5.c – 03/03/2024.
- V5.d – 12/03/2024.
- V5.e – 03/06/2024.
- V5.f – 24/06/2024.
- V5.g – 28/08/2024.
- V5.h – 22/10/2024.
- V5.i – 28/01/2025.

Display:

- V2.h – 12/06/2023
  - Release version.

4.4 Start and stop – Safety start device

To test your aircraft on the ground, you have to be very careful. Carry out a checklist before starting the engine (chapter 5). Brake the aircraft in such a way that the thrust created by the rotation of the propeller does not cause any harm to you or other people near you. Shout CLEAR PROP! You can now start the engine. Be ready to turn off the engine at any time for safety reasons.

Engine start-up

Switch the ECU on by turning on the battery.
The fuel line will be filled in automatically in 40 ÷ 60 seconds.
Wait till the “FUEL TANK LITERS” is displayed and set the amount of fuel on board.
Once the “Run” screen is shown you are ready to start the engine.

For both cold and warm engine starting, leave the throttle position at idle

To start the engine, press the start/stop button twice within 0.5 seconds and hold it down until the engine starts.

Safety start device

The Moster 185 EFI is equipped with a safety start device that ensures the protection of the pilot and people around when the engine is turned on.
Through this device, the engine immediately shuts down whenever, during the first 2 second after the engine is turned on, the engine speed exceeds 3700 rpm and the throttle position is higher from the idle position.

Engine shutdown

To switch off the engine, press the start/stop button and hold it down until the engine is completely stopped.

If the start/stop button is released during the switch off procedure, before the engine is completely stopped, the procedure is aborted and the engine remains running.

4.5 Engine warm up

Warm up the engine before use.

30 sec	Idle Rpm
2-6 min	Heat the engine at constant RPM (5.500 RPM) up to 70 °C CHT.
15-20 sec	Keep FULL throttle
NOW the engine is ready to fly	

Be careful. The thrust generated by the propeller can be sudden and must be ensured with the right procedure when warming up the engine.

4.6 Break-in procedure

A carefully executed break-in phase, following the next instructions, improves the life of the engine and its performance. The presence of experienced personnel during the running-in phase is recommended, also to carry out the necessary checks at the end of the period.

The engine must be used carefully in the first hours of break-in (15 liters) and fuel mixture must be prepared as indicated in the table. The first time the engine is started, it must be warmed up on the ground for a few minutes, paying utmost attention to noises or abnormal behaviour. We recommend to complete the break-in on the same day.

Break-in	**Moster 185 EFI**
From 1st to 15th litre of fuel	Oil 2,0 % or 50:1 Motul800
After the 15th litre of fuel	Oil 1,8 % or 55:1 Motul800

Ground Break-in

Tools: chronometer (also visible in the "flight time" screen in the "Info" menu);
Test location: on the ground;
Duration: about 2 hours in total;
Test cycle: operating cycle of 15 working minutes followed by 15 minutes of cooling, to be repeated 4 times.

RPM	**Time**
4.000	4 min
Idle (2.000-2.200)	1 min
5.000	3 min
Idle (2.000-2.200)	1 min
6.000	2 min
Idle (2.000-2.200)	1 min
7.000	1 min
Idle (2.000-2.200)	1 min
8.000	30 sec
Off	15 min cooling

Final checks: carry out the checklist shown in the next chart before proceeding to the flight phase.

Flight Break-in	**Test location:** on flight; **Duration:** up to 15 liters (considering also the fuel previously consumed on the ground break-in); **Test cycle:** each flight duration is up to 30 minutes. Do not keep the engine at max RPM for more than 30 seconds or do not keep constant RPM for a long time. Gradual accelerations and releases are recommended.
Regular use	Use engine with mixture of oil 1,8 % Motul800.

At the end of the ground break-in perform the following checks:

Engine screws and nuts tightening;
Propeller screws tightening;
Engine idle;
Rubber mountings;
Airbox fixing;
Electric starter;
Exhaust bushing joints (correct sliding, no leaks);
Belt tensioning;
Pump value min
All installed components (engine fixing, electrical system, fuel line system, instrumentation, other parts).

Carry out the above operations in accordance with the installation, user and maintenance manual and under the supervision of authorized personnel.

4.7 Belt tensioning

The belt tensioning must be checked when the engine is cold.

To check belt tensioning, pinch the belt and measure the frequency oscillation with a frequency tension tester (or mobile app).
If the values are within the frequencies indicated in the table, the belt is properly tensioned.
Otherwise follow the directions in the maintenance manual (chapter 3.16.8 Belt tensioning) to perform the works safely.

First installation	Retensioning
500-520 Hz	430-450 Hz

Check the belt tensioning and the condition of the grooves each 25 hours.
Replace the belt every 100 hours.

The values of tensioning and duration refer to the original belt Vittorazi. The use of not original belt or the application of wrong values of tensioning, can cause serious damages to the transmission and to the crankshaft, besides to void the warranty of the whole motor.

When installing a new belt, refer to the chart values for the first tensioning (500-520 Hz), then carry out a tensioning check after 2 hours of operation (430-450 Hz).

5 Safety first, check it

5.1 Maintenance schedule

Refer to the following maintenance indicated time schedule to fly in total safety. Work on the engine is only allowed to be carried out by experienced mechanic and authorized dealers. These are prescribed checks at certain interval times to avoid engine problems through preventative maintenance.

Caption:

 Cleaning

 Check

 Measuring

 Replacement

 Lubricate with WD-40

Note:

1) or after a year, whichever comes first.

2) or after 500 cycles, whichever comes first.

3) or after 300 charging cycles or 3 years, whichever comes first.

4) Springs

Flight hours	Before each flight	Every 10 h	Every 25 h	Every 50 h	Every 100 h	Every 150 h	Every 200 h	Every 400 h
Pre-flight checklist								
Screws and nuts (tightening)								
Spark plug								
Spark plug cap								
Airbox Snaplock								
Airbox			 					
Airbox safety strap								
Airbox sponge and sleeve			 		 1)			
Fuel injector								
Fuel injector connector					 			
Fuel injector test								

The table follows in the next page

Flight hours	Before each flight	Every 10 h	Every 25 h	Every 50 h	Every 100 h	Every 150 h	Every 200 h	Every 400 h
Pump value min test								
Microfilter with O-ring								
Fuel suction filter								
Fuel injector pipes								
Fuel tank pipes								
FIU								
Rubber mountings (FIU, engine, exhaust)						 1)		
ECU signal wiring								
ECU supply wiring								
Electric starter wiring								
RJ-45 cable								
CHT sensor								
EGT sensor								

The table follows in the next page

Flight hours	Before each flight	Every 10 h	Every 25 h	Every 50 h	Every 100 h	Every 150 h	Every 200 h	Every 400 h
Battery							 3)	
Air rotary valve lever								
Reed valve petals								
Electric starter					 2)			
Kit exhaust bushing (1^{st} joint)	 			 				
Kit exhaust bushing (2^{nd} joint)	 			  4)				
Exhaust manifold with springs								
Soundproofing material silencer								
Rubber silencer fixing washers						 1)		
Gaskets (cylinder, Air Rotary Valve, reed valve, exhaust, silencer)								
Piston					 			

The table follows in the next page

Flight hours	Before each flight	Every 10 h	Every 25 h	Every 50 h	Every 100 h	Every 150 h	Every 200 h	Every 400 h
Piston roller bearing								
Head and cylinder								
O-ring head								
Oil seal carter case								
Crankshaft bearings								
Crankshaft								
Belt								
Reduction bearings								
Centrifugal clutch								
Clutch bell								

5.2 Tightening values

Component	Torque value	Thread size	Lubricant/ sealant
Spark plug	25 Nm	M14x1,25	
Airbox fixing clamp	2,5 Nm	50-70 mm (clamp size)	
Injector screw	6,5 Nm	M5x12	Loxeal 55-03/ Loctite 243
Fuel pipes fixing clamp nut	10 Nm	M6	
Microfilter cap	0.3 Nm	M10x4,20	
FIU rubber mountings screws	1.6 Nm	M4x10	Loxeal 55-03/ Loctite 243
FIU mounting screws	1.6 Nm	M4x6	Loxeal 55-03/ Loctite 243
Battery and probes supply cables fixing clamp screw	5 Nm	M5x10	
Probes supply cable fixing clamp screw	0,6 Nm	M4x6	Loxeal 55-03/ Loctite 243
Relay supply cable fixing clamp screw	0,6 Nm	M4x6	Loxeal 55-03/ Loctite 243
Probes support fixing plate nuts	3 Nm	M4	
ECU signal cable fixing clamp screw	10 Nm	M6x10	Loxeal 55-03/ Loctite 243

The table follows in the next page

Component	Torque value	Thread size	Lubricant/ sealant
Ground cable fixing screw	4 Nm	M4x12	Loxeal 55-03/ Loctite 243
Coil cable fixing clamp screw	4 Nm	M4x12	Loxeal 55-03/ Loctite 243
Electric starter cable fixing clamps screws	10 Nm	M6x10	
Sensors support screws	0,4 Nm	M3x25	Loxeal 55-03/ Loctite 243
CHT sensor screw	10 Nm	M6x10	Loxeal 83-55/ Loctite 270
EGT sensor	7Nm	M8x6	Interflon paste HT1200
Air rotary valve screws	6 Nm	M6x60	Loxeal 55-03/ Loctite 243
Air rotary valve lever screw	2,5 nm	M4x8	
Air rotary valve flange screws	8 Nm	M5x25	
Reed valve petals screws	1,5 Nm	M3x5	
Battery self-locking nuts	5 Nm	M5	
Exhaust nuts	32 Nm	M8	Copper paste
Silencer nuts	10 Nm	M6	

The table follows in the next page

Component	Torque value	Thread size	Lubricant/ sealant
Silencer screw	13 Nm	M8x25	Loxeal 83-55/ Loctite 270
Rubber mounting nuts (M021a, M021b, M151c)	18 Nm	M8	
Rubber mounting nuts (M151a)	15 Nm	M8	
Exhaust support plate's nuts	15 Nm / 18 Nm	M8	
Rubber mountings ring nuts	20 Nm		
Electric starter screws	10 Nm	M6x25	
Electric starter fixing plate screws	10 Nm	M6x25	
Ring gear screws	4,1 Nm	M4x16	
Flywheel nut	52 Nm	M10x1,25	
Spark plug cable fixing clamp screw	Hand tighten	M4x20	
Aluminium toothed pulley's screws	8 Nm	M5x20	Loxeal 55-03/ Loctite 243
Ring gear cover screws	10 Nm	M6x14	
Clutch	20 Nm		

The table follows in the next page

Component	Torque value	Thread size	Lubricant/ sealant
Eccentric rear screw	25 Nm	M8x16	
Eccentric side screw	12 Nm	M6x35	
Cylinder head nuts	16 Nm	M8	Copper paste
Engine carter screws	10 Nm	M6x35/40	
Carter support screws	20 Nm	M8x16	
Carbon propeller screws	10-12 Nm	M6	

5.3 Pre-flight checklist

Check propeller screws **tightening**.
Visually check the engine **integrity**: rubber mountings, muffler, airbox fixing, belt, cylinder head and all the other components.
Visually check the fuel line, electric cables and components.
Verify that throttle joystick sliding is correct, in its upper and lower limits.
Switch on EFI. Wait until the fuel line filling has been completed. Set the fuel quantity on board.
ENGINE IS NOW READY TO START.
Place your aircraft in a **safe position to start the engine**.
Shout **CLEAR PROP! Start the engine by quickly pressing the start/stop button twice and holding until the engine is fully started**
Leave the **throttle at idle** until the WAIT message disappears from the screen.
Complete the engine WARM UP procedure.
Check for abnormal **vibrations** or **noise**.
Check that **Max RPM** is between **8.400** and **8.600.**
Check that engine keeps the **Max revs** for at least 10 **seconds**.
Check the engine idle, so the RPMs are stable between **1.800** and **2.200 RPM**.
Turn off the engine to check the correct operation of the **Start/stop switch button**.
ENGINE IS NOW READY TO TAKE OFF.

5.4 Spare parts

Ask to a Vittorazi dealer for the spare-parts. If a dealer is not available in your area or country, you can contact the nearest Vittorazi dealer (or directly the factory).

The use of not original parts and parts not recognized by Vittorazi, can make the motor dangerous and this immediately voids the warranty. Vittorazi doesn't accept any warranty for those motor used with not original parts, parts not recognized, modified motors or those who have been used improperly.

You can download the Vittorazi Motors Illustrated Parts Catalogue (IPC) directly from the website. The manufacturer will ensure immediate availability of spare parts.

IPC, manuals, bulletins, newsletter, warranties, FAQ

https://www.vittorazi.com/en/services/

Find the nearest dealer

www.vittorazi.com/en/dealers/

Vittorazi Official YouTube channel: video and free tutorials available

https://www.youtube.com/user/VITTORAZIMOTORS

6 Warranty

On all the motors sold by Vittorazi Motors from January 1st 2022, will be applied the new warranty conditions indicated in this manual.

6.1 Warranty limits

This warranty remains in force for a period of 2 years / 150 hours of use, means that the engine is covered for 2 years from the date of purchase or 150 hours of use - whichever occurs first. To keep your warranty valid for up to 150 hours, you must follow a maintenance schedule as outlined in the manuals and record the service work in the following document (service booklet). This warranty does not cover repairs, replacement of components or provision of services after the warranty expiration date.

Any procedure of installation, maintenance and/or repair of the products must be carried out exclusively with the original Vittorazi Motors parts and tools specified by Vittorazi, in compliance with the specifications contained in the user, installation and/or maintenance manual of the products; to ensure maximum safety and performance of the products, the above-mentioned procedures will be carried out by mechanic and electronic engineers with proven experience in the ultralight aviation or general aviation or with experience gained by Vittorazi Motors professional training courses. Failure to do so, will held harmless the company from any liability for any damage due to the malfunctioning and immediately void the warranty of the product.

6.2 Warranty procedure

Any warranty claim must be requested from the product owner to the authorized dealer within ten (10) days of discovering the anomaly. The owner has to show the copy of the "proof of purchase" of the product, such as the bill or commercial invoice of the engine or the entire aircraft, together with the "service booklet". Vittorazi Motors can request at its own discretion, the invoice of the original spare parts bought and/or the invoice of the service performed by mechanics with proven experience, as further proof of the accomplished maintenances.

The dealer has in charge the complete filling of the proper "Warranty Form" and the sending to the Vittorazi Motors headquarters for the acceptance. The dealer is the only official channel to activate a request of warranty: the requests received through direct mailing, social post, telephone contact, won't be taken in consideration from Vittorazi Motors. Once the request is accepted, the dealer will be the responsible to plan the inspection and the reparation of the product, as long as the motor is covered by the warranty. Vittorazi Motors undertakes to deliver the replacement parts under warranty to the head office of the dealer / aircraft manufacturer. All the shipping expenses that are necessary from the head office of the dealer to the address of the client, will be not in charge of Vittorazi Motors.

Vittorazi Motors may require to return the anomalous parts or components for evaluation prior or subsequent to the approval of any warranty. In this case the shipping costs will be on charge of Vittorazi Motors from the address of the client to the factory headquarter. All the parts replaced, both defective or non-compliant, during the interventions of warranty, will become property of Vittorazi Motors. The company can also require a proof of destruction of the broken parts instead of their return, at its own discretion.

6.3 Warranty coverage

This warranty covers engine damage caused by: components that are defective in form or material, design or assembly error from the factory. By using a new engine, the owner agrees that these terms and conditions have been accepted at the time of purchase of the product. Accordingly, under this warranty, the company's obligations shall be limited to repairing the defective component and/or replacing one or more components, or as necessary to restore full engine functionality.

Improper use of the products or improper technical service (in relation to the specifications contained in the user, installation and maintenance manual) **will held harmless exempt the company from any liability for any damage due to the malfunctioning and immediately void the warranty of the product.** Here are listed most of the reasons.

- improper use or mistreatment of the engine by the user, such as:
  - any neglect or omission of generic controls;
  - any lack of maintenance at the specified time intervals;
  - use of the engine already affected by any damage;
  - use of the engine with a non-approved propeller;
  - use of the engine with a damaged or unbalanced propeller;
  - use of the engine with a wrong combination propeller/reduction ratio;
  - use of wrong fuel, wrong mixture oils, wrong fuel/oil mixture percentage, fuel stored for excessive time;
  - use of inadequate fuel for presence of water, additives, impurities;
  - use of the engine with liquids, lubricants that are not compatible with the engine;
  - incorrect warm-up procedure;
  - incorrect break-in procedure;
  - other reasons described in the manuals.

- use of the engine that has exceeded any limit recommended by the engine manufacturer, e.g. max engine RPM, cylinder head temperature (CHT), exhaust gas temperature (EGT), fuel consumption;

- use of the engine for racing or any other competitive activity;

- use of non-original components Vittorazi Motors, non-compliant accessories, other items not approved for the engine;

- not authorized modification from original configuration of the product (e.g. the drilling of the exhaust manifold);

- improper technical service in relation to the specifications contained in the user, installation and maintenance of the engine;

- any incident affecting the engine and/or the propeller, or even a single component of the aircraft;

- missing or incorrect implementation of any service bulletin issued by the company;

- any incident involving the engine and/or the aircraft, related to fire, lightning strike, water landing, transport, storage and any other factor out of Vittorazi's control.

The following cases are not guaranteed under any circumstances:

- replacement of normal wear and tear or service items (such as spark plug, belt, membranes, gaskets, liquids and more);

- any failure or malfunction resulting from piston seizure, piston scuffing, and any damage resulting from lack of lubrication (including related damage to cylinder, head, crankshaft, bearings, etc.);

- any failure or malfunction due to ingestion of foreign objects (e.g., dirt inside or outside the product, corrosion, ingestion of water, ice, sand, other) or any other damage due to the operating environment;

- further maintenance interventions required by the client, besides those covered by the warranty.

The following are not covered by warranty or compensation:

- damage caused to persons/animals/things caused by general use of the engine;

- damage caused to persons/animals/things, caused by collision with any part detached from the engine;

- damage caused to the aircraft components and/or propeller, caused by collision with any part detached from the engine;

- recovery, shipping, telephone or rental costs of any kind, inconvenience or loss of time, or other consequential damages.

For any question about the warranty coverage, contact the authorized dealer, that can provide further information.

6.4 Contacts

For any questions, claims, doubts or problems with the operation of the engine, do not hesitate to contact us. We will always be ready to help you.

Check out our list of information channels and follow us constantly to stay updated.

Find the nearest dealer

www.vittorazi.com/en/dealers/

Vittorazi Newsletter: to receive exclusive information and obtain technical safety updates

https://www.vittorazi.com/en/newsletter/

Facebook official page: follow us and catch commercial promotions

https://www.facebook.com/vittorazimotors/

Facebook official group: support our initiatives and share your experiences with us

https://www.facebook.com/groups/VittoraziMotorsSupportOnline/

Service booklet

Owner's data	
Name and last name	
Address (Street, City & Country)	
E-mail address	
Telephone number	

Engine's data	
Engine model	
Engine serial number	CRC
Date of purchase	
Dealer / Distributor / Seller	

Hours	Operations	Flight hours	Date	Dealer Signature & Stamp
25	Suggested maintenance			
50	**Mandatory maintenance**			
75	Suggested maintenance			
100	**Mandatory maintenance**			
125	Suggested maintenance			
150	**Warranty expiry**			