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D-MOTOR International © AIRCRAFT ENGINE

ENGINE OWNERS MANUAL

TYPE LF26 - 4 Cylinder Engine

Publication : 2019.3/LF26

Succession Notice

This manual is a revision of the previous manual published in 2013 and any revisons there of. Information within this document replace the instructions of previous D-Motor International Publications – Engine Owners Manual.

Effective Changes for this manual / document

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March 2019 V2			

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Contents

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INTRODUCTION

D-MOTOR Engines

D-Motor LF 26 4 cylinder and LF39 6 cylinder engines are direct drive 100% water cooled boxer side valve engines. The engines incorporate multi-point fuel injection controlled by an advanced twin ECU control system which is performance mapped with Lambda sensing.

A 300W/25A generator is fully integrated as standard fitment; the oil and coolant pumps are directly driven by the camshaft. The fuel pressure is held at a constant level with a pressure regulator, which is connected to the fuel recirculating system. Air inlet preheating is not required and not installed.

The entire motor is controlled and monitored by the ECU (**E**lectronic **C**ontrol **U**nit). A second ECU is standard, battery and fuel pump can be installed as a redundant system.

D Motor aircraft engines are a Premium Quality European Product designed and produced in Belgium

https://www.d-motor.eu

SCOPE AND PURPOSE OF THIS DOCUMENT

This manual gives instruction and guidance for engine preparation, installation, and operation of the LF26 and LF39 aircraft engines. The installation instructions within this manual are basic guidelines. When installing the engine in the airframe, follow the airframe manufacturer's installation instructions. Refer to the D-Motor Engine Service and Installation manual for required maintenance (service information) such as: oil changes, oil top up, oil filter replacement, routine time limited-interval inspections, routine service, spark plug replacement/inspection procedures, cylinder inspection, fuel system inspection, and scheduled servicing procedures. For airworthiness limitations, guidelines to fault finding and for procedures to replace components, disassembley and re-assembley of the engine, refer to the D-Motor Engine Maintenance Manual. For spare parts information, refer to the D-Motor Illustrated Parts Catalog.

Warning

This is a non-certified aircraft engine ; the possibility of engine stoppage exists at all times. Do not operate this engine over densely populated areas. Do not operate this engine over terrain where a safe, power off landing cannot be performed.

The operation and maintenance instructions supplied with this engine must be followed at all times. Flying any aircraft involves the risk of injury or death, building and maintaining your own aircraft requires great personal responsibility.

Advisories

This document utilizes three types of advisories; defined as follows:

WARNING

A warning emphasizes information which, if disregarded, could result in severe injury to personnel or equipment failure.

CAUTION

Emphasizes certain information or instructions, which if disregarded, may result in damage to the engine or accessories.

NOTE

Provides special interest information, which may facilitate performance of a procedure or operation of equipment.

Warnings and cautions precede the steps to which they apply; notes are placed in the manner which provides the greatest clarity. Warnings, cautions, and notes do not impose undue restrictions. Failure to heed advisories will likely result in the undesirable or unsafe conditions the advisory was intended to prevent. Advisories are inserted to ensure maximum safety, efficiency, and performance. Abuse, misuse, or neglect of equipment can cause eventual engine malfunction or failure.

Order of Precedence

WARNING

The aircraft operator must use the airframe manufacturer's operating instructions found in the Airplane Flight Manual/ Pilot's Operating Handbook (AFM/POH) while operating the aircraft unless the AFM/POH directs otherwise.

Updates/Changes Distribution

Document updates are available from our web site upon notification of official document approval. Printed publication subscribers receive printed changes and revisions as they are released.

Document revisions are released if the update changes more than 50% of the contents of a publication. Revisions replace the previous version of a publication from cover to cover.
Minor corrections are released as change pages to the original publication, identified with a change number and effective change date in the page footer. Information on the page that changed from the previous edition is identified by a vertical, six-point black line referred to as a "change bar" in the outside margin of the page. A page change replaces only the previous edition of the affected page.

Suggestions and corrections

D-Motor International solicits and encourages user comments regarding suggested changes to this manual. Direct recommended changes or questions to the attention of "Publications" at the address listed in this section, "Contact Information" or send comments via e-mail to info@d-motor.eu. Notify our Customer Service Department immediately, using our telephone number, if you discover incorrect information which adversely affects safety !! Thank you !!

Contact Information

D-Motor International factory representatives are available to answer technical questions and encourage suggestions regarding products, parts, or service. If customers have an inquiry or require technical assistance, they should contact their Regional D-Motor Dealer/Distributor or Field Representative. To contact a Factory Representative, refer to the contact information below:

D-Motor International, bvba
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B-8540 DEERLIJK

BELGIUM

Customer service department : +32 (0)56 498149

helpdesk@d-motor.eu https://www.d-motor.eu

⚠ WARNING

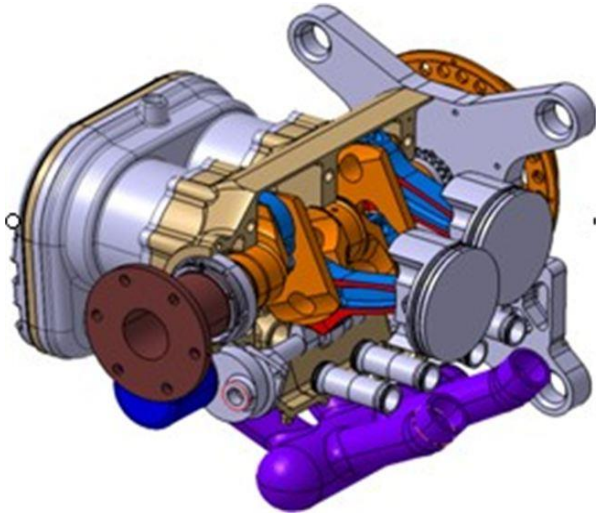
Before starting the engine, read the Operators Manual, as it contains important safety relevant information. Failure to do so may result in personal injuries including death. Consult the original equipment manufacturers handbook for additional instructions!

TOA (Table of Amandments)

Current N°	Chapter	Page	Change date	Remark	Date approval	Date inclusion	Signature
0 0	INTRO						

Before operating the engine, carefully read this Operators Manual.

This Manual provides you with basic information on the safe operation of the D Motor engine. If any sections of the Manual are not clearly understood or if you have any questions, please contact a D-Motor International® authorized aircraft engines Dealer/Distributors or their Independent Service Center. D-Motor International wants to ensure your satisfaction, flying your aircraft powered by this D-Motor®-aircraft engine.



SAFETY INFORMATION

! WARNING : **Never operate the aircraft equipped with a D-Motor at locations, airspeeds, altitudes, Or other circumstances from which a succesful no-power landing cannot be made, after sudden engine failure (stoppage).**

- The D-Motor engine is not suitable for acrobatics.
- The selection and use of the D-Motor on any aircraft is at the sole discretion and responsibility of the aircraft manufacturer, assembler and owner or user.
- Duet o different designs, equipment and types of aircraft, D-Motor will allow no warranty or representation on the suitability of its engine's use on any particular aircraft. Furthermore, D-Motor grants NO warranty or representation of its engine's suitability with any other part, component or system which may be selected by the aircraft manufacturer, assembler or user for aircraft application.
- Whether you are a certified pilot or a student, complete knowledge of the aircraft, its controls and operation is mandatory before flying solo. Flying any type of aircraft involves a certain risk! As user or owner of a D-Motor engine, be informed and prepared for any situation or hazard associated with flying.
- Make sure that you also obtain as much information as possible about your aircraft and engine (Service and Information Bulletins), their maintenance and operation from your dealer!
- Be aware that our engines may seize or stall at any time! This could lead to crash landing and possible severe injury or death. D-Motor recomments strict compliance with the maintenance and operation and any other information which may be given to you by your dealer or was published on the D-Motor website (https://www.d-motor.eu)
- Fly only when and where conditions, topography, and airspeeds are the safest !
- Use proper aircraft instrumentation. D-Motor does not deliver this instrumentation!
- Always ensure BEFORE FLIGHT that all engine controls are operative. Make sure that all control scan be reached in case of an emergency.
- Always run the engine and propellors in a bystander clear area !
- DO NOT leave the aircraft unattended with the D-Motor engine running !
- Keep a engine LOGBOOK and respect the engine and aircraft maintenance windows. KEEP YOUR D-MOTOR ENGINE IN TOP OPERATING CONDITIONS AT ALL TIMES.
- When in storage protect the engine and fuel system from contamination and exposure.
- NEVER operate the LF26/39 engine without OIL or Water, NEVER with insufficient OIL or WATER !
- Periodically verify level of coolant.
- Never exceed maximum rated RPM. Allow your D-Motor engine to cool at idle for several minutes before turning off the engine.

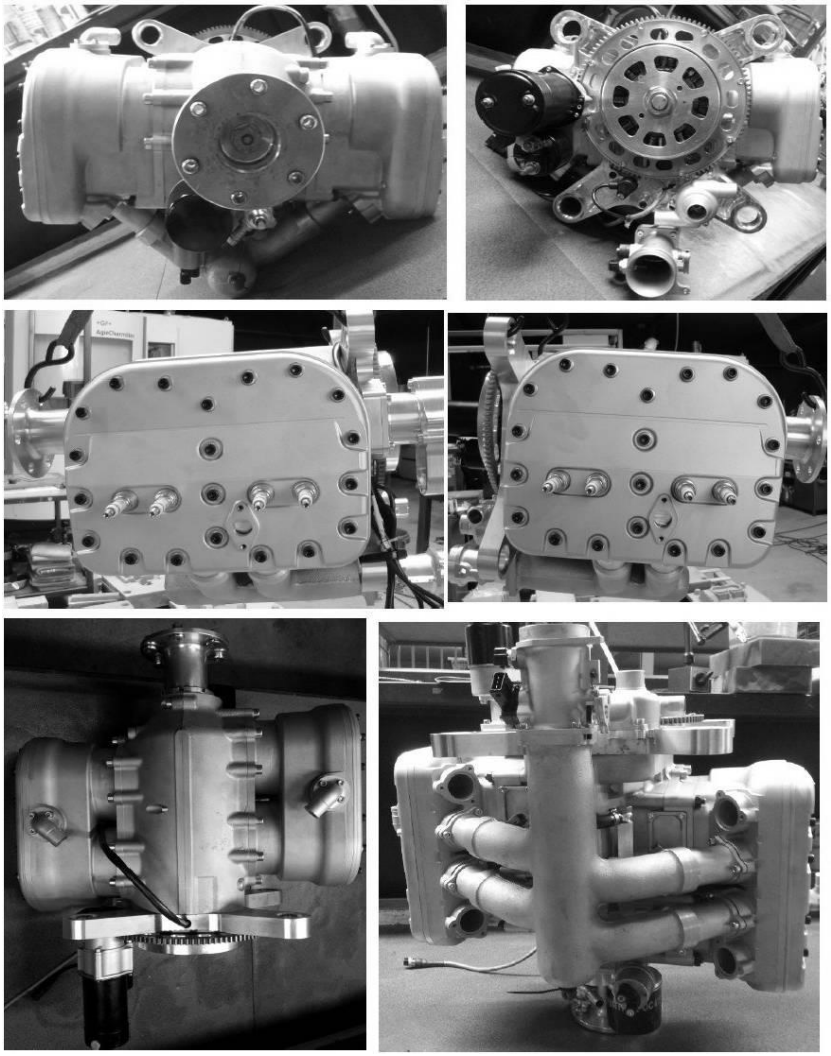
MAIN SECTION

Technical Sheet LF26 type D-Motor Engine

Producer	D-Motor, Belgium
Construction	4 cylinder boxer motor, four stroke, side valve
Reduction gear	Direct drive
Cooling	fully liquid cooled
Control unit	ECU – 12 V
	8A for ECU and fuel pump required
Intake	Multipoint sequential fuel injection
Ignition	Double CDI, controlled by ECU
Generator	300 W/25A integrated
Bore	103.6 mm
Stroke	80 mm
Displacement	2.697 cc
Compression	8,0
Starter	12V - 1.1 KW
Fuel pressure	2.5 – 3.0 bar (36 to 43psi)
Fuel regulator	2.5 bar (36psi) opening pressure in the recirculation system
Fuel	MOGAS Super Unleaded 95 OCT, UL91 or AVGAS
Fuel filter pump	Ultra-fine fuel filter mounted on the pressure side of fuel
	P/N 107201
Power	69 kW (94hp) at 3.000 RPM
Torque	220 nm (162 ft/lbs) at 2.600 RPM
Rage of use	800 to 3000 RPM
	2100 RPM to 2800 RPM in Cruise
Lubrication	Dry sump
Oil pump	Pump driven by camshaft

Oil pressure	1.5 - 5.0 bar (21 to 75psi)
Oil specification	Synthetic 5W50 - 5W40 (Cold weather 0W50 – 0W40)
Oil quantity	2.5 Litre (4 ½ pints)
Oil filter	D Motor (P/N 107001)
Oil temperature	min 50° C to 100° C (122 to 212 f)
	80°C to 100°C (176 to 212 f) best range
Coolant liquid	50/50 deionised water with anticorrosive
	(for Aluminium motors)
Coolant liquid temperature	50°C to 100°C (max 212 F°) (opening pressure at 1.2 bar 17psi)
	See Service Bulletin 2019-15 or newer
Cooling liquid pump	pump driven by camshaft
Propeller flange	bolt-hole circle dia. 101.6 mm 6 x 13mm
Spark plug	P/N 106021
Ignition coil	P/N 106031
Plug cap	90° angled, rubberized
Lambda probe	P/N 185001

LF 26 type ENGINE



Description

D-Motor LF 26 4 cylinder and LF39 6 cylinder engines are direct drive 100% water cooled boxer side valve engines. The engines incorporate multi-point fuel injection controlled by an advanced twin ECU control system which is performance mapped with Lambda sensing.

A 300W/25A generator is fully integrated as standard fitment; the oil and coolant pumps are directly driven by the camshaft. The fuel pressure is held at a constant level with a pressure regulator, which is connected to the fuel recirculating system. Air inlet preheating is not required and not installed.

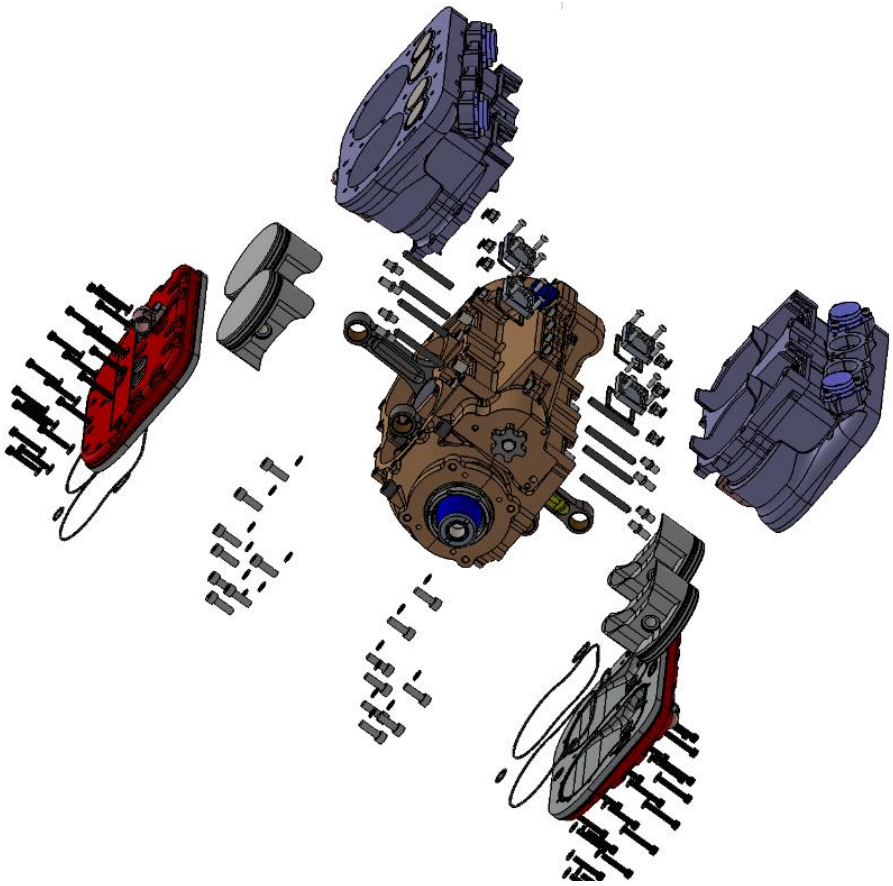
The entire motor is controlled and monitored by the ECU (**E**lectronic **C**ontrol **U**nit). A second ECU is integral within the ECU housing as standard, a secondary battery and fuel pump can be installed as a redundant system.

During the operation of the engine the following data and information are constantly collected, analysed and interpreted by the ECU

- Throttle position
- Intake air temperature
- Crankshaft position analogue
- Crankshaft position digital
- Air and manifold pressure
- Coolant temperature
- On-board power supply voltage
- RMP
- Lambda probe values

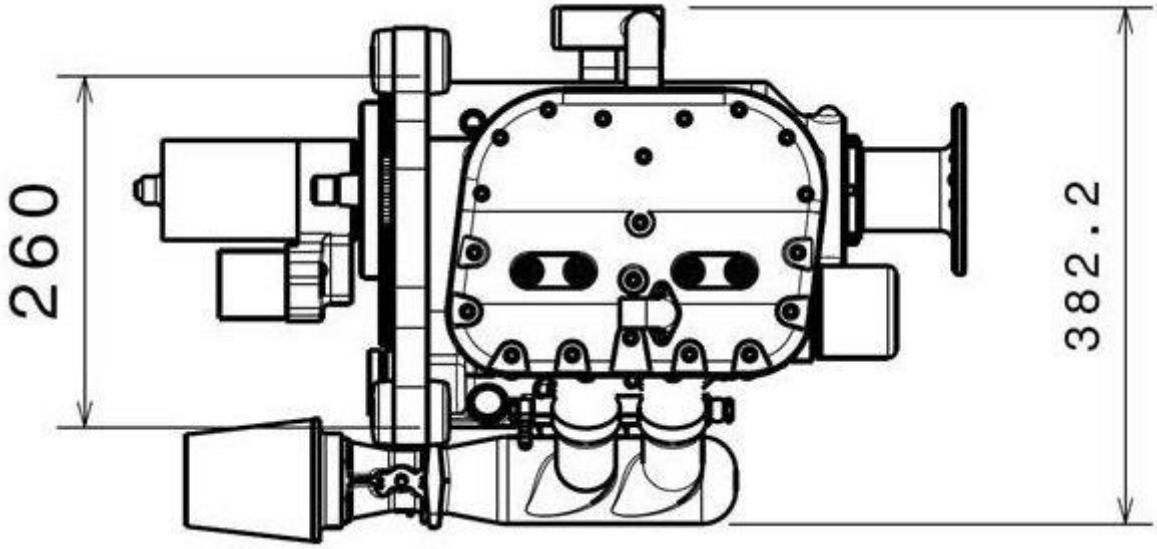
Should one of the sensors fail, the ECU will automatically revert to a standard or emergency program, in this configuration the will motor continue to run, but with reduced power output and increased fuel consumption. The ECU signals its status by means of LEDs on the ECU Casing, or optionally by means of a separate monitor.

As the option of a redundant system is installed by default(by the ECU, Battery and Fuel pump, etc.) the redundant systems controls themselves reciprocally. The full operation is still assured if one circuit fails totally



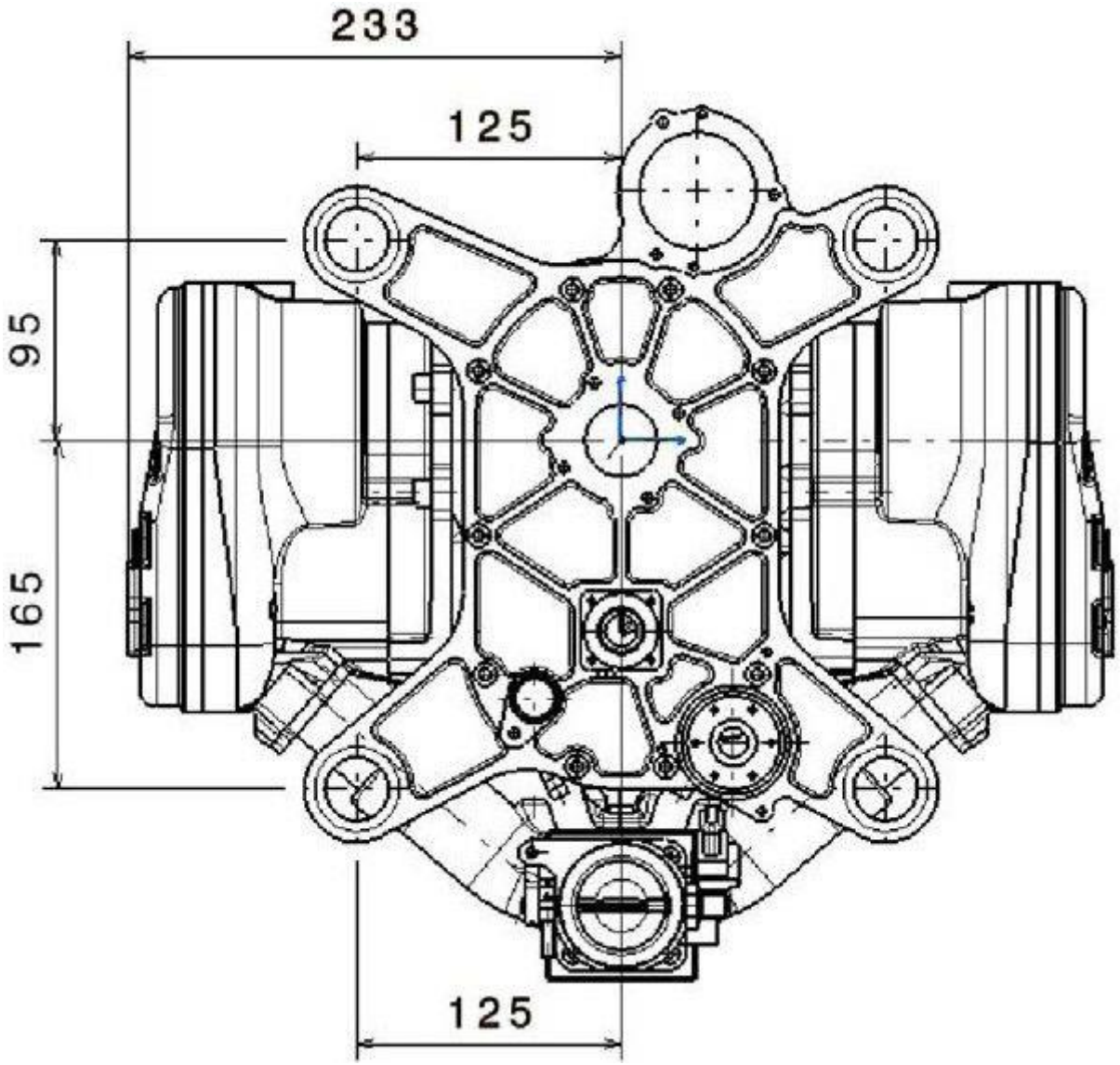
Due to the side valve design of the motor, some motor failures normally found with OHV engines (for example valve tearing will not stop the motor from functioning). Inflight even the loss of one or two cylinders can be compensated for and the motor continues to run with less power, which allows time for a safety landing.

The electrical supply is very important for a safe operation of the motor, should the generator fail and the battery is not charged sufficiently , the motor will continue to run only until the minimum power supply voltage of 8V is reached. Installation in the electric system of a sufficiently sized capacitor will ensure continued operation of the engine in the case of a battery failure.



Short specification list

- **Type**: D- motor LF26
- **Class**: Microlight aircraft
- **Engine**: Four cylinder, four stroke, liquid cooled
- **Displacement**: 2690 cc
- **Stroke**: 80 mm
- **Compression ratio**: 8/1
- **Max power**: 69 kW (94hp) at 3000 RPM
- **Max continuous power**: 65.3KW (88.8 hp) at 2800 RPM
- **Used fuel**: 91, 93, 95. 98 octane or avgas
- **Fuel consumption**: see fuel consumption table
- **Maximum torque**: 220 Nm (162 ft/lbs) at 2500 RPM
- **Intake**: Multipoint sequential fuel injection
- **Alternator**: 25 Amp integrated
- **Electric starter**: 1.1 KW integrated
- **Ignition**: Double
- **Installed dry weight (liquids 5kg)**: 58 kg (127lbs) (battery and liquids not included)

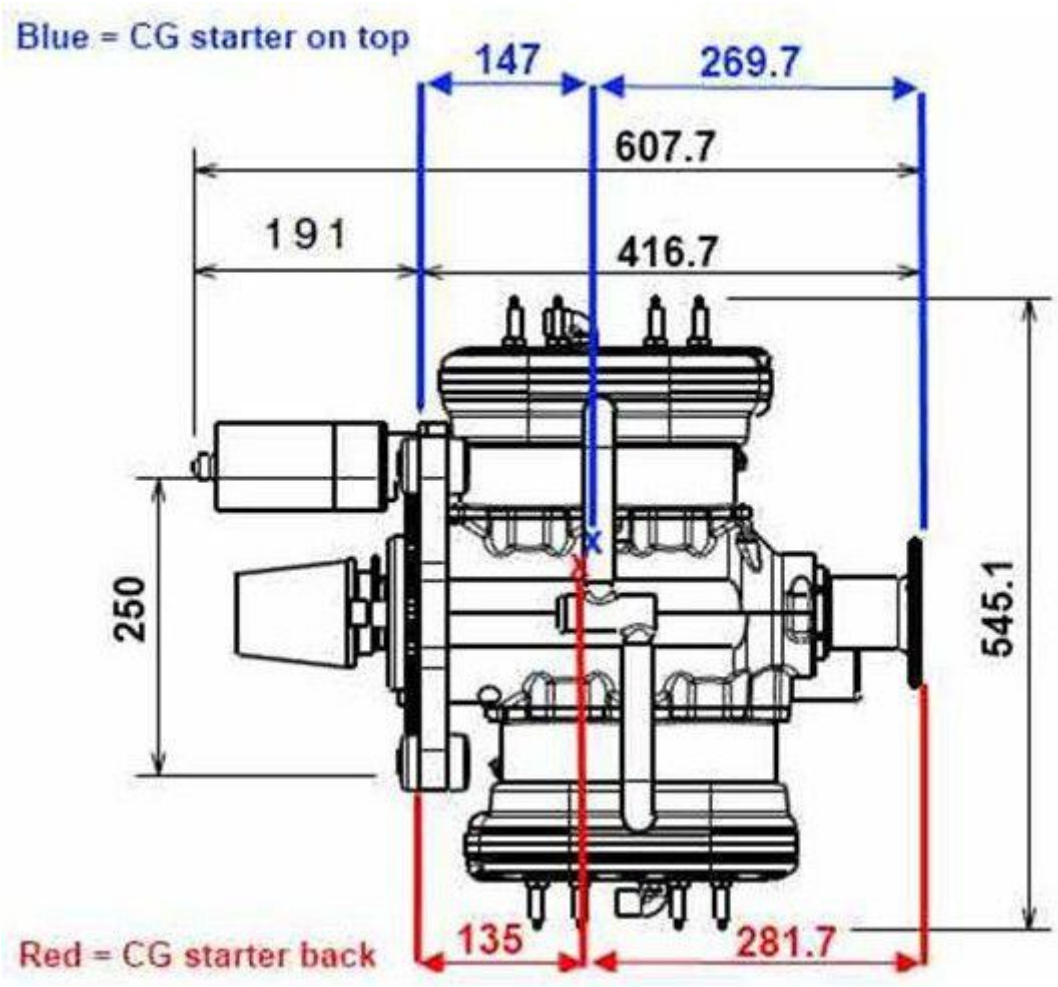


WARNING !!

DUE TO THE PRECISION OF THE ECU CRANKSHAFT ROTATION MEASUREMENT

IT IS POSSIBLE TO HAND START THE LF26 BY ROTATING THE PROPELLER.

ALWAYS ENSURE ALL SWITCHES ARE OFF BEFORE WORKING ON THE LF26 ENGINE.



ENGINE OPERATION

Engine start

The LF 26 does not have a choke or hot air intake. Thanks to the twin ECU and multipoint fuel injection system the motor may be started at any temperature without any special precaution.

The handling of the engine is based on following elements:

- Master switch — Activate starting system
- Start Button — Activate the starter
- ECU Fuse/Switch — ON/OFF switch for the ECU with fuse function
- Fuel pump Fuse/Switch — ON/OFF switch for the fuel pump with fuse function

- Ignition circuit (2x) — ON/OFF switches of the ignition circuits (mag switches)
- Throttle — Regulate the power setting

⚠ CAUTION!

Never start the engine without prop installed. Otherwise the engine will be damaged.

After the pre-flight check and provided the propeller area is free the motor can be started:

- Turn on Master Switch
- Fuel pump - ON
- Both ignition circuits - ON
- ECU – ON (if the outside air temperature is low the ECU may be switched 2 or 3 times ON and OFF in order to enrich the fuel injection and ease the starting procedure.
- Throttle set on idle position.
- Push the starter button until the motor starts. Try for maximum 10 seconds, and then stop the starting process. Wait 30 seconds and try again to start the motor.
- As soon as the motor runs increase the RPM after a few seconds
- Switch on the monitoring instruments and check the oil pressure
- Warm up with about 1200 RPM

If the oil pressure is insufficient or in case of an error message from the ECU, stop the engine immediately and if necessary investigate for the problem.

If no error is reported and the oil pressure is sufficient warm-up the motor until the oil and water reach 50°C (122 f).

Check both ignition circuits before take-off. To do so increase the power setting up to 2000 RPM and switch OFF circuit 1 for 5 seconds, monitor the RPM which shouldn't change for more than 50 RPM. Repeat with circuit 2. The difference between the RPM drop while checking both circuits shouldn't exceed 30 RPM.

While checking both circuits, as soon as one circuit is switched OFF the ECU should report this error by means of a flashing LED or by the corresponding text message on the engine monitory instrument.

Motor STOP

The engine should not be stopped when it is very hot, as the coolant and the fuel are not being circulated anymore and it may create vapour lock problems due the residual heat. Generally if the landing is made at reduced power and taxiing is sufficient to cool down the engine temperature to enable immediate stopage of the engine.

- Throttle set to idle
- Switch OFF all electrical units.
  If a NESIS is installed it should be switched OFF only after the motor has been stopped, in order to secure the safeguarding of the log book and the last flight.
- Switch OFF the fuel pump
  If the engine is still running for a few seconds, it reduces the remaining pressure in the fuel system.
- Switch OFF both ignition circuits (mag switches), then the engine stops
- Switch OFF the ECU
- Turn OFF Master Switch
- For parking maintain this status and remove the key

ENGINE Checking

If the last flight was normal without any unusual occurences, then the pre-flight check is limited to following:

- Control of cooling liquid — Sight control of the overflow reservoir
  Open maintenance panel
- Control of the oil level — Sight control of the oil reservoir
  Open maintenance panel

WARNING

As usual with all engines having dry sump lubrication, the highest level is reached only after the propeller has been turned a few times by hand until the typical gurgling noise is heard from the oil reservoir. This reservoir installed in your aircraft is normally equipped with a sight tube showing the oil level and therefore the control of the level is made visually. MAKE SURE THAT ALL POWER SWITCHES ARE IN 'OFF' POSITION !!!

It is recommended to note the level before and after turning the propeller in order to memorise the increase of the level. Once this is memorised one may not need to turn the propeller each time to control the oil level as the increase should be always the same.

Operation

As with all engines, the way you treat your engine will increase or decrease tremendously its life expectancy, the consumption, the maintenance costs and deterioration of your engine. The following recommendations will help to ensure you get the best out of your D Motor LF26 engine :-

- The take-off or full power setting should be applied only once the engine coolant and oil has reached its minimum temperature of 50°C.
- Reduce the power setting after the take-off and once you reached a safe altitude, increase airspeed in a cruise climb keeping cooling airflow over the engine and coolant radiator, this will reduce fuel burn and wear on the engine. Do not opt for high angles of attack in your climb configuration, unless it is necessary to clear geographical obstacles
- Flying fast does not always mean a reduction in flight time to reach your destination. By reducing the power setting speed your reduced slightly, but the fuel consumption is significantly reduced and your operational significantly increased. Please see the consumption table under paragraph "7.5 Range and Fuel Consumption".

- Avoid rapid changes of the power setting (except in case of emergency). It is better to increase or decrease the power setting slowly and smoothly. Significant and sharp power setting changes means high stresses for the crankshaft, especially for direct driven engines.
- Each engine coming from serial production has typical behaviour at different power settings, this is a characteristic of each individual engine. The LF26 engine runs extremely smoothly, it's recommended to avoid low power settings where your engine might exhibit vibration, increasing the RPM slightly at low power settings will ensure smooth running
- Should your engine show unexpected starting difficulties this may emanate from contamination in the injectors or on the spark plugs. These contaminants may be removed by using a special cleaning program built into the ECU. To start the cleaning program, set the throttle to full power setting, switch on the ignition and the ECU, and activate the starter for a few seconds. In this configuration the engine will not start, but initiate will initiate the cleaning program.
  After running the cleaning program switch OFF the ECU, then switch the ECU ON again and try once more to start up the engine in the normal way.

Emergency Procedures

Engines for Microlight, Ultra-light or LSA aircraft are not certified, but certification is no guarantee that an engine will not suffer failures. Please note that any aircraft and/or engine configuration can suffer failure. Should any irregularity occur or reading go out of parameter before or during the take-off roll the flight should be aborted immediately. In case of a failure in flight the right reaction is very important:

- **Failures indicated by the ECU**
  Basically there are two kinds of failure notification, an indication by a clear text message (if a monitor is installed with this capability) or by the blinking or constant glowing, of the LED on the ECU. The first kinds of failures are those of the sensors or deviations of the measurements, but which is not an engine failure. For example, if the LED shows a constant glowing, the flight can continue until you reach the next airfield or an appropriated landing area. It does not mean an immediate danger. As for the second kind of failure, signalized by a fast blinking, this means that an emergency landing is to be initiated immediately.

- **Loss of cooling liquid**
  Should your engine loose its cooling liquid during the flight (for example due a broken pipe) the temperature will rise instantly and rapidly. An emergency landing has to be prepared for immediately. The remaining run time of the motor without cooling liquid will be a few minutes, this means that the power setting should be reduced to idle, the remaining running time may be used just before landing.

- **Loss of power supply**
  In the case of low voltage , for example if the generator fails and the battery is not fully charged, turn off all non essential electrical devices and immediately initiate your landing at the nearest airfield. The remaining running time depends on the size and the loading status of the battery. If two batteries are installed having together 4.5Ah the remaining running time will be between about 20 and 30 minutes.

- **Sensor failure**
  Some sensors have built in redundancy; some values are in direct relation to other values. For example the coolant is measured by two sensors, one to indicate to the pilot the temperature, the second to supply the ECU with coolant temperature. If the indicated temperature of the water is too high, but no warning comes from the ECU and the oil temperature shown is within the normal range, then a damaged coolant sensor is suspected. Or if the oil temperature is extremely high but the coolant temperature and the oil pressure are normal then probably the sensor is damaged. If it seems to be likely that a sensor failure has occurred, it is not necessary to initiate an emergency landing. Land on the nearest airfield and locate the problem.

- **Redundant systems**
  Some sensors and systems are redundant, for example the ignition, the crankshaft sensors, etc. Other systems are optionally available as redundant, fuel pump, battery, generator or additional injectors. Redundant systems serve to increase the reliability of the motor and NOT to allow flying if one system fails. It is NOT allowed to take-off if one system failed on ground before take-off (for example one ignition circuit). Redundant systems are only there to flight continuation until an airfield may be reached, and a safe landing secured so the failure may be fixed.

- **Unusual noises**
  If any unusual noises come from the engine bay then there could be an exhaust or air intake problem. In the case of a defective exhaust system this could mean that the exhaust gases are not exiting outside the cowling and may even penetrate into the cabin. Alternatively some hot gases impinge on other parts and create further damage. This is a seious potential problem for both

aircraft and crew and a landing of the next airfield is to be initiated immediately. Once landing has occurred the problem must be identified and fixed.

Unusual noises coming from the intake system points to problems coming from a defective or loose air filter and intake duct system. This has potential for damaging the engine, the possibility of induction of foreign particles into the engines combustion chamber, which will damage the engine seriously. This is a serious potential problem for both aircraft and crew and a landing of the next airfield is to be initiated immediately. Once landing has occurred the problem must be identified and fixed.

- **Heavy vibrations**
  The LF26 has a Multipoint fuel injection system so carburettor icing cannot occur, and will not be the cause of vibrations. This means any heavy vibrations must come from other sources, like the propeller, loss of counterweights on the propeller, loose bolt holding the propeller, loose spinner, etc.

  Heavy vibrations can also be a sign of beginning engine failure or indicate the loss of one cylinder, for example due to an injection failure or a damaged ignition.

  In any case set a power setting with lowest vibration, but which still allows a safe flight and land on the next airfield.

ECU ERROR MESSAGES

Possible error messages coming from internal diagnosis of the ECU:

Two leds are incorporated in the ECU case.

When the two LEDs are NOT lit = Everything is OK, No Errors.

Errors are logged and can be displayed when downloaded from the ECU (See ECU D-Motor manual)

Indicated errors from the diagnose means that or the sensor is damaged, or that the parameter is outside the expected range. For example, if the temperature is too high.

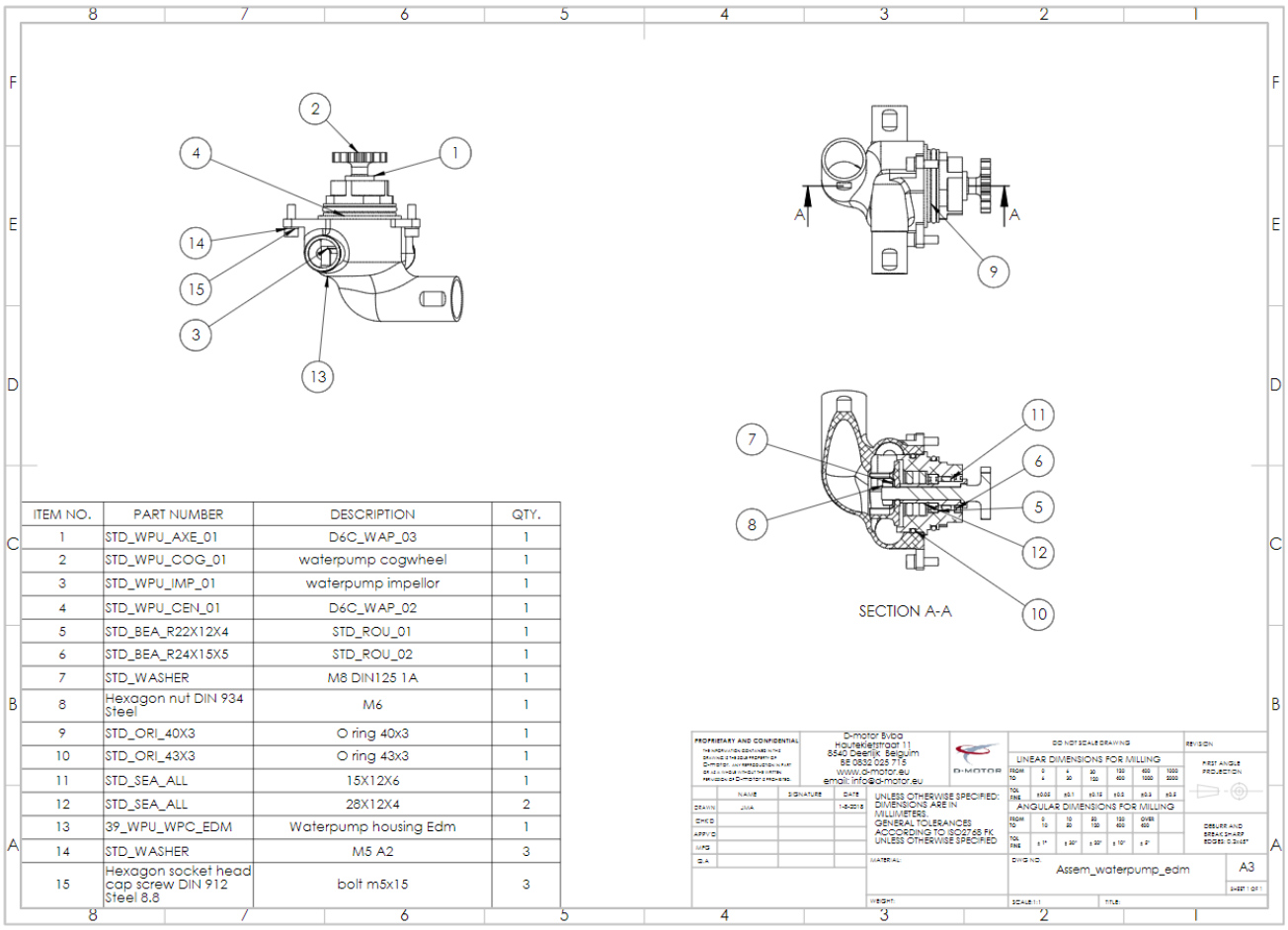
The error number 8 may be shown also directly after the start of a cold engine. In this case the operational temperature of the probe has yet not reached to make a precise measurement. After warming up the error message should disappear.

Safety / Avoiding failures

Some failures are announced or get worse over the time. The recognition on time and the analysis of the causes may help to avoid failures of the motor or dangerous situations.

Loss of Cooling liquid

Loss of coolant leads to insufficient cooling of the engine, resulting in engine temperatures that are too high and in most cases cause engine damage. For that reason the water-tightness of the cooling system should be thoroughly inspected regularly. The normal inspection through the maintenance flap is not sufficient for a complete check of the cooling system.



ITEM NO.	PART NUMBER	DESCRIPTION	QTY.
1	STD_WPU_AXE_01	D6C_WAP_03	1
2	STD_WPU_COG_01	waterpump cogwheel	1
3	STD_WPU_IMP_01	waterpump impellor	1
4	STD_WPU_CEN_01	D6C_WAP_02	1
5	STD_BEA_R22X12X4	STD_ROU_01	1
6	STD_BEA_R24X15X5	STD_ROU_02	1
7	STD_WASHER	M8 DIN125 1A	1
8	Hexagon nut DIN 934 Steel	M6	1
9	STD_ORI_40X3	O ring 40x3	1
10	STD_ORI_43X3	O ring 43x3	1
11	STD_SEA_ALL	15X12X6	1
12	STD_SEA_ALL	28X12X4	2
13	39_WPU_WPC_EDM	Waterpump housing Edm	1
14	STD_WASHER	M5 A2	3
15	Hexagon socket head cap screw DIN 912 Steel 8.8	bolt m5x15	3

NOTE

A damaged sealing surface of the filler cap or a damaged head seal for example, cannot be recognized by checking the level of the cooling liquid in the overflow reservoir. It is possible that when the motor gets warm, the cooling liquid is pushed into the reservoir, but as the engine cools the liquid is not sucked back in the cooling system of the engine anymore. An indication of this is, for example, if the temperature of the motor is normal during the flight, but during or after the landing the temperature of the engine does not get down, or even gets higher.

For full inspection of the cooling system the upper part of the cowling has to be removed. All parts and pipes of the cooling system should then be checked visually for leakage, damage or signs of abrasion. Check the hose clips of the pipes for tightness, open the cap of the header tank (only if engine is cold) and verify if the header tank is full of coolant (level should be just below the sealing surface). Check if the sealing surfaces of the header tank and of the cap are clean and without visible damage. If not change the damaged parts and refill the cooling liquid if required before undertaking any flight.

Some Microlight/Ultralight aircraft are equipped with an oil water heat exchanger. In the heat exchanger the oil exchanges its heat with the cooling liquid. This means that the cold oil is heated and the hot oil cooled down by the cooling liquid. Once the engine is heated up to normal range and while it is operated normally (horizontal flight) the temperature of the oil and of the cooling liquid are tightly related to each other, whereat the temperature of the oil should be 10°C to 15°C (50 to 59 f) higher than the cooling liquid.

NOTE

For example: Oil temperature is 90°C to 95°C (194 to 203 F) and cooling liquid has about 80°C. (176 f

Should the difference of the temperature be higher or lower, the oil, the cooling liquid and the sensors needs to be checked.

Oil Supply

The oil supply is provided by the oil pump and the dry sump system.

⚠ CAUTION!

(1) use only oil specified in this manual
(2) don't use any additives.

Mode of operation: The oil pump pulls oil through the heat exchanger and the oil filter, oil out of the reservoir and press the oil through the different channels toward the lubrication spots. A spring loaded ball valve regulates the oil pressure. The crankcase pressure coming from the movement of the pistons pushes the oil back in reservoir.

Insufficient oil level may lead to severe damage on the engine. The oil has basically two functions, the lubrication and the cooling of the motor. Checking the oil level is very easy and made by a visual

inspection of the dip stick on the screw on oil tank cap. The oil tank level and system must be checked regularly and completely.

For a complete inspection of the oil supply system the upper cowling has to be removed. The system should be inspected visually for leakage, damage or unusual signs such as fretting. Open the oil reservoir cap and check the level, also check if sign of water are visible, especially watch out for traces of foam, which can be an indication that the oil has some water in it.

Check all the hoses and hose clips of the oil supply system for tightness and check that the pipes are not kinked.

A slightly low oil level does not automatically lead to engine damage, but may lead to higher temperature as there is not enough oil available for cooling the internal components of the engine. In case the oil temperature increases slowly but continuously it is often an indication of a low oil level.

If the oil level is much too low in the oil tank, the pipes that feed the oil pump may run dry and the gear pump may suck air instead of oil. In such case the required oil pressure will not be achieved and damage to the engine will occur. If this happens, stop immediately the engine, refill the oil to necessary level and remove the air from the pipe toward the gear pump.

NOTE

Take care not to spill oil on the ground or inside the engine compartment.

Throttle adjustments.

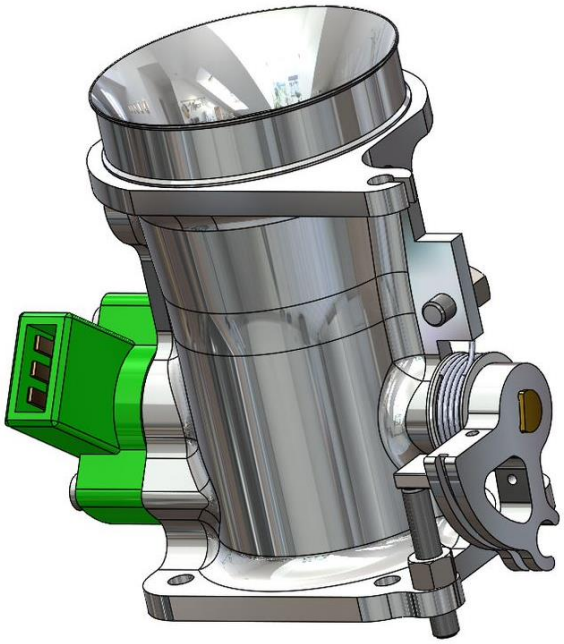
Adjust idle speed to 800 RPM using the idle screw on the throttle.

CAUTION!

The rotating propeller is extremely dangerous! Adjustments must be done with the utmost caution from behind the engine. The aircraft must be tied down or properly chocked. Do not perform this operations without a safety observer.

Check smooth running at idle. Run the engine at 1800 RPM and close the throttle to idle position. The engine should idle smoothly at 800 RPM. For helicopters please contact our team!

When increasing the engine RPM to 1800 RPM and bringing the throttle back to idle the engine must run smooth and continuously



Fuel Supply

A safe operation of an engine with fuel injection is only ensured if the fuel supply is maintained with sufficient pressure in the system and flow. Carburettor icing is impossible; vapour lock appears, due to the high pressure in the system, only under very special conditions. The fuel is sucked out of the fuel tank, through the pre-filter with the water separator, toward the fuel pump. After the fuel pump the fuel is pressed through the fine-filter into the common rail system. The injectors get the required quantity of fuel and the rest is recirculated back again into the fuel tank. A pressure regulation valve in the recirculation system keeps the pressure of the entire system constant. The permanent circulation in the system avoids an excessive heating of the fuel in the area of the engine and assure a permanent and autonomous ventilation of the system.

Troubles in the fuel supply may lead to poor performance, uneven running, high fuel consumption, and even to a total engine failure.

As prevention the fuel supply system must be inspected regularly for leakage, damage or abnormal sign of use. It is also very important to ensure that no fuel pipes are kinked or porous and that all hose clips are tight. Further it is important that all electric connections correctly and firmly terminated.

If a fuel pressure indicator is installed, it may be used to recognize irregularities of the fuel system or of the fuel pressure.

NOTE

Strong indicators of potential problems or failures within the fuel supply system are unsteady or constantly low fuel pressure. Blocked filters, kinked pipes or a damaged fuel pump could be the source of these problems.

Too high fuel pressure is an indication of a damaged regulating valve or a blocked back flow pipe.

If any of these signs are recognized it is mandatory not to take off and if in flight to land as soon as possible on the nearest airfield.

Defective switches or fuses within the fuel supply system have to be replaced before next flight.

Important Information about fuels and lubricants :

Fuel :	Automobile fuel, unleaded premium UL91 95 Octane (RON) minimum AVGAS.
Fuel pressure :	2,5 BAR (36psi)
Oil type :	Fully synthetic branded automotive oil to API SJ standard as a minimum. Engine warranty is void if oil is used that is below this standard.
Oil volume:	2,5 Litres (4 ½ pints)
Oil level is between	Ensure between max. & min. On standard oil tank the upper limit is on the upper oil tank swage line and lower level 25mm (1") Below
Oil pressure:	1,5 Bar (22psi) @ 2000 RPM 0,8 Bar (11psi)@ idle RPM

Oil temperature (readings off of the feed line into engine):
Min. 50 Deg.C (122 Deg.F)

Max. 110 Deg.C (230 Deg. F)

Optimum oil temperature range :

80 – 100 Deg.C (170-212 F.)

⚠ CAUTION!

Don't use any additives

Cooling system

Liquid cooled (Max. water temperature 100 Deg. C (212 f))

Max. continuous power keep water temperature between min. 75 & max. 95 Deg. C. (167 – 203 f)

50% coolant by volume.

Recommended coolants are: BP Procool and Shell Glyco Shell

Power Supply

For a safe operation an engine with fuel injection requires a trouble-free power supply. The ECU receives all relevant data from the sensors, calculates the optimal ignition and injection time, as well as the required fuel quantity which needs to be injected and the injection duration.

Therefore the ECU and the fuel pump, require a continuous and trouble-free power supply. The ECU controls and provides the ignition coils and the injectors with the required electric signals and power.

Any power supply interruption of the ECU leads to an immediate engine stoppage. A safe function of the switches and a correct connection of the cables is therefore extremely important.

Control and function test of the power supply

While the engine is running, the integrated generator produces an AC current which is converted by means of a digital voltage regulatorinto direct current in order to charge the 12V battery. The generator is able to produce high voltage at low RPM enough current to provide the required electrical power for the fuel pump, injectors, ECU and the ignition without discharging the battery, even at idle regime. The charge condition is monitored by the digital voltage regulator and limited to 14V. All electrical units are supplied power by the battery and all circuits are separately protected.

The power generation is monitored using the a voltmeter and ammeter.

The average current consumption on board, when the engine is running, including the radio, transponder, glass cockpit and position lights amounts is approximately 10A if the battery is fully charged.

NOTE

A decreasing voltage in flight is an indication that the generator is not functioning correctly or even has a total failure. If the generator has a failure all electrical systems are supplied only by the battery. If the on board voltage drops lower than 8V the ECU stops working and the engine will stop. Should this occur it is essential that all non-essential systems that consume electric are turned off The remaining flight time depends on the condition and capacity of the battery.

DO NOT operate the engine without a battery connected to the generator. Aircraft with more than one battery (Backup) must both be connected via the voltage regulator to the generator, while the engine is running.

Spark plugs

- Spark plugs should only be removed when engine is cold.
- Brush clean with a plastic bristle brush.
- **DO NOT** use a brass brush or a steel wire brush for cleaning.
- After 200 hours or at least annually. Replace spark plugs.
- Spark plug type: P/N 106021
- Engine must be cold before handling the spark plugs !!

TABLE FOR TORQUE VALUES

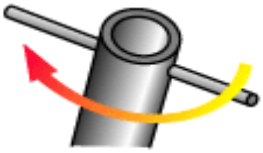
		Nm	Ft/lbs
Oil drain screw	M22	15	11
Oil pump screw (banjo)	M18	32	23
Crankcase screw small	M6	12	9
Crankcase medium *	M8	34	25
Crankcase screw big	M12	110	81
Crankcase screw front	M8	34	25
Rods	M8	42	31
Cylinder head	M6	12	9
Mounting plate	M6	14	10
Oil pump	M6	12	9
Flange	M20	240	177
Screw for starter	M5	7	5
Intake manifold screw	M5	7	5
Water pump housing	M5	7	5

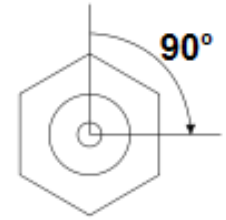
Gear on camshaft	M6	18	13
Extension crankshaft	M6	18	13
Screw-nut alternator	M20	60	44
Bolts cylinders to crankcase	M8	34	25
Spark plugs	M14x1.25	22	16

If torque wrench is not available. Tighten as far as possible by hand with spark plug tool and then 90° for new spark plug and 30° for used spark plugs.

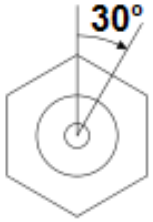
Fig 1

Fig 2





New flat sealing spark plug



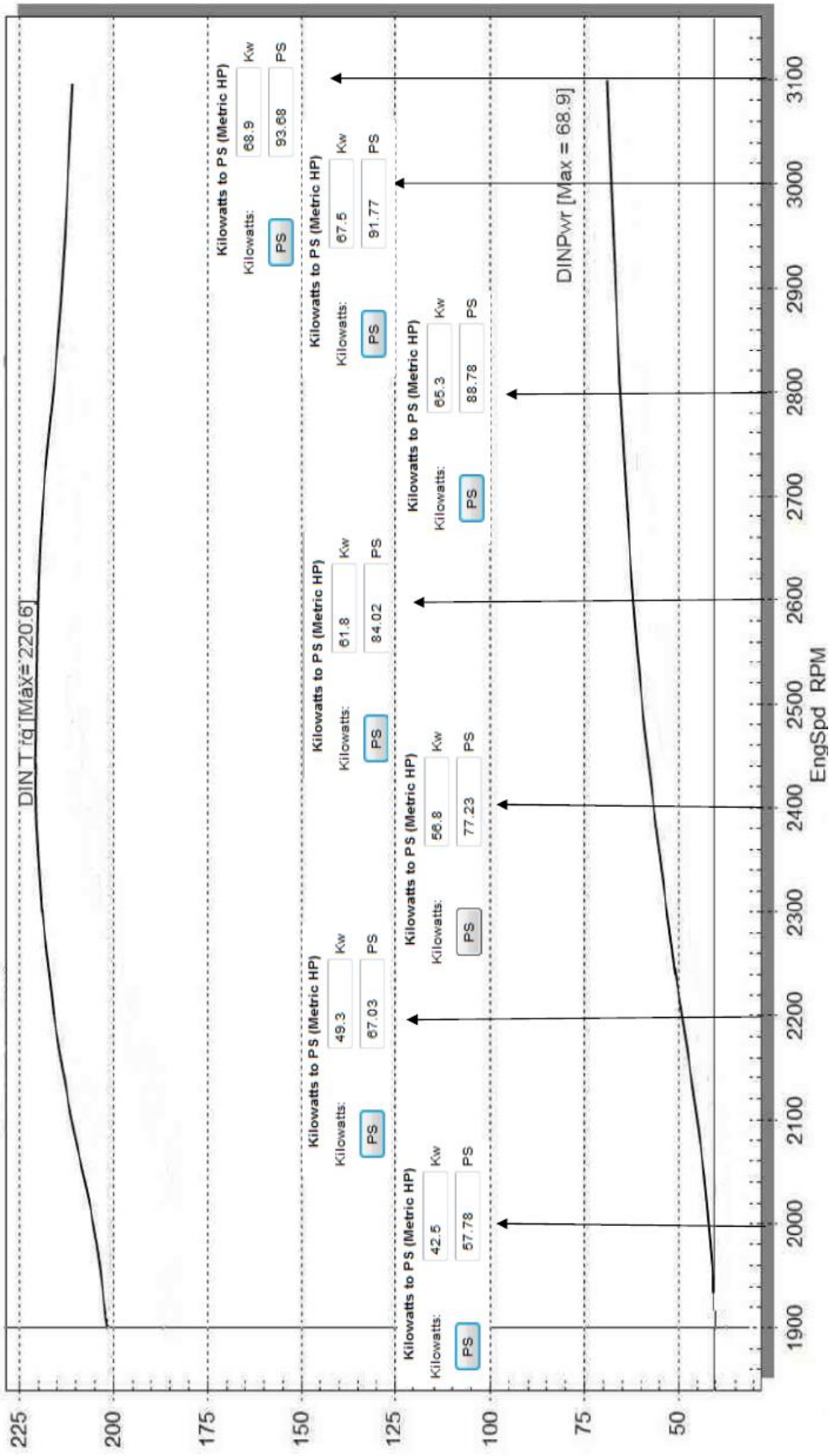
Used flat seal spark plug

When replacing used spark plugs, two points must be followed: Firstly, under no circumstances must contamination around plug hole fall into combustion chamber. Secondly, plugs must be tightened to the correct torque.

Excessive torque tightening can damage the plug, insufficient torque results in poor sealing and heat dissipation

(*) 1 internal and 1 external in the middle of crankcase

Performance Curve of the LF26 Engine



Periodic inspections

After the first 25 hours of operation the inspections listed in 6.2.1 must be performed. The next inspection is due to at 50 hours and thereafter every 100 hours. The 100-hour inspection mentioned under 6.2.2 is to be performed every 100 hours or annually whichever comes first. The 200-hour inspection mentioned under 6.2.3 is to be performed every 200 hours or annualy whichever comes first.

First 25 & 50-hour-inspection

- Check condition of the throttle cables,.
- Engine mounts. Check for cracks, loose bolts and other fasteners, and condition and tightness of engine mount rubbers.
- Check tightness of bolts, nuts and locking pins/split pins.
- Check for oil leaks from hoses, the oil tank and fittings.
- Perform an oil change and send sample to constructor (D-Motor)
- Change the oil filter.
- Check all fuel lines for fit, fretting, general condition, safeties, leaks and wear.
- Fuel filter-(Gascolator) check, clean and re-assemble.
- Check the ignition harness for damage and tight connections at spark plug cap.
- Check the general condition of the exhaust system; look for cracks, particularly at the welds.
- Check the muffler and flanges at the exhaust ports on the cylinders for exhaust leaks.
- Check the ignition coils for wear, fitting of the ignition leads and security of attachment.
- Check for leaks at the oil pressure and temperature sensors.
- Electrical wiring, check for wear, damage and security of attachment.
- Check the crankcase for leaks and cracks.
- Clean engine if dirty or oiled.
- Run up the engine, ensuring oil pressure rise on starting, no oil or coolant leaks.

100-hour-inspection or annually

- carry out the 50-hour-check.
- Perform a compression check. 80 over 80 and record findings
- Change spark plugs.

200-hour-inspection

- carry out the 100-hour-inspection.
- Check the spark plug caps. Change if necessary.
- Change the fuel filter.
- Change or clean and re-lubricate the air filter.

Preservation of the engine for long term storage

If the engine is not used for long periods and/or in extreme climatic conditions, we recommend the following instructions to protect against corrosion. Extra protection against corrosion beyond these recommendations is not necessary.

1. Change the engine oil in accordance with the section in this manual
2. Blank all openings, the exhaust tubes, the breather tube and air filters. Place in a large heavy duty plastic bag with a minimum of 4KG of desiccant bags. Take care not to puncture the plastic storage bag.
   Using a vacuum cleaner, draw all the air out of the storage bag and seal the neck of the bag by gathering the neck, folding it back on itself and clamping with a large ty-wrap. Re-activate the desiccant bags at least once a year by placing in a warm oven at 100 deg c (212 F) for several hours.

Bringing the engine back operation

1. Remove all the protective measures
2. Check oil level
3. Check water level
4. Check all connectors (from ECU to connector on engine, and from connector on engine to all sensors, injection tubes, ignition coils, map and angle sensor(s)
5. Check battery

An engine awaiting overhaul or return to service after overhaul must be given careful attention. It does not receive the daily care and attention necessary to detect and correct early stages of corrosion. For this reason, some definite action must be taken to prevent corrosion from affecting the engine. Engines that are not flown regularly may not achieve normal service life because of corrosion in and around the cylinders. The normal combustion process creates moisture and corrosive by-products that attack the unprotected surfaces of the cylinder walls, valves, and any other exposed areas that are unprotected.

In engines that have accumulated 50 hours or more time in service in a short period, the cylinder walls have acquired a varnish that tends to protect them from corrosive action; engines under favorable atmospheric conditions can remain inactive for several weeks without evidence of damage by corrosion. This is the best-case scenario, but aircraft that operate close to oceans, lakes, rivers, and humid regions have a greater need for engine preservation than engines operated in dry low humid areas.

⚠ CAUTION!

For longer storage periods, the preservation procedures must be performed at least annually.

Winter operation

Care of the electrical system

With the onset of winter the following procedures must be followed.

- Check all the connections of the ignition system and clean if necessary.
- Check the battery voltage and charge if necessary .
- The battery poles and terminal connectors should be cleaned and terminal protectant applied.
- Check the coolant mix is suitable to cope with an outside air temperature of -36deg C (-32 f).

In Countries with extremely low temperatures it is recommended to protect the battery against freezing by keeping it in a warm location for storage between flights.

Cold starting procedures

Throttle OFF

Limit starter to periods of no longer than 10 sec, allow 30 seconds before attempting a restart. After the engine starts, keep the engine running but do not exceed 2.000 RPM until the oil temperature reaches 50 deg C (122 deg F).

TROUBLE SHOOTING

Engine does not fire

Cause	Action
Ignition OFF	ON.
Spark plug gap too big	Change plugs or re-gap plugs.
Fuel shutoff valve OFF or fuel filter blocked	Fuel shutoff valve ON, clean or replace fuel filter.
Lack of fuel	Fill fuel tank.
Ignition cable loose or damaged	Check cable connections. Replace if necessary.

Battery defective or discharged	Install charged battery or recharge.
Starting speed too low, start problems	Check battery.
Spark plugs wet from condensation	Dry plugs inside and outside.
Spark plugs wet with fuel (over-choked)	Dry spark plugs.
Inner mechanical defect	Contact engine manufacturer or approved service centre.

Warm engine shows irregular idling

Cause	Action
Intake manifold leaky	Tighten all intake connections. Replace any defective parts.

Engine runs erratic or misfires occasionally

Cause	Action
Spark plug failure	Clean plugs inside and outside. Replace if necessary.
Ignition cable break down	Check ignition cable and replace if necessary.
Ignition troubles	Check complete ignition system and replace parts if necessary.
Fuel filter blocked (fuel pressure indicator below 2,5 Bar (36 psi))	Disassemble and replace the filter.

Engine overheats, Oil temperature over 100 deg.C (212 deg.F)

Cause	Action
Too much oil remaining in the crankcase	Check the oil return line
Insufficient air-flow to the oil cooler	Check and clear the air passages.
Insufficient oil supply	Check oil level and fill if necessary.

Poor oil quality	Change oil. Use prescribed oil.
Oil filter blocked	Change the oil filter.
Defective oil temperature gauge	Replace the oil temperature gauge.
Excessive piston ring gas leakage (blow by)	Major overhaul is necessary.
Bearings defective	If there is metal contamination in the crankcase sump, a major overhaul is necessary.

The engine does not develop full power

Cause	Action
Ignition trouble	Check all connections.
Too much oil remaining in the crankcase	Check oil return line.
Fuel supply inadequate (less than 2,5 Bar (36 psi))	Check fuel filter.
Incorrect fuel grade	Refuel with prescribed grade fuel.
Intake leaking	Tighten all connections. Replace defective parts.

Low oil pressure

Cause	Action
Insufficient oil in oil tank	Check oil level and fill if necessary
Oil remains in engine and doesn't circulate	Check oil return line to tank
High oil temperature	See 10.4.
Pressure loss	Check the pressure control valve.
Air in suction line	Vent the oil line.
Defective oil pressure gauge	Replace the oil pressure gauge.
Bearings defective (no oil pressure)	A major overhaul is necessary.

The engine does not stop immediately

Cause	Action
Idle speed to high	Adjust proper idle speed (800 r/min)
Ignition switch defective	Replace the switch.

Excessive oil consumption

Cause	Action
Piston rings or oil scraper rings worn	A major overhaul is necessary
Poor oil quality	Change oil. Use prescribed oil.
Worn valve guides or bad valve guide seals	A top overhaul is necessary.
External oil system leaky	Check for defects and correct as necessary.

Engine « knocks »

Cause	Action
Using fuel with a low octane rating	Use fuel with a higher octane rating.

Engine hard to start at low temperatures

Cause	Action
Low battery charge	Replace battery or recharge.
High oil pressure	During a cold start a pressure reading up to 7 bar (100 psi) is permissible

OVERHAULS

Major inspections at TBO is to be performed by the manufacturer or approved service centres only. For Major Overhaul the engine is to be sent with its logbook and ECU to the manufacturer or the nearest approved service centre. The recommended time between overhaul (TBO) is at present 1500 hours of operation. An increase of TBO due to field experience will be published in the Service Bulletins of the manufacturer D-Motor.

Major repairs and major modifications are also only to be performed by the manufacturer or by approved service centres, which are authorized by the manufacturer. In case of prop strikes or sudden stoppage, the engine must be disassembled and the crankshaft must be checked for cracks. This is considered a major repair and must be performed by the manufacturer or an approved service centre.

ENGINE REGISTRATION CARD – WARRANTY ACTIVATION

Every D-Motor engine product has to be registered with D-Motor at the date of purchase.
Products which are not registered with D-Motor are excluded from the manufacturer's warranty.

Any Warranty by D-Motor becomes null and void if spare parts and/or accessories other than **GENUINE D-Motor** spare parts and/or accessories are used.

Personal information

Company : Address :
Contact :
E-Mail contact : GSM Contact :

Type of engine : LF26/LF39 S/N Engine : LF
S/N ECU :
Version ECU :

Date of Sale engine :
First date of Use :

Aircraft information

Type Aircraft :
CALL SIGN Aircraft :
Owner Aircraft : tel/gsm/e-mail owner :

Propeller information

Type of propellor :
Type flange :

Signed :

Date : ___/___/20__

Standard Warranty on our basic engines : 24 months or 400 hours (whatever comes first)

Please sign, scan and return to :
sales@d-motor.eu or send to Houtekietstraat 11, B-8540 Deerlijk (B)

Checklist parts		**Type LF26 (4 Cylinder)**
2019-V2.1 (GKG)		Additional Parts / pièces supplémentaires

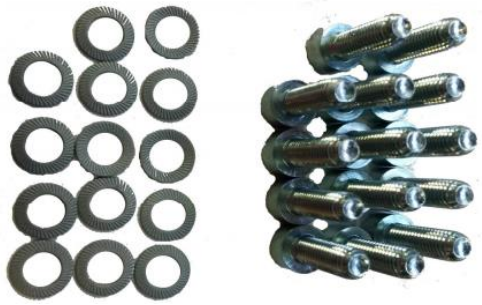
(1) Oil Sump (with / without indicator)
Carter d'huile (avec / sans indicateur)
P/N 107010 – 107011 - #1

(2) Oil Radiator
Radiateur d'huile
P/N 107015 - #1

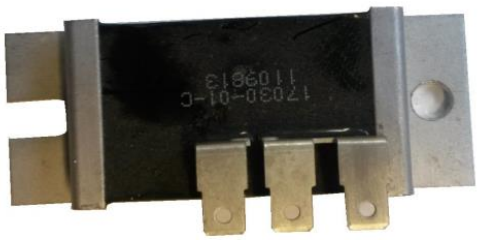
(3) Copper Sealing rings for Exhaust (optional)
Joints d'étanchéité en cuivre pour échappement (facultatif)
P/N 211012 - #6

(4) Exhaust Kit (optional)
Kit d'échappement (optionnel)
P/N 211001 - #1

(5) Bolts/Washers for Exhaust Kit (M5 Hex)
Boulons/rondelles pour kit d'échappement (hexagone M5)
P/N 211013 - #14 pcs 1 set



(6) Alternator Voltage Regulator (Vreg.)
Régulateur de tension d'alternateur
P/N 500101 - #1



(7) Connection Part (T-shape) for ECU temp sensor
Pièce de connexion (en forme de T) pour capteur de température du calculateur
P/N 107102 - #1

(8) Water temperature sensor
Capteur de température de l'eau
P/N 107101 - #1

(9) Cables Bougies /Spark Plug cables
P/N 106025 - #1

(10) Bougies/Spark Plug LF26
P/N 106021 - #8

(11) Raccord d'huile /Oil Fitting
45° + 90° + 180°
P/N 107085 107086 107087 #1

(12) Lambda Sensor
P/N 185001 - #1

(13) Fuel Filter unit
Unité de filtre à carburant
P/N 107201 - #1

(14)Fuel Pressure regulator
Régulateur de pression de carburant

P/N 107202 - #1

(15) Silent Blocks (Engine mounting)
Silent Blocks (support moteur)
P/N 107501 - #8

(16) Ignition Coils
Bobines d'allumage
P/N 106032 - #2

(17) Washers for Silent Blocks
Rondelles pour blocs silencieux
P/N 107502 - P/N/ 107503 - #4

(18) Fuel pump
Pompe à essence
P/N 107210 - #1

(19) Oil Hose (2 metres)
Tuyau d'huile (2 mètres) optional
P/N 107090 - #1

(20) Rings for Propellor mounting
Anneaux pour le montage de l'hélice
P/N 400101 - #6

(21) ECU / Ordinateur moteur
P/N 500110 - #1

(22) ECU Loom / Cable Ordinateur
P/N 500120 - #1

Please verify if all the add-ons parts are shipped with your D-Motor Engine !

Check our system (http://drop.d-motor.eu) if the most updated add-on list is enclosed.

Contact our after Sales Department (info@d-motor.eu) in case of missing parts.

D-Motor team

Veuillez vérifier si toutes les pièces ajoutées sont expédiées avec votre moteur D-Motor!

Consultez notre système (http://drop.d-motor.eu) si la liste des add-on les plus à jour est jointe.

Contactez notre service après-vente (info@d-motor.eu) en cas de pièces manquantes.

Équipe D-Motor

LF 26 Illustrated Delivery Parts :

FIG.	Description	Part Number (P/N)	QTY.
1	OIL Sump Tank Without indicator (UK market) OIL Sump Tank With indicator	107010 107011	
2	Oil Radiator	107015	1

3	Copper sealing rings Exhaust	211012	6
4	Exhaust KIT	211001	1
5	Bolts / Washers for Exhaust Kit	211013	14
6	Alternator Voltage regulator (See IB2019-015)	500001	1
7	ECU Water Temperature Sensor (T-Part)	107102	1
8	Water temperature Sensor (mounted on engine)	107101	1
9	Spark plug Cables NGK	106025	8
10	Spark plugs	106021	8
11	Oil Fitting 45° Oil Fitting 90° Oil Fitting 180°	107085 107086 107087	1 1 1
12	Lambda Sensor	185001	1
13	Fuel Filter Unit Bosch	107201	1
14	Fuel Pressure Regulator	107202	1
15	Silent Blocs (engine mounted)	107501	8
16	Ignition Coils	106032	2
17	Washers for Silent Blocs type A Washers for Silent Blocs type B	107502 107503	4 4
18	Fuel Pump	107210	1
19	Oil Hose 2 metres	107090	1
20	Rings (bush) for propellor mounting	400101	6
21	Engine Controller Unit (ECU)	500110	1
22	ECU Cable Loom Set	500120	1

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