



***Engine***

# **DLE430**

## **使用说明书 USER MANUAL**

为了您更好的使用该产品，请您在使用前仔细阅读说明书。改装或不按规定使用可能导致严重事故，由此引发的所有安全问题我们将不予负责。

**In order to use this product safely, please read the instructions carefully before use. Modifications or improper use may result in serious accidents and we will not be held responsible for any safety issues arising therefrom.**

## ● 简介 Introduction

感谢您选购DLE引擎。DLE430双缸直列两冲程发动机可用于无人机、动力伞、超轻型实验类飞行器等，独特的结构设计使该引擎具有重量轻、寿命长、马力大、振动小的特点，全新理念设计的DLE430将带给你前所未有的飞行体验。

在发动机启动之前，请仔细阅读本手册。本手册会提供给你安全操作发动机的基本信息。

Thank you for choosing the DLE engine. DLE430 twin-cylinder in-line two-stroke engine can be used for drones, paraglider, ultra-light experimental aircraft, etc. The unique structural design makes the engine light weight, long lifespan, large output and low vibration, we hope the DLE430 would bring you an unprecedented flight experience.

Please read this manual carefully before starting the engine. This manual will provide you with basic information on the safe operation of the engine.

## ● 警告 Warning

该引擎不是玩具！如果你是第一次购买该类引擎，并想通过自己一个人的努力完成飞行，请立即停止你危险的行为，去寻求有经验人士的帮助。

使用和维护不当可能会导致引擎损坏，亦可能造成人员伤亡。安装调试和维修引擎需要委托有经验的人员来操作。DLE 不承担由于操作和维护不当造成的任何损失！

该引擎没有认证，仅限于实验用途，在使用过程中有可能出现意外停车，使用者需要有应对空中停车的应急措施。DLE 不承担空中意外停车造成的任何损失！

该引擎是没有产品责任保险的，我们不能保证不发生设备故障，使用它是存在危险的，意外事故有可能造成财产损失、身体受伤甚至死亡，如果你不愿意承担使用中的所有风险，请不要启动引擎！

**This engine is NOT A TOY! If you are using this type of engine for the first**

**time and want to fly it with your own efforts, PLEASE STOP immediately and seek help from experienced people.**

**Improper use and maintenance can result engine damage or personal injury or death. Engine Installation, tuning and maintenance needs to be commissioned by experienced personnel. DLE will not be held responsible that caused by improper operation and maintenance!**

**The engine is not certified and it's experimental use only. Unexpected Shut-Down may occur during use, and users need to have experience and countermeasure to In-Flight Shut-Down. DLE will not be held responsible that caused by In-Flight Shut-Down!**

**The engine is not covered by any liability insurances. We cannot guarantee equipment failure during the use. Accidents may cause property damage, body injury or even death. If you are not willing to bear all the risks in use, please do not start the engine!**

## **● 安全信息 Safety Information**

- 需要由了解和使用过该类型发动机的人进行安装和维护操作，并已详细阅读了说明书，接受了被告知的存在风险。
- 该发动机未经过适航认证，使用时必须遵守国家相关部门的规定。
- 该发动机仅用于目视飞行条件下的飞行器上，只能在白天使用。
- 任何发动机都有可能意外停车，从而引发严重事故或导致人身伤亡，制造商不承担因发动机停车所造成的损失。
- 如果在发动机突然停车、无电的情况下无法成功地进行迫降，请不要安装此发动机进行飞行；如果只能在特定的地点、空速、高度等条件下才可以无动力安全降落的飞行器，安装该发动机使用时请不要超出这些特定条件。
- 处理燃料的时候要非常小心，混合燃料或给飞行器加油时，禁止在狭小的封闭区域（如车库、地下室）或者其他有易燃物容易达到着火点的地方进行操作。
- 发动机出厂时变速箱里是没有润滑油的，当变速箱里面没有充足的

油时禁止启动发动机。

- 必须按比例在汽油里面添加合格的两冲程专用机油并充分混合才能作为发动机的燃料使用，具体要求参见说明书。
- 加油前，要关掉发动机并取下点火钥匙，如有燃油溢出要即刻清理。
- 错误的发动机安装以及燃油、滑油、冷却的错误使用，由此引发的损坏发动机制造商不负任何责任。
- 禁止在不安装螺旋桨的情况下启动（测试）发动机，这样会引起发动机超速磨损或爆缸的危险。
- 发动机启动之前，需要对发动机进行常规检查，如各个部件的安装螺丝是否松动，油门控制绳索、拉杆是否磨损，皮带等消耗品是否已到更换时间，电器电路部分工作是否正常，确保所有操作在紧急情况下能正常使用。
- 避免在周围人员环境不可控的情况下启动发动机，如果旁观者太多、太近请勿启动发动机。
- 不能在无人监控的状态下运行发动机。
- 发动机启动以后不能马上升空，需要预热后加减油门观察其状态是否在正常范围内，如出现异常的振动和噪声等，需立即熄火进行检查，排除原因后才能再次启动。
- 禁止超过最大额定转速，关闭发动机之前让它在低速状态工作几分钟进行冷却。
- 经常定期检查发动机安装架和螺旋桨、燃料管道、线路、皮带以及空气过滤器等。
- 可以在发动机外部安装传感器，监测发动机温度、转速等信息，但这项工作需交给经验丰富的人来操作。不恰当的改装引起的发动机损坏制造商将不予负责。
- 使用非DLE正品的配件会导致本发动机的质保无效。
- 坚持记录发动机日志，至少包含发动机工作时间、维护维修记录、燃油滑油信息。遵守发动机的使用维护说明，使发动机保持最佳工作状态。
- Installation and maintenance operations are required by professionals or veteran users, operator should read the instructions and accepted the risks of being told.

- The engine has not been airworthy certified and must comply with the relevant national regulations.
- This engine is used on aircraft with visual flight conditions only and it can only be used during the daytime.
- Any engine may accidentally stop, causing serious accidents or personal injury, the manufacturer will not be responsible for the loss caused by engine shut-down.
- If the territory is not support for a successfully emergency landing when the engine suddenly stops and no power, please do not install this engine for flight; if aircraft can only be landed powerlessly at a specific location, airspeed, altitude, etc., Do not exceed these specific conditions when using the engine.
- Be very careful when handling fuel. When mixing fuel or fueling an aircraft, it is forbidden to operate in tight enclosed areas (such as garages, basements) or other places where flammable materials are easily accessible.
- When the engine is shipped, there is no oil in the gearbox. DO NOT start the engine when there is not enough oil in the gearbox.
- Qualified two-stroke oil must be added to the gasoline in proportion and mixed for the engine. See the instructions for specific requirements.
- Before refueling, turn off the engine and remove the ignition key. If there is fuel spill, clean it immediately.
- The manufacturer will not be held responsible for any engine damage by incorrect engine installation and misuse of fuel, oil, and cooling.
- It is forbidden to start (or test) the engine without installing a propeller, which may cause the engine to over-speed or cylinder explosion.
- Before the engine starts, it is necessary to carry out routine inspection of the engine, such as check screws are loose or not, whether the throttle control cable and the rods are worn, whether the consumables parts (belts) has reach to the replacement cycle, whether the electrical parts are working properly, and make sure they can properly work during any conditions, includes emergency.

- Avoid starting the engine with uncontrollable surroundings. If there are too many audiences around, do not start the engine.
- It is forbidden to start or keep the engine running without supervision.
- After the engine is started, do not take off immediately. Engine needs to be preheated, and accelerate/decelerate to observe whether it working on a normal range. If abnormal vibration and noise occur, it should be turned off immediately and restart after problem fixed.
- Do not exceed the maximum rated speed. Allow the engine to cooling down at a low speed for a few minutes before turning off the engine.
- Regularly check engine mounts and propellers, fuel lines, lines, belts, and air filters.
- Sensors can be installed outside the engine to monitor engine temperature, speed, etc., but this work needs to be operated by experienced personal. The manufacturer will not be responsible for engine damage caused by improper modifications.
- The use of Non-DLE genuine accessories will void the warranty of this engine.
- Keep recording engine logs, including at least engine operating hours, maintenance and repair records, and lubricant oil information. Follow the engine's maintenance instructions to keep the engine work at optimal status.

### 发动机参数表 Engine Specification

排量 Displacement	430CC
缸径 Cylinder diameter	70MM
行程 Stroke	56MM
压缩比（理论）compression ratio(theoretical )	11:1
压缩比（实际）compression ratio(practical)	6.5:1
减速比 reduction ratio	2.55
旋转方向 Direction of rotation	顺时针方向 （面对螺旋桨） Clockwise(when face to propeller)

功率 Power	42HP/6800RPM
静拉力 Static thrust	110KG
发动机主机 Main frame	27KG
排气管 Muffler	4.1KG
整机重量 Total weight	32.25KG
最高转速 maximum speed	7000RPM
怠速 Idling	1000RPM
发动机类型 Engine Type	两冲程、双缸直列 Two stroke,Twin cylinder inline
启动方式 starting mode	电启动 Electrical starter
启动电机 Starting dynamo	DC12V,35A
点火方式 Ignition method	双套直流电容放电点火 Dual DC capacitor discharge ignition
点火电压 Ignition voltage	DC12V, 功率 power 5W/个 each
火花塞 Spark plug	14mm DLE-8
火花塞间隙 Spark gap	0.6mm
化油器 Carburetor	DLE 自吸式 Self-priming
燃油 Fuel	普通车用汽油与 2 冲程专用润滑油混合 Ordinary gasoline mixed with 2 stroke engine oil
推荐润滑油 Recommended oil	2T FD 级 全合成 2T DF grade full synthetic
混合比 Mixture ratio	50:1
发电机 Alternator	三相永磁发电机 , 功率200W Three-phase permanent magnet generator, Power 200W
整流调压器 Regulator	DC14.5V,功率180W DC14.5V, Power 180W
散热方式 Cooling system	强制风冷, 更换散热风扇, 前拉和后推均可使用 Forced air cooling, can be used for push or pull after replacement of cooling fan

## ● 组装 Assembly

所有的安装螺丝需要涂抹螺纹胶（乐泰 243），同一平面超过 4 颗螺丝时需要对角交叉均匀拧紧。发动机主体的密封面采用了免垫片设计，在拆装时需要把表面清理干净，在密封面均匀涂厌氧平面密封剂（乐泰 518），轴承安装面使用圆柱零件固持剂（乐泰 609）。高温排气口的表面密封使用耐高温的硅酮胶。

### 发动机的安装

将发动机从金属框中取出，使用框架上配套的减振胶垫和金属平垫固定在发动机支架上，固定螺丝选用直径 10mm12.9 级，最好使用自锁防松螺母（不能使用包装框架上的螺丝螺母安装固定发动机）。发动机支架需要确保四个安装点在同一平面，并且具有足够的强度。如果要自行改变发动机的安装点，需要由经验丰富的人员进行安装改进设计。发动机安装固定点必须有良好的减振措施，由于没有减振或不恰当改装引起的发动机损坏厂家将不予保修。

### 减速箱的换装

DLE430 的减速箱是可以上下翻转 180°，出厂时默认为输出轴靠上。如把减速箱翻转 180°安装，可使输出轴中心向下移动 130mm。

### 散热风扇的换装

DLE430 可做为前拉和后推使用，出厂时默认为后推状态。后推使用时搭配白色风扇叶片，气流由发动机后部吹向螺旋桨方向。如要用做前拉使用，需要更换成黑色风扇叶片，使气流从螺旋桨方向吹向发动机后部。散热风扇和螺旋桨形成的气流方向保持一致，才能最有效的对发动机缸体进行散热。

### 螺旋桨的安装

请选用优质的经过校验过平衡的螺旋桨。劣质的螺旋桨会加大振动对引擎造成严重损害，影响飞行安全。

螺旋桨安装孔与安装螺丝的间隙尽量小，过大的间隙容易造成螺丝松动，螺旋桨的剪切力会切断所有固定螺丝。

安装螺旋桨时必须使用中低强度的螺纹胶。（乐泰 242）

推荐使用变距螺旋桨：1.5 米 9 度

推荐螺旋桨最高转速：2500 转/每分钟。



## 电气系统的安装

永磁发电机输出的交流电经过调压器整流稳压为直流14.5V，给点火器供电，同时对电池充电。推荐使用12V7AH以上的铅酸电池。

电池要在所有线路连接完成后才接入电路，这样可以避免意外启动造成的伤害。

DLE430有两套完全独立的点火系统，其中一套失效后，发动机也可以正常工作。

点火器引出的红黑导线分别对应电源的正负极，蓝色线为点火触发信号，连接发动机任意一个传感器的蓝色引出线，两根高压线分配到前后任意气缸，把高压帽按进火花塞。另一个点火器连接剩下的火花塞和传感器。

按照线路图连接各个部件，启动电机回路的导线直径不低于4mm<sup>2</sup>，使用随机的导线连接启动电机和电池，尽量不延长它们之间的导线距离。距离过长或线径太小会造成导线电压降过大，启动无力。不要把启动继电器固定在振动较大的位置。

用不低于1 mm<sup>2</sup>的红色导线连接驾驶舱的控制开关和发动机。K1、K2同时打开，接通点火器电源，按下启动按钮或其它不带锁定的开关K3，继电器接通启动电机供电，电机带动发动机旋转，发动机启动后迅速断开K3。K1、K2同时关闭，发动机熄火。可以加装一个10A的保险给其它小于80W的负载供电。

K3可以使用带锁的专用引擎启动开关，同时可以关闭其它负载的供电，方便对操作人员的管理。

两个点火器不要共用一个开关，这样在发动机启动后，可以交替关闭其中一个点火器，检查点火系统是否正常工作。

自行购买质量可靠的开关实现启动和熄火功能，开关失效可能会导致发动机熄火。

对导线进行捆扎固定，走线尽量避开高温部件，避免振动引起的导线与部件之间长期摩擦破损。对接插头插到位后，用电力胶带缠绕防止松脱。

火花塞型号为DLE-8A，这是经过长期测试的定制双铂金火花塞，如果换用其他火花塞，有可能因为热值的差异引起发动机故障。安装火花塞时，保证火花塞瓷件表面清洁干燥，用手拿住瓷件部位，对准火花塞螺纹孔旋至拧不动为止，用力矩套筒扳手紧至2.4Kg.m(24n.m)。

All mounting screws need to be coated with threaded glue (Loctite 243). When there are more than 4 screws in same plane, it is necessary to evenly tighten them in diagonal cross. The engine main frame uses gasket-free design at sealing surface. The surface needs to be cleaned when assembly, use the anaerobic plane sealant (Loctite 518) uniformly coats on the sealing surface, and the cylindrical part glue is

used for the bearing mounting surface (Luotai 609) ). The surface of the exhaust port is sealed with a high temperature resistant silicone glue.

### **Engine Installation**

Take the engine out of the metal frame and mount it on the engine bracket with the damper and metal washers on the frame. The fixing screws should be 10mm diameter and 12.9 grade . It is best to use the self-locking nut (do not use screws from the package of frame). The four engine mounting points must in the same plane and have sufficient strength. If you want to change the installation point of the engine, please seek for the help from experienced personnel. The engine installation fixed point must have good shock absorption measures, the warranty will be voided if engine is damage caused by no vibration reduction device or improper modification.

### **Gearbox Replacement**

The DLE430's gearbox can be flipped up and down by 180°, the output shaft is up by default . If the gearbox is flipped 180°, the center output shaft should be moved down by 130mm.

### **Cooling fan Replacement**

The DLE430 can be setup for pull or push. The factory default is the push. When use it as pusher, please use the fan of white blade, so the air is blown from the rear of the engine toward the propeller. When use it as puller, please use the fan of black blade to blow air from the propeller to the rear of the engine. The airflow direction of the cooling fan must same as the propeller in order to maximize the cooling efficiency.

### **Propeller Installation**

Use a quality, calibrated and balanced propeller. Inferior propellers can increase vibration and cause serious damage to the engine, affecting flying safety.

The clearance between the propeller mounting hole and the mounting screw should be small as possible. Excessive clearance may cause the screw to loosen, and the propeller will cut off all the fixing screws.

Medium and low strength thread glue must be used when installing the propeller. (Loctite 242)

It is recommended to use variable pitch propeller: 1.5 m, 9 degrees

Recommended maximum propeller speed: 2,500 rpm.

### **Electrical System Installation**

The AC output from the alternator is rectified and regulated by the voltage regulator to 14.5V DC, it supplies to the ignition and charge the battery at the same time. It is recommended to use a lead acid battery of 12V7AH or higher.

The battery should be connected to the circuit after all the wires have been connected, so as to avoid the damage caused by accidental starting.

The DLE430 has two completely independent ignition systems, the engine will still running if one of ignition failed.

The red and black wires from the ignition correspond to the positive and negative poles. The blue wire is for ignition trigger signal, connect the blue lead wire of any sensor of the engine. The two high voltage wires are connected to any cylinders (front or rear), and pressed high voltage cap into the spark plug. Another ignition connects the remaining spark plugs and sensors.

Connect the components according to the drawing, starter motor wire diameter should not less than 4mm<sup>2</sup>, use the stock wire connects to starter motor and battery, try not to extend the wire distance between them. If the distance is too long or the wire is too thin, the voltage will drop significantly when starting. Do not fix the starter relay in a location where vibration is high.

Connect the control switch and engine of the cockpit with a red wire no less than 1mm<sup>2</sup>. K1 and K2 are simultaneously turned on, turned on ignition power, pressed the start button or other switch K3 without locking mechanism, the relay is turned on power supply to starter motor, the motor drives the engine to rotate, the engine can be turned off by quickly disconnected K3 first, then turned off K1 and K2 at the same time. A 10A fuse can be added to power other loads less than 80W.

The K3 can use a special starter switch with locking mechanism, it should able to turn off the power to other loads for a easy operation.

Do not share a switch between the two ignitions, so when the engine is started, one of the ignitions can be alternately turned off to check if the ignition system is working properly.

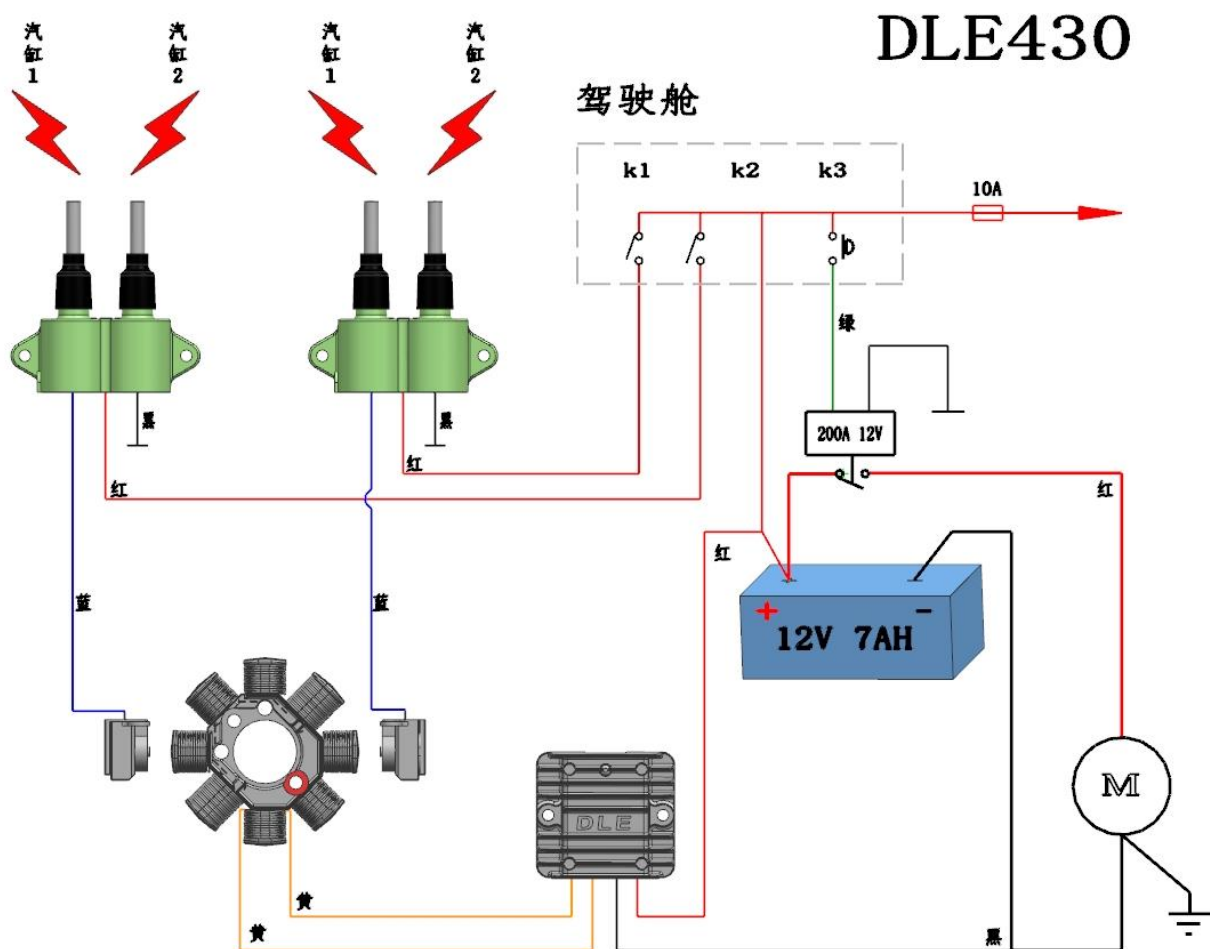
Buying a reliable quality switch to achieve start-up and shutdown functions, failure of the switches may cause the engine to shutdown.

Properly fix the wires, away from high-temperature components as much as possible to avoid long-term friction between the wires and components caused by

vibration. Connectors should be wrap it with electrical tape to prevent loosening.

The spark plug model is DLE-8A, which is a long-tested customized dual platinum spark plug. If you switch to other spark plugs, it may cause engine failure due to the difference in heat value. When installing the spark plug, ensure that the spark plug is clean and dry. Hold the porcelain part and screw plug until it is not possible to tighten by hand. Then use a torque socket wrench to tighten it at 2.4Kg.m (24n.m).

DLE430 电气连接图  
Electrical connection diagram



## ● 减速箱滑油 Gearbox oil

出厂时减速箱内是空的状态，必须加注齿轮油才能启动引擎。

可以选用的齿轮油种类：85W-140EP API-GL5 GL6 SAE 140 EP

齿轮油从减速箱上部孔加注，换油时从下部孔排出。加注时拧开上部注油孔螺丝和侧面靠下的油位观察孔螺丝，缓慢注入齿轮油，直到从油位孔开始溢

出为止，分别拧紧螺丝即，加油量约为 400ml。

改变减速箱安装方式时，溢油油位孔始终以靠下方一个为准，减速箱前部的通气孔需保持向上位置。

加注油量过多时，初期使用过程中，齿轮油温度升高，可能会从通气孔溢出齿轮油，这时不会影响正常使用，一段时间后该现象会自行消失。

不同牌号的齿轮油不能混用。

There is no gearbox oil in the engine, and gear oil must be added before start the engine.

Suggested gear oil types: 85W-140EP API-GL5 GL6 SAE 140 EP

The gear oil is filled from the top hole of the gearbox and discharged from the bottom hole when change oil. When filling, unscrew the top oil hole screw and the oil level observation hole screw on the lower side, and slowly inject the gear oil until it starts to overflow from the oil level observation hole. Tighten the screws separately, and the oil is required about 400ml.

When changing the installation method of the gearbox, the oil level hole should be in a lower position, and the vent hole at the front of the gearbox needs to be kept up all the time.

When there is too much oil, temperature rising can result the gear oil overflow from the vent hole. This will not affect the normal use, and this problem will disappear after a period of time.

DO NOT mixed different grades or brand of gear oil.

## ● 燃料滑油 Fuel oil

DLE430 为两冲程发动机，不能直接使用汽油做为燃料，需要按比例往汽油里添加两冲程专用机油并充分混合后才能使用。

请选用优质的92#或95#无铅汽油。

建议使用FD级别以上的优质二冲程全合成机油。

劣质的机油会造成引擎性能下降甚至损坏。

燃油配比为40 : 1至50 : 1之间，磨合期间40 : 1，正常使用为50:1，夏季高温为45 : 1。

**注意——是体积比而不是重量比。**

根据气温与发动机温度适当调整混合比与油针，环境温度高时请适当增加机油的比例和

增加高速油针开度。

- 禁止不同厂家、牌号的机油混合使用，否则会引起化油器严重阻塞。更换机油时需要对化油器进行清洗。
- 混合油料和加油时必须使用金属容器，防止和消除静电，禁止在狭小封闭的空间进行此项工作。
- 混合油料时要让机油充分溶解，在温度较低时，机油可能会沉积在容器底部，仅通过晃动容器不能完全溶解，要用干净的金属棒搅拌均匀。
- 已混合存放的燃油使用时需再次摇晃均匀，不要使用混合时间超过3周的燃油。
- 不要轻易使用别人配的燃油。

The DLE430 is a two-stroke engine. It cannot directly use gasoline as a fuel. It requires two-stroke lubricating oil with the gasoline in proportion and mix it thoroughly before use.

Please choose high quality 92# or 95# unleaded gasoline.

It is recommended to use high quality two-stroke synthetic oil, above FD level.

Inferior oil can cause engine performance to drop or even damage.

The fuel ratio is between 40:1 and 50:1, 40:1 for breaking-in, 50:1 for normal use, and 45:1 for summer or high temperature area.

**Note - The fuel mixing ratio is the volume ratio, not the weight ratio.**

Adjust the mixing ratio and oil needle according to the temperature and engine temperature. When temperature is high, increase the proportion of oil and

- open high speed oil needle a little bit to make engine running at rich oil.
- **DO NOT mixing of different manufacturers and grades of engine oil, otherwise it will cause serious clogging on carburetor. The carburetor needs to be cleaned before changing the oil.**
- **Metal containers must be used when mixing oil and refueling to prevent and eliminate static electricity. It is forbidden to carry out this work in a small enclosed space.**
- **When mixing the oil, the oil should be fully dissolved. At lower temperatures, the oil may deposit on the bottom of the container. Shaking container will not dissolve the oil . Stir well with a clean metal rod.**
- **The fuel that has been mixed and stored should be shaken again when using it. Do not use fuel that has been mixed for more than 3 weeks.**
- **Do not use the fuel from others, it may mixed in an incorrect ratio.**

## ● 启动 Start Up

每次启动前请依次检查发动机、螺旋桨及其他附属各部件没有异常。关闭阻风门，油门加到最大，接通两个点火器供电开关，按下启动钮，起动机带动引擎运转吸油（首次启动或长时间不用可能会延长泵油时间），化油器进油后发动机启动并富油熄火，打开风门，油门减小至接近怠速位置，按下启动钮，发动机启动后进入正常工作状态。冬季启动后请暖车2—5分钟，夏季启动后请暖车1—2分钟，以检查校验引擎的怠速稳定性和加减油门的响应。交替关闭点火器开关，确认两个点火器均正常工作。

单次启动时间不超过10秒，启动失败后间隔1分钟以上才能重新启动。如果在化油器已进油的情况下连续多次启动失败，需要对发动机进行检查。

Check list is suggested for the engine, propeller, and other accessories before starting each time. Close the choke, throttle to the maximum, turn on the two ignition power switches, press the start button, the starter motor drives the engine to draw the oil (first time of use or long time storage of engine may extend the pumping time), after the carburetor enters the oil, the engine should starts and shut down because of rich oil. next open the choke , throttle at idle, and press start button, and the engine will enters the normal working state after starting. Please warm the engine for 2-4 minutes after the start in the winter, or 1-2 minutes in the summer. Check the idle speed stability and the response of the throttle by accelerating or decelerating. Turn off the ignition switch alternately and verify that both ignitions are working properly.

The single start-up time should not exceed more than 10 seconds, and there should be at least 1 minute of interval time for each restart. If the start-up fails several times in the event that the carburetor is full of oil, the engine needs to be inspected before start again.

## ● 磨合 Breaking-in

油针出厂状态    **L: 1.25圈**    **H: 1.25圈**

DLE430引擎的出厂默认油针能够正常启动。对引擎进行良好的磨合可以延长发动机的使用寿命。

**禁止把发动机固定在没有减振装置的支架上进行磨合。**

**禁止在没有安装标准螺旋桨的情况下启动引擎。**

磨合引擎须安装在带有减震装置的发动机架上，发动机架牢靠固定在试车台或者飞行器上。在没有尘土杂物，不影响他人的安全环境中进行引擎。建议在有经验的人员指导下进行。

推荐使用OPPAMA品牌的PET系列感应式转速表监测发动机转速，把感应天线的夹子夹住高压点火线，转速表上显示的数字除以2就是发动机的转速。双套点火系统的特性使发动机每转点火两次。

**怠速低速磨合：燃油配比40 : 1。**

启动引擎，保持转速在2500—3500转间断运行30分钟。期间可停车几次冷却并检查引擎与螺旋桨工况使之在稳定状态。

启动引擎，保持转速在3500至4500转间断运行30分钟。期间可停车几次冷却并检查引擎与螺旋桨工况使之在稳定状态。

**低中高速间歇磨合：燃油配比50 : 1。**

启动引擎预热后，在低于5000转的转速以下运行，间隔5分钟左右加大油门，前三次大油门的时间在10秒以内，如发动机加减速正常，继续在各个中低速状态下间隔5分钟加一次全油门，连续全油门的时间逐步延长至3分钟，每次全油门结束需降至怠速冷却发动机1分钟。

此阶段磨合时间60分钟，这段时间内可以对化油器进行细微调整，磨合后正常状态的引擎怠速稳定、加减速顺畅。

地面磨合超过2小时，检查所有部件正常，引擎运行良好，可投入使用。

开始使用的10小时内引擎在油门全开状态请勿超过5分钟，引擎长时间工作在极限状态会缩短使用寿命。

**Default setting of Oil needle: L: 1.25 turn, H: 1.25 turn**

The factory default oil needle setting is to make sure DLE430 engine can be started normally. Good breaking-in of the engine can extend the life of the engine.

**It is forbidden to fix the engine on the test bench without the damping device for breaking-in.**

**It is forbidden to start the engine without a standard propeller installed.**

When breaking-in, the engine must be mounted on an engine mount with shock absorbers that are securely attached to the test bench or aircraft. The engine should place in a safe environment without dust or debris. It is recommended to operate the engine under the guidance of experienced personnel.

It is recommended to use the OPPAMA brand PET series inductive tachometer to monitor the engine speed. Clamped the pick up sensor to the high voltage ignition



wire. The number displayed on the tachometer divided by 2 is the engine speed. Because of the dual ignition system allow the engine to fire twice in each turn.

### **Breaking-in at Idle/low speed: fuel ratio 40:1**

Start the engine and keep the speed running for 30 minutes at 2500-3500 rpm. During the period, you shall stop the engine and let it cooling several times and check the engine and propeller conditions to make it stable.

Start the engine and keep the speed running at 3500 to 4500 rpm for 30 minutes. During the period, you shall stop the engine and let it cooling several times and check the engine and propeller conditions to make it stable.

### **Low, medium and high speed intermittent breaking-in: fuel ratio 50:1**

After engine is warm-up, running it below the speed of 5000 rpm at first, increase it to full throttle for less than 10 second at first three full throttle breaking-in. There should be about 5 minutes spacing for each full throttle breaking-in. If the engine acceleration and deceleration is normal, continue the full throttle breaking-in intervals of 5 minutes from medium and low speeds to maximum, but extend the full throttle time to 3 minutes. Each time the full throttle ends, the engine should be cooled at idle speed for 1 minute.

At this stage, the breaking-in time takes 60 minutes. The carburetor can be finely adjusted during this time, . After the breaking-in, the engine can work at the best conditions.

Ground breaking-in will cost more than 2 hours in total, check that all components and the engine is running well, then it can be ready for use.

Do not let the engine running at full throttle more than 5 minutes at first 10 hours of usage time. The engine life will be shorted when it's working at limiting operational condition.

## **● 化油器的调整 Carburetor Adjustment**

“L”油针用于调节低速供油，“H”油针用于调节高速供油。油针螺丝是很精细的部件，用力过大可能会造成化油器损坏。怠速螺丝调整设定发动机的最低转速。

化油器的出厂设置可以使引擎正常启动并满足大部分地区的工况需要，但海拔、温度的变化需要对化油器进行细微调整，才能保证发动机工作在最佳状态。

DLE430的前后气缸由两个化油器独立供油，调整时要尽量保持两个缸的同步和一致性。

两个化油器的阻风门和节气门用丝杆和关节轴承连接，把化油器两个怠速螺丝全部旋出，打开阻风门挡板，检查节气门翻板是否一致关闭，加大和减小油门，节气门翻板开度是否一致，如果有差异，调整关节轴承之间丝杆的长度使之达到一致。（仅在关节轴承磨损和丝杆受外力变形的情况下才需做该项调整）

调节怠速螺丝，使发动机的最低怠速保持在1000转以上，怠速设置过低容易造成收油门熄火现象。在使用中可以拆除其中一个化油器上的怠速螺丝，一个怠速螺丝即可同时作用两个化油器。

调整L、H油针时，顺时针旋转为减小供油，逆时针旋转为增加供油。正常情况下，L油针的调整范围在0.8-1.75圈，H油针的调整范围在1.5-2圈。如果调整时超过这个范围或调整过程中没有变化，可能是化油器内部油道出现了堵塞现象，需要对化油器内部进行清洗。

前后两缸的化油器油针必须同步调节。

低速油针(L):

1. 富油状态时转速不稳定，瞬时减速易熄火，需适当减小L油针。
2. 贫油状态时加速不顺畅，加不了高速，需适当开大L油针。

高速油针(H):

1. 富油状态时加速转速下降，瞬时减速易熄火，需适当减小H油针。
2. 贫油状态时加速不顺畅易熄火，需适当开大H油针。

调整低速油针时会引起怠速变化。

建议使用转速表配合调整高速油针，高速贫油和富油都会导致发动机最高转速下降。调整H油针使发动机转速达到最大值，再逆时针开大0.1—0.2圈保持略微富油为标准状态。

**通过火花塞颜色判断油气混合状态:**

启动引擎，全油门运转20秒在高速状态下熄火，卸下火花塞，正常的中心电极为深褐色，螺纹部位有微湿的油渍，电极发黑说明富油，发白表示贫油。

如前后两个气缸的火花塞颜色差异较大，根据火花塞颜色对化油器进行微调。

**引擎在贫油状态下运行会烧坏活塞和气缸，导致发动机严重损坏。**

调整油针的工作需要交给有经验的人员进行。（发动机贫油状态下运行导致的发动机损坏不在保修范围）

The “L” oil needle is used to adjust low speed oil supply, and the “H” oil needle is used to adjust high speed oil supply. The oil needle screw is a very delicate part, any excessive operation may cause damage to it. The idle screw adjustment sets the minimum engine speed.

The factory setting of the carburetor allows the engine to start normally and meet the working conditions in most of case. However, altitude and temperature difference require fine adjustment of the carburetor to ensure that the engine is working at its best condition.

The front and rear cylinders of the DLE430 are independently supplied by two carburetor. When adjusting, try to keep the two cylinders synchronized and consistent.

The chokes and throttles of the two carburetor are connected by the screw rod and joint bearing, unscrew the two idle screws of the carburetor, open the choke flap, check the both throttle flaps and ensure it can be uniformly closed, open at same angle. if there is a difference, adjust the length of the screw rod between the joint bearings to make it consistent. (This adjustment is only required if the joint bearing wears and the screw rod is deformed by external force)

Adjust the idle screw to keep the minimum idle speed of the engine above 1000 rpm. If the idle speed is set too low, it will cause the engine off when throttle back to idle. One of the carburetor idle screw can be removed, and one idle screw is enough to control both carburetors.

When adjusting the L and H oil needles, the clockwise rotation is to reduce the oil supply, and the counterclockwise rotation is to increase the oil supply. Under normal circumstances, the adjustment range of the L oil needle is 0.8-1.75 turns, and the adjustment range of the H oil needle is 1.5-2 turns. If the adjustment exceeds this range or the engine is not response to the adjustment process, the oil passage inside the carburetor may be blocked, the carburetor needs to be cleaned.

The carburetor needles of the front and rear cylinders must be adjusted simultaneously.

#### Low speed oil needle (L):

1. When the oil is rich, the speed is unstable, engine is easily off at the instantaneous deceleration. The L oil needle should be appropriately reduced.

2. In the lean state, the acceleration is not smooth, engine has problem to accelerate to high speed. The L oil needle should be appropriately increased.

High speed oil needle (H):

1. The speed decreases in acceleration when the oil is rich, engine is easily off at the instantaneous deceleration. The H oil needle should be appropriately reduced.

2. In the lean state, the acceleration is not smooth and engine is easily off during acceleration. The L oil needle should be appropriately increased.

Tuning low speed oil needle will cause an idle speed change.

It is recommended to use a tachometer to adjust the high speed oil needle. Lean oil and rich oil will cause the engine having problem to reaches to maximum speed. Adjust the H oil needle to maximize the engine speed, and then open the 0.1-0.2 turn counterclockwise to maintain a slightly rich oil condition to prevent overheating.

diagnosing the gas mixing state by the color of the spark plug:

Start the engine, let engine running at full throttle for 20 seconds and turn off the engine, remove the spark plug, normally the center electrode is dark brown, and the thread has slightly wet oil, the electrode turned to black indicate rich oil, and the white indicates lean oil.

If the spark plugs of the two cylinders shows different colors, the carburetor should be re-tuned according to the color of the spark plug.

**Running the engine in a lean state will burn the pistons and cylinders, causing serious engine damage.**

**The adjustment process of oil needle needs to be carried out by experienced personnel. (Engine damage caused by improper carburetor setting will not covered by the warranty)**

## ● 运行说明 Operation Instructions

- 请使用推荐规格的螺旋桨，未安装螺旋桨时禁止启动引擎，禁止使用破损的螺旋桨。螺旋桨不匹配会缩短引擎的寿命。
- 在螺旋桨两侧有人或周围人员较多的情况下请勿启动引擎。
- 启动发动机后交替关闭点火供电开关，确认两套点火系统均正常工作。
- 每次飞行在启动并预热引擎后请检查引擎的怠速、加减速性能正常后方可起飞。
- 在使用过程中有异常的声音或振动，要马上降落检查，排除故障后才能继续

使用。

- 在正常飞行中请不要熄火滑翔,长时间停车可能造成在阻风门打开的状态下难以启动。
- 空中启动时继电器可能会发生短路,造成启动电机损坏,甚至引起火灾。
- 遇到空中停车,请尽快寻找能安全降落的地点,不要花太多时间尝试二次以上的启动。
- 保持发动机表面清洁,保证散热良好。
- 饮酒或身体不适时,严禁对引擎进行保养和使用。

应避免在灰尘较大的环境中使用。飞行几十小时后可视情况把空滤拆下用汽油或压缩空气对其进行清理。

在一定周期内清洁化油器里面的燃油滤网及针阀,否则将引起油针调节失灵,发动机工作不稳等情况。

#### **每使用10个小时:**

检查所有螺丝是否松动,检查皮带、油管、线路是否异常磨损。

#### **每使用50个小时:**

更换皮带。

检查火花塞情况,如需更换火花塞请选用原厂配件,不恰当的火花塞型号可能会导致发动机过热损坏。

#### **每使用100个小时:**

更换空虑。

检查清理气缸积炭,复装气缸时端面涂抹耐高温密封胶。

拆下化油器固定螺丝检查簧片阀。

**注:**有必要把每次维修都记录在维修保养记录里。

- Use the recommended size of propellers. Do not start the engine when the propeller is not installed. Do not use a broken propeller. Mismatched propellers shorten the life of the engine.
- Do not start the engine if there are people on the sides of the propeller or there are more people around propeller.
- Turn off the ignition supply switch alternately after starting the engine to confirm that both sets of ignition systems are working properly.
- After each start and warm up the engine, please check the engine's idle speed, acceleration and deceleration performance before taking off.
- If there is abnormal sound or vibration during use, you should immediately land the plane for inspection and remove the fault before continuing to use it.

- Do not turn off the engine for gliding during normal flight. Long-term shutdown may cause difficulty for engine restart when the choke is open.
- In-flight starting may short-circuited the relay and causing damage to the starter motor and even causing a fire.
- In case of In-flight shutdown, please find a place where you can land safely as soon as possible. Do not spend too much time trying to start more than twice.
- Keep the engine surface clean and ensure good cooling.
- Maintenance and use of the engine is strictly prohibited when drinking alcohol or physical discomfort.

Avoid use in dusty environments. After flying for dozens of hours, remove the air filter and cleaned with gasoline or compressed air.

Clean the fuel filter and needle valve inside the carburetor in a certain period of time, otherwise it will cause the oil regulating failure, engine unstable.

**Every 10 hours of use:**

Check all screws for looseness and check for abnormal wear on the belt, fuel tube, and wiring.

**Every 50 hours of use:**

Replace the belt.

Check the spark plug. If you need to replace the spark plug, please use the original accessories. Inappropriate spark plug models may cause overheating damage.

**Every 100 hours of use:**

Replace the air filter.

Check the carbon deposits in the cylinder and apply high temperature sealant to the mounting surface when reassembly the cylinder.

Remove the carburetor screws and check the reed valve.

**Note:** It is necessary to record each repair in the maintenance log.

## ● 故障排除 Troubleshooting

无法启动：首先检查电路，确保火花塞安装到位，取下火花塞，启动电机转动，观看火花塞上是否有跳火。无火，检查磁电机到高压包之间的线路，有火，检查油路的问题。

取下火花塞时，如果火花塞上全是油渍，可能是供油量太大，或者油泵得太多，擦干净火花塞重新启动。如果火花塞是干的，说明供油有问题，再重新泵油，如果泵不进去，检查从油箱到化油器之间的油路是否堵塞，包括为化油器提供泵油条件的单向进气阀。

Unable to start: first check the circuit, make sure the spark plug is in place, remove the spark plug, start the motor, and see if there is a lightning on the spark plug. If spark plug is not fired, check the line between the magneto and the ignition, If spark plug is fired, check the oil circuit.

When removing the spark plug, if the spark plug is full of oil, the oil supply may be too much, or pumped too much of oil, wipe the spark plug and restart. If the spark plug is dry, it indicates that there is a problem with the oil supply, re-pump the oil again. If the oil does not go in, check the oil passage from the fuel tank to the carburetor see if there is anything blocked it, including one-way air valve for the carburetor.

## ● 保修条款 Warranty

- 本产品自购买之日起提供1年的质保期。
- 传动皮带、火花塞、空滤等消耗品不在保修范围内。
- 改装、安装了非DLE原厂部件或不按要求使用等人为因素造成的损坏不享受免费保修。
- 不按要求往汽油里添加机油或使用了劣质机油，造成发动机损坏的不属保修。
- 保险期间寄送产品的费用，国内用户自购买之日起三个月内往返运费由厂方负责，超过三个月的往返运费由买家承担。
- 请妥善保存好说明书及填写客户信息，以作为保修时的凭证。
  
- This warranty time is one year from the date of purchase.
- Consumables parts such as drive belts, spark plugs, and air filters are not covered by the warranty.
- Damages caused by modification, use Non-DLE original parts or man-made damage are not covered by the warranty.
- Failure to mix oil with the gasoline or used inferior oil, resulting engine damaged is not covered by the warranty.
- Manufacturer will cover all domestic shipping cost within three months from the

date of purchase. If it's more than three months, buyer has to pay for the shipping cost in both way.

- Please keep the manual and fill in the customer information as proof of warranty.

● **附件 Attachment**

● **发动机保修卡 Warranty card**

DLE 发动机售后维修卡 / DLE Engine Warranty card

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发动机型号 / Engine Model	DLE430CC	发动机编号 / Engine S/N	
用户姓名 / User Name		购买日期/Purchase Dates	
经销商 /Distributor		联系电话 / Phone	
通讯地址 / Address			

● **维修记录 Maintenance Records**

DLE 维修记录 / Maintenance Records

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时间/Date	维修地点 / Maintenance Location	维修内容 / Maintenance Log

**Contact us**

电话(Tel): 0086 4001006090

传真(Fax): 086-0873-6131518

销售(Sale): 0086 13529826090

网址 (Web) : www.dlengine.com

电邮 (E-mail) :

dle@dlengine.com

地址: 中国云南省红河州弥勒市弥阳工业园区

Address: Miyang Industry Zone Mile City Honghe Prefecture, Yunnan Province China.

弥勒浩翔科技有限公司

Mile HaoXiang Technology Co., Ltd