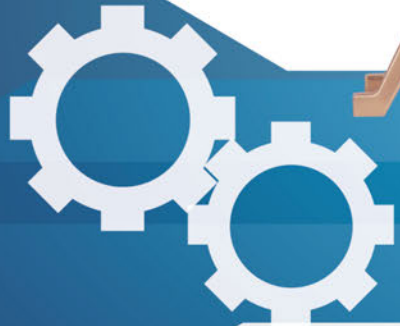


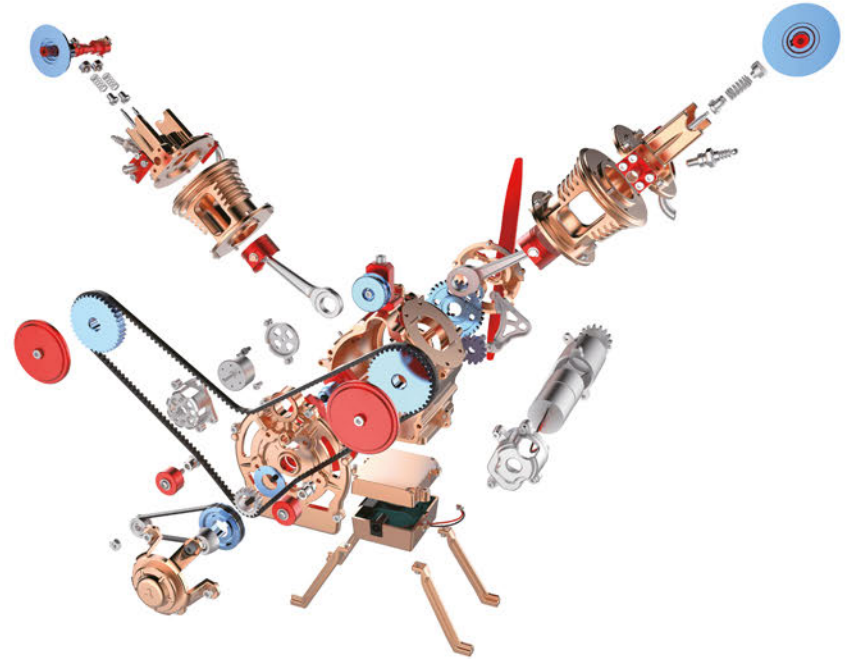
V2 Engine (Overhead camshaft)

Metal Assembly Model



## Structural features:

1. Double-acting V cylinder structure
2. Overhead camshaft valve control structure
3. Synchronous cam driving mode
4. Traditional crankshaft connecting rod system
5. Single intake and exhaust valve structure



I–Make • Real Model • Real World

## General information about product

### I. Product Data

Product name: V2 Engine ( Overhead camshaft )

Product model: DM14

Main materials: Anodic aluminum oxide + stainless steel

Charging voltage: DC5V

Battery capacity: 500mAh

Product standards: GB/T9254–2008

GB/T17626.2–2006

### II. Product description

- ◆ Teching Craftsman series of products are metal structure assembly models. Its primary material is aluminum alloy with anodized surface, and the product structure is a real industrial structure;
- ◆ Assemble parts using various tools with the installation procedures and methods substantially compliant with practical industrial requirements;
- ◆ This series of products are principally designed to improve users' hands-on ability and concentration, and to develop habits of "preciseness and stress on discipline";
- ◆ Learn about various industrial machines, and study various industrial structures to improve user's capability of research and innovation.

### III. Assembly Requirements

- ◆ Be sure to read the Basics of Standard Parts Assembly carefully to master basic standard parts assembly procedure and the usage of tools before assembly;
- ◆ The table shall be kept tidy and clean during assembly to prevent parts being lost or incorrectly assembled. Assemble parts in a rigorous and orderly fashion, view the diagrams carefully, and avoid incorrect assembly;
- ◆ Pay attention to the prompt text in instruction manual, carefully view the part installation orientation, and avoid incorrect comprehension. Pay attention to the requirements on testing;
- ◆ Lubricating oil shall be applied to friction areas to the greatest extent to prevent jamming during operation. Fastening screws must be thoroughly mounted to prevent looseness of parts;
- ◆ If you have any doubt when adjusting any assembly clearance or tightness after the completion of assembly, please refer to our website or WeChat public account;
- ◆ Users are encouraged to optimize the parts using material removing tools like files and sand paper with adult care where the personal safety is guaranteed;

- ◆ Users are encouraged to perform part modification or overall modification of model without potential safety hazard so as to develop modification capability as soon as possible;
- ◆ The user may disassemble this model and put it in the package again according to the parts list attached hereto;
- ◆ If any part is lost, please inquire of or purchase it from us (Teching official online store);
- ◆ The model structure is subject to continual improvement. If the real object differs from the instruction manual, please refer to our latest assembly information.
- ◆ Once the product fails to function due to battery failure, lubricating oil shortage or dust accumulation in product gaps because it is left unused for long, it's advisable to change the battery or disassemble and clean its parts.

## Precautions

### I. Safety Instruction

- ◆ Please read this manual carefully so that you are in a position to use this product correctly and safely;
- ◆ This series of products are industrial-level metal models, so its assembly and use requires certain safety awareness; improvement of safety awareness is also a function of the model;
- ◆ This model is suitable for users aged 14 and over. Please read this manual carefully for relevant safety information;
- ◆ Strictly prohibit children or pets swallowing or biting this product or its spare parts, since this may cause injury/damage;
- ◆ Use assembly tools rationally, assemble the parts in strict conformity with the instruction manual, and avoid forcible handling to avoid scratches; keep sharp points of tools or parts away from the eyes to avoid contusions;

- ◆ This model is made up of metallic parts mainly, and has a certain level of hardness and a certain weight; please place it properly to avoid bodily injuries; Protect the products and accessories against intense shock and vibration so as to avoid personal injury and product damage;
- ◆ During mechanical movement, do not put a finger or any other part of the body within the movement range to avoid contusions;
- ◆ Wire connectors must be connected according to the marks specified in the instruction manual to avoid short-circuit or failure arising from wrong connection;
- ◆ Charge, discharge and place the battery as required; it is advised to replace the battery when it has not been used for 3 months or more;
- ◆ Do not prevent any part from running forcibly in any form; to do this, turn off the power directly;
- ◆ To refit this model, please pay attention to the relevant part parameters, and avoid using any high-power electric part or device that may result in an accident.
- ◆ Please use parts of this product properly as per instruction manual. Don't use them for other purposes.

### II. Battery and charging precautions

- ◆ This product is delivered with dedicated charging cable. Users shall use their own power adapters; output DC voltage: 5V; output DC current  $\geq 1200\text{mA}$ ;
- ◆ Please make sure the contact is dry and free of dirt before charging. Please don't charge the battery if the product is not in use or is in repair;
- ◆ Don't put the battery in fire or have it exposed to sunlight, fire or similar excessively hot environment, since this may lead to leakage, excessively high temperature, bursting or ignition of battery;
- ◆ If improper change of battery may cause explosion, the battery must be replaced with one of identical or equivalent type;

- ◆ Never disassemble, squeeze, heat and set fire to the lithium battery delivered with this product, and never touch and pry the battery using any sharp object or screwdriver, etc., since this may cause the battery to ignite or burn;
- ◆ In the case of excessively high temperature, discoloration, bulging, leakage and other anomalies during the use, charging or keeping of battery, please take it out of service and change it with a new one to avoid safety problem;
- ◆ Since the battery temperature rises when it's being charged, please don't have the battery to come into contact with inflammables (e.g. bedside, clothing and books, etc.) since this may result in a fire;
- ◆ Please don't charge the battery in a moist space with high temperature; the temperature is recommended to be 0 ~ 35° C, and the humidity shall not exceed 65%; the design max. ambient temperature for using the product is 45° C;
- ◆ To alleviate the risk of electric shock, children are not allowed to use the product without the help of their parents or other custodians.

### III. Product Declaration

- ◆ Please carefully read and observe various instructions and warnings in this manual before using this product. Our company shall not be held responsible for any consequence of failure to properly use this product or observe related operating instructions;
- ◆ This product is suitable for users aged 14 and over. Our company shall not be held responsible for any safety problem arising from the use of this product by too young users or users who are not familiar with relevant safety requirements;
- ◆ As a model in industrial structure, this product is designed exclusively for learning and experience. Do not use this product for other purposes; otherwise, we will assume no responsibility for any consequence thereof;

- ◆ We have been improving the design and operation features of our product, so separate notice will not be given for slight difference between instruction manual and actual product. Hence, any claim for compensation filed based on the data, pictures or text of this instruction manual will be rejected;
- ◆ For constant improvement and sustainable development, our company reserves the right to modify and improve any product detail given in this manual without prior notice;
- ◆ The pictures in instruction manual guide users for operation, and are thus for indication only; the real product shall prevail;
- ◆ Our company and its suppliers shall not be held responsible for any special, incidental, collateral or indirect loss in any case to the greatest extent the law permits, regardless of its cause;
- ◆ Please keep this manual properly since it contains important information.

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Working Principle Of V2-T  
Engine  
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Engine  
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1

Assembly instructions  
**P3**

- P3. Cylinder head assembly
- P6. Crankshaft, piston connecting rods
- P11. Installation of the cylinder caps
- P13. Installation of flywheel
- P17. Installation of engine bracket
- P18. Circuit System
- P21. Installation of crankshaft pulley
- P23. Installation of generator assembly
- P25. Installation of starter motor assembly
- P30. Installation of propeller
- P31. Installation of idler pulley assembly
- P33. Gas distribution principle
- P38. Troubleshooting and analysis

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Parts list of V2-T Engine  
**P44**

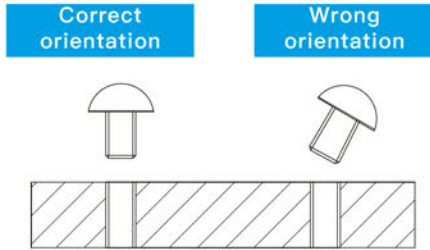




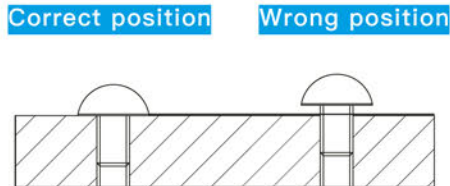
# Basic knowledge on standard parts assembly

## 1.Installation of screws

### (1) Installation of screws

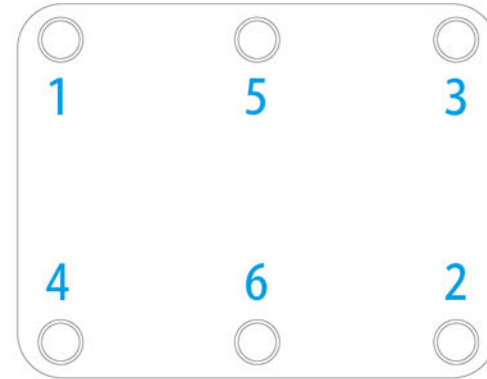


### (2)Degree of screw tightening

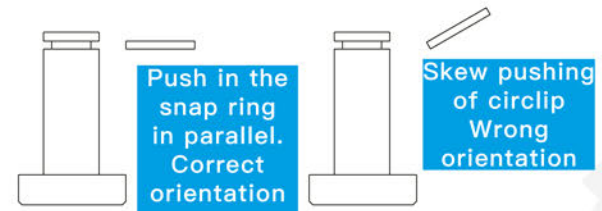


### (3)Screw installation order

Mount the screws diagonally in order of number

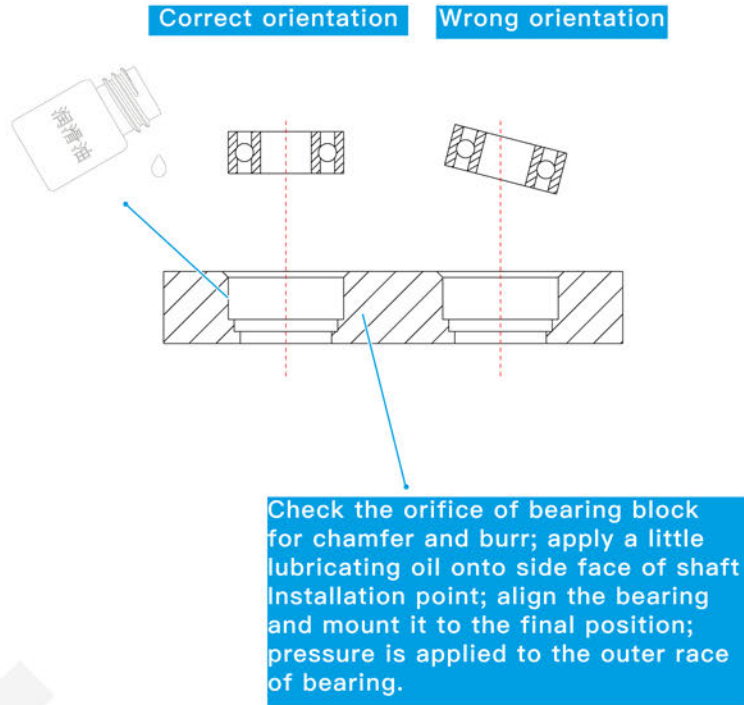


## 2.Installation of snap ring

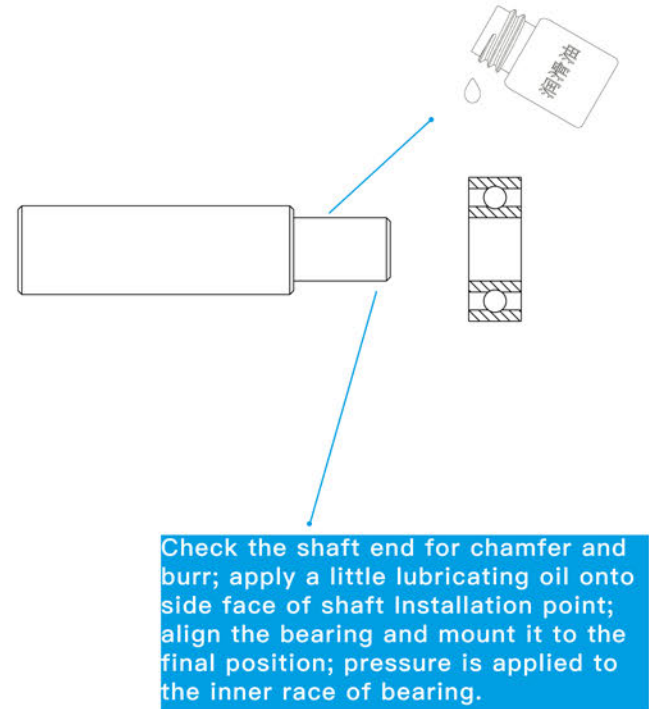


### 3.Installation of Bearing

(1)Install the bearing into the bearing seat hole



(2) Install the bearing onto the shaft

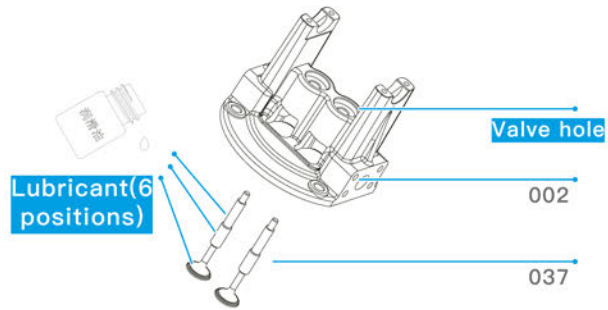


Important note: before assembly, find the bottled lubricating oil, be sure to put enough oil in all the places that need to be lubricated, otherwise the machine is easy to get stuck

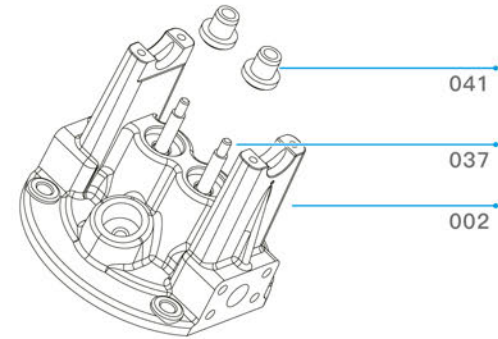


# 1 Assembly and disassembly of V2Engine

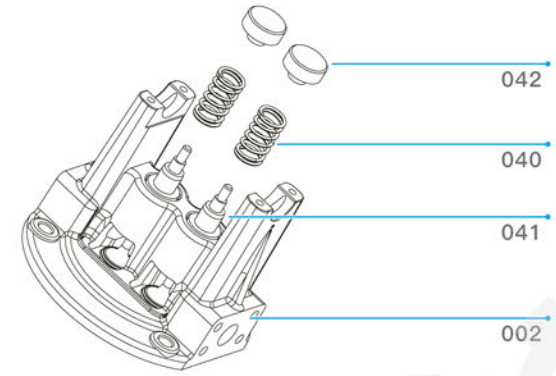
- 1. Composition Of The Cylinder Caps
- 1.1 Installing The Valves



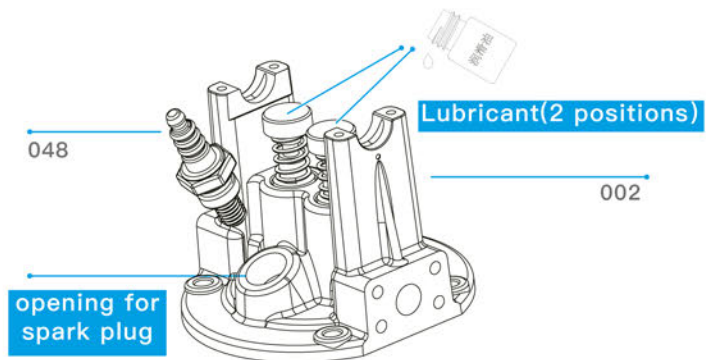
## 1.2 Installing Valve cover



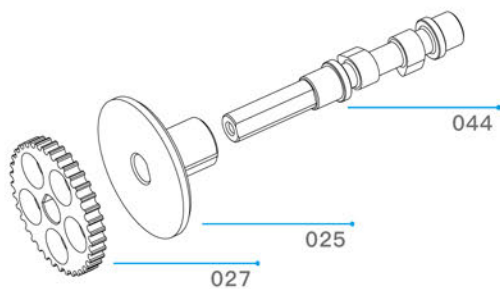
## 1.3 Installing of valve springs and valve caps



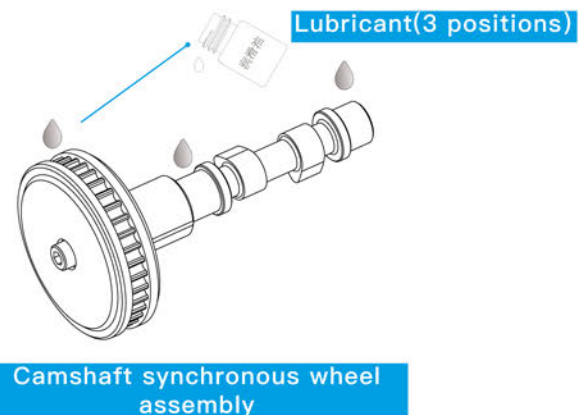
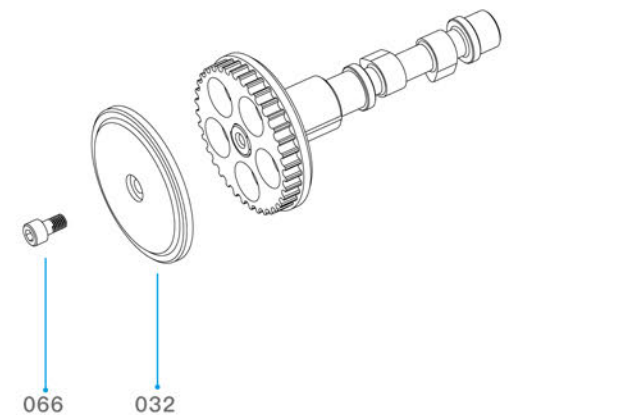
### 1.4 Installing Intake and Exhaust



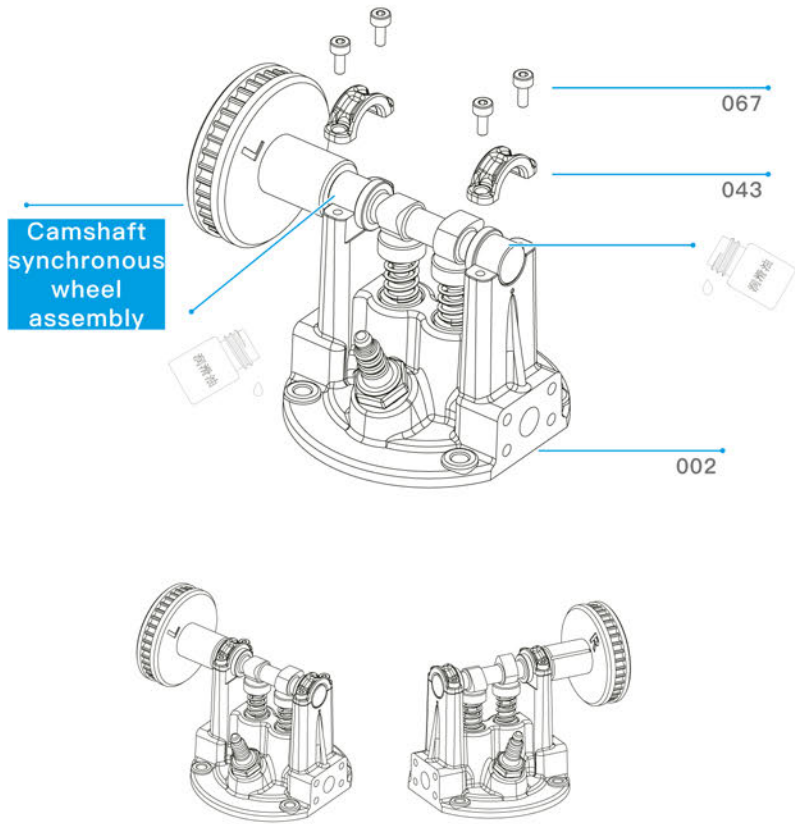
### 1.5 Installing Camshaft



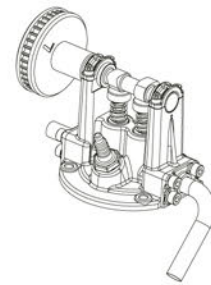
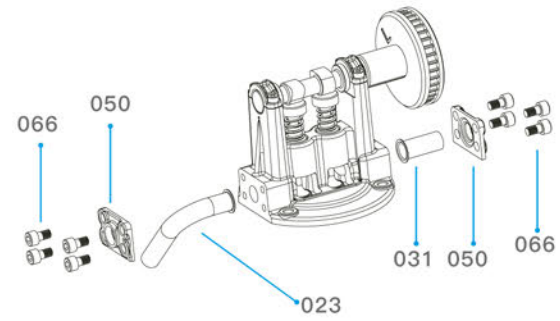
### 1.6 Connect the camshaft and the synchronous wheel



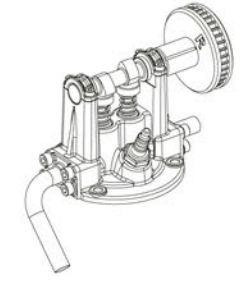
### 1.7 Composition Of The Cylinder block



### 1.8 Installing Exhaust pipe



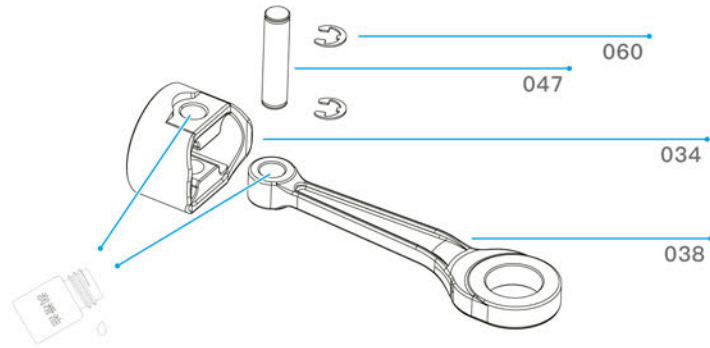
Left Cylinder Cap



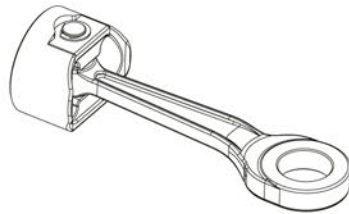
Right Cylinder Cap

## 2. Crankshaft, Piston Connecting Rods

### 2.1 Composition of Piston and Piston Connecting Rod

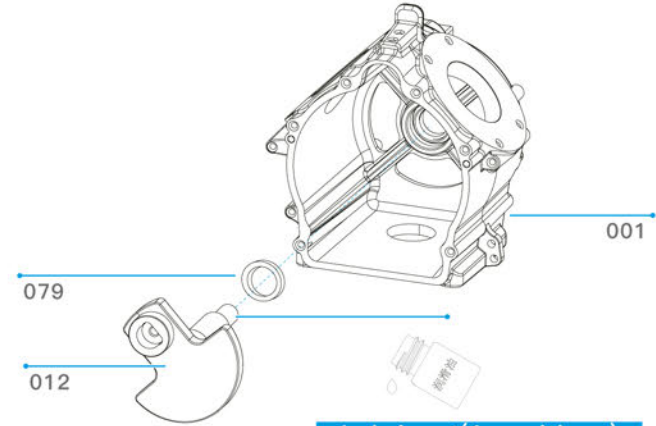


Lubricant(2 positions)

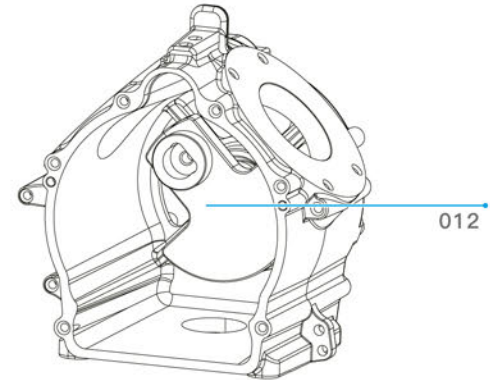


Piston Sets (Two Sets)

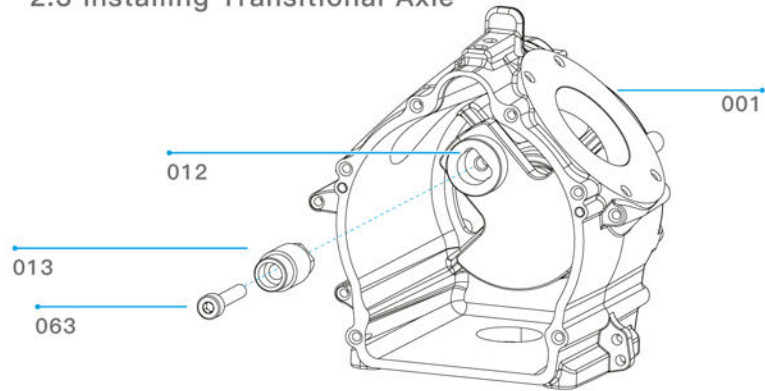
### 2.2 Installing Front Crankshaft



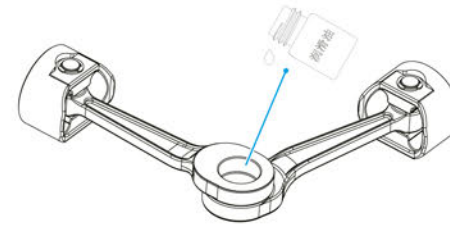
Lubricant(1 positions)



### 2.3 Installing Transitional Axle

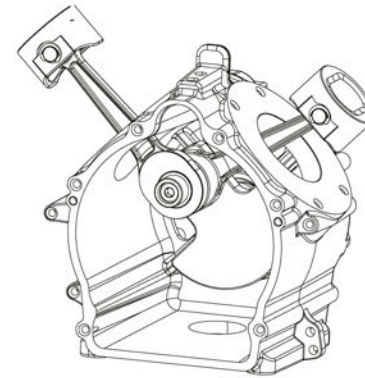
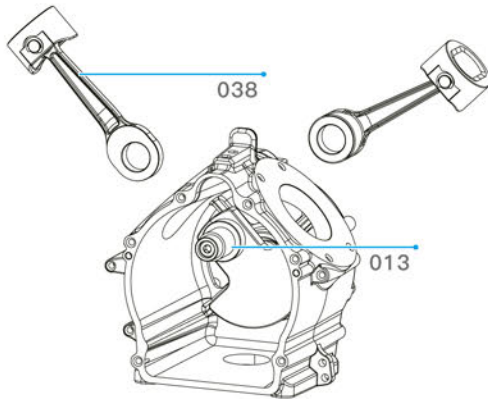


**Warning: Pay attention to the orientation when aligning the axle openings on the connecting rods, as shown below:**

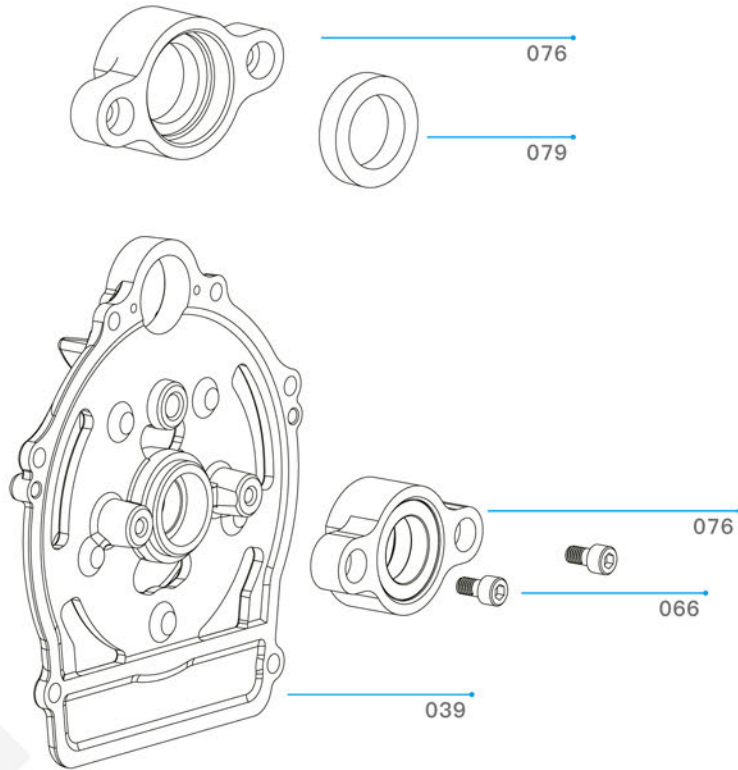


**The concave sides of connecting rods should face each other.**

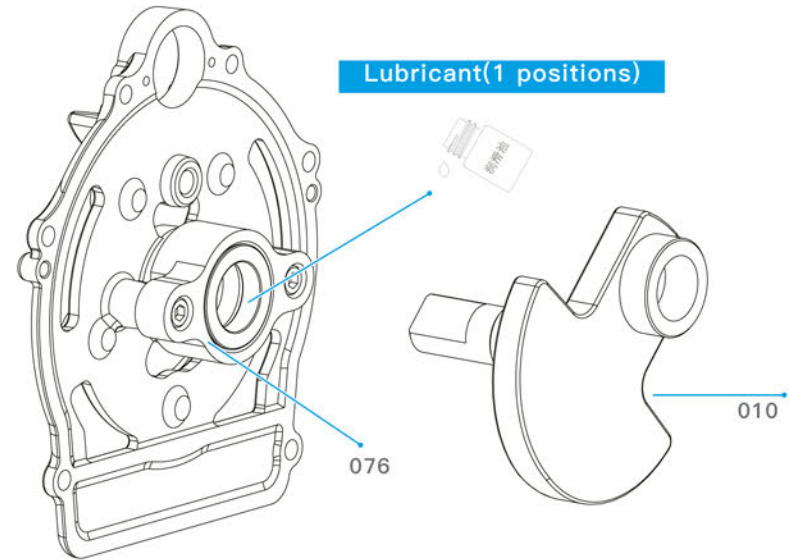
### 2.4 Assemble crankshaft and connecting rod



## 2.5 Installing the crankshaft sleeve

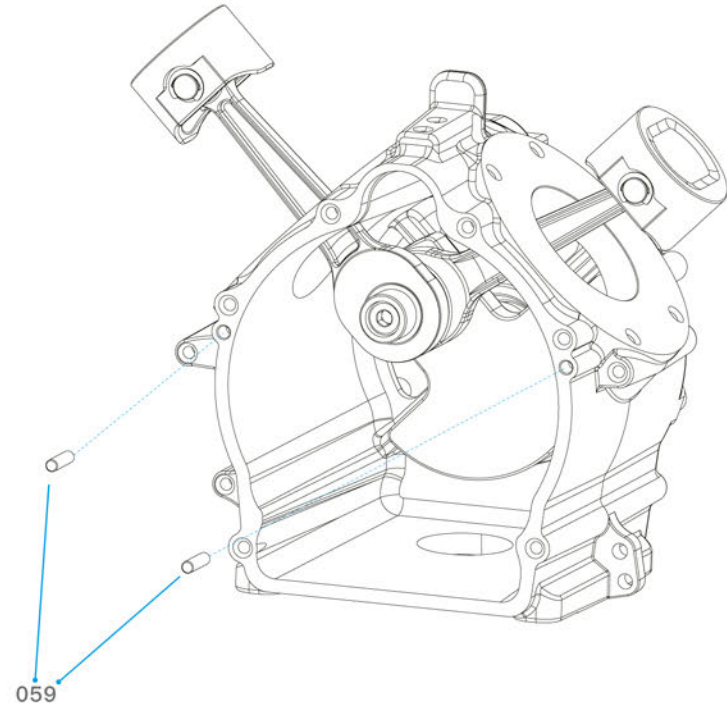
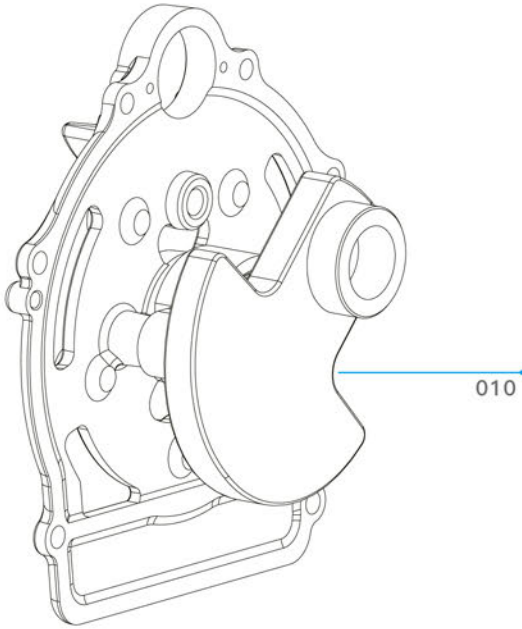


## 2.6 Installing Back Crankshaft

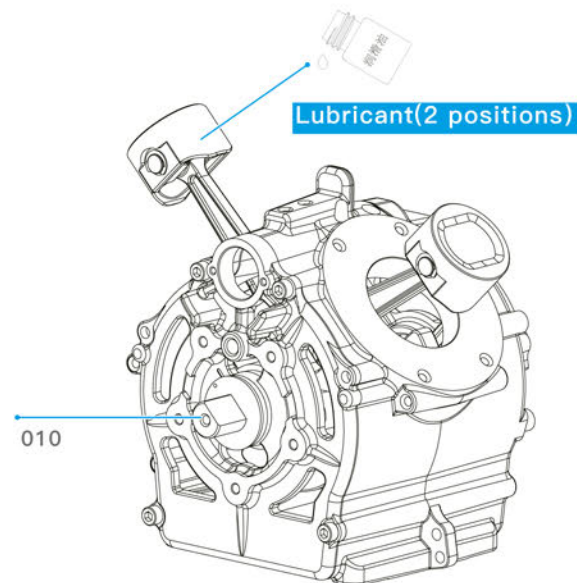
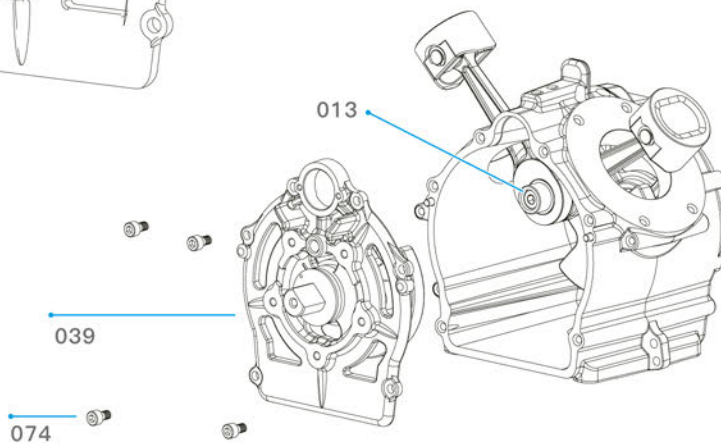
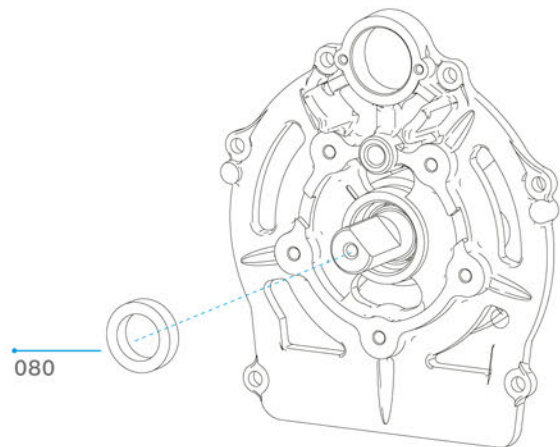




## 2.7 Installing Dowel Pins



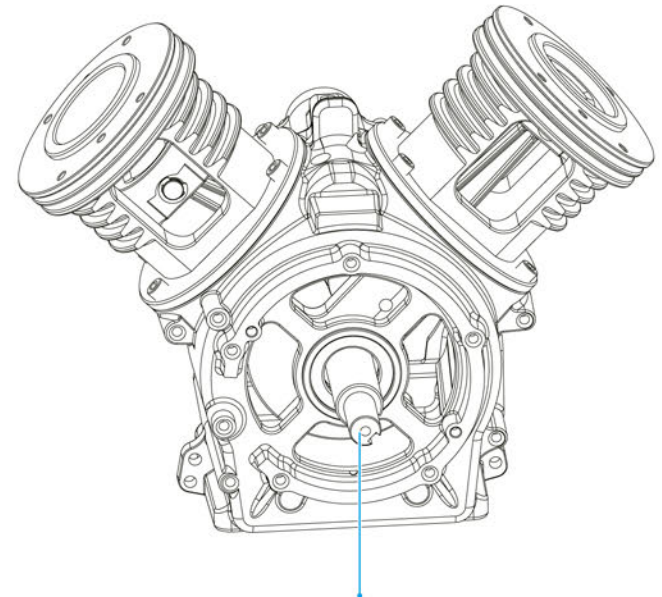
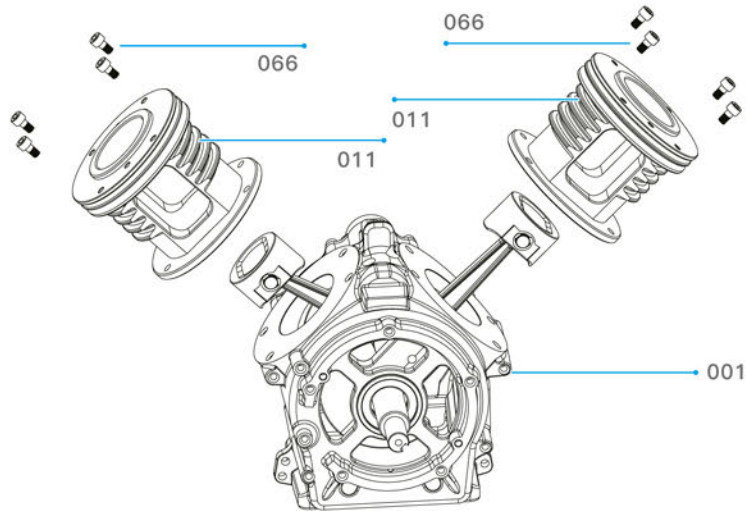
## 2.8 Installing Crankcase Back Plate



The crankshaft connecting rod is installed

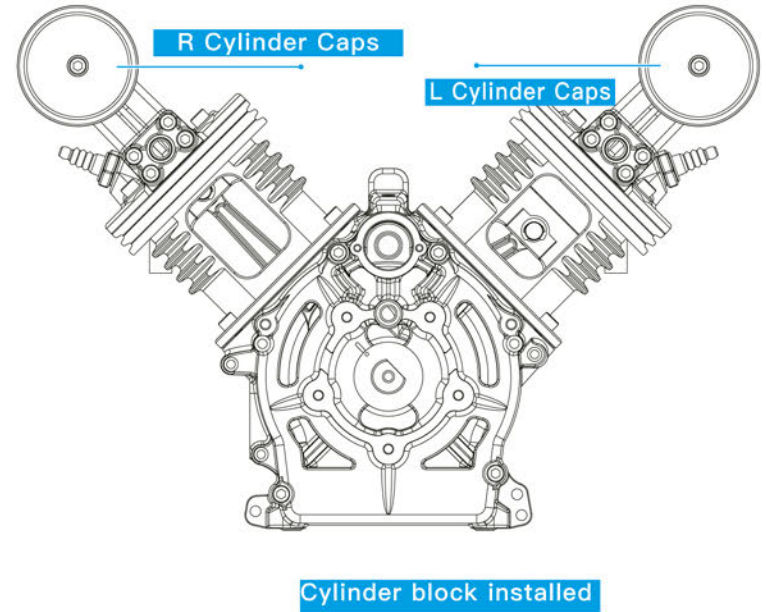
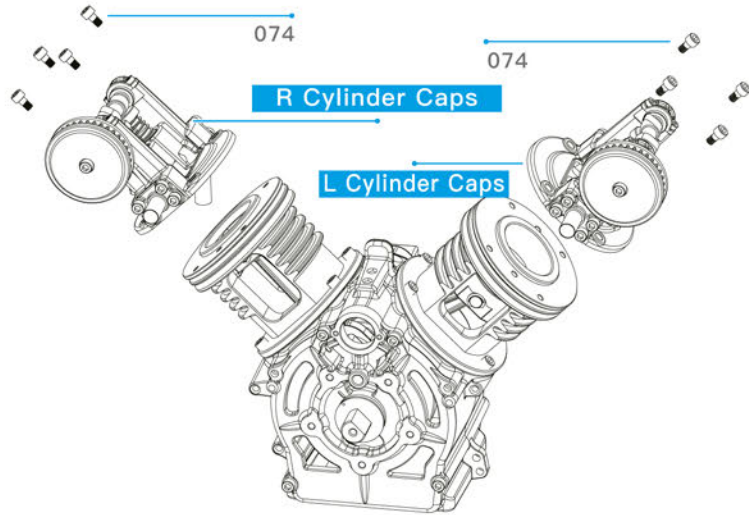
### 3. Installing the Cylinder Caps

#### 3.1 Installing and checking the Cylinder Caps



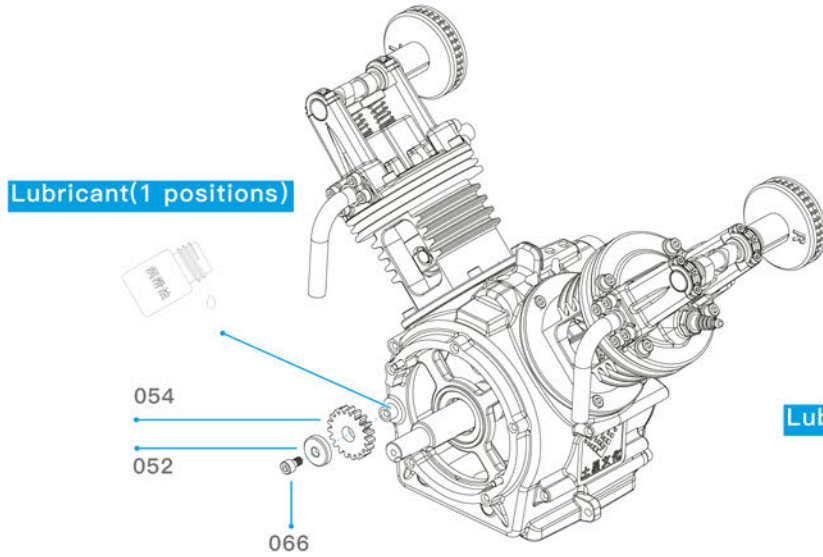
Rotate 010 to check whether the crankshaft and piston rotate normally

3.2 Rotate 010 to check whether the crankshaft and piston rotate normally

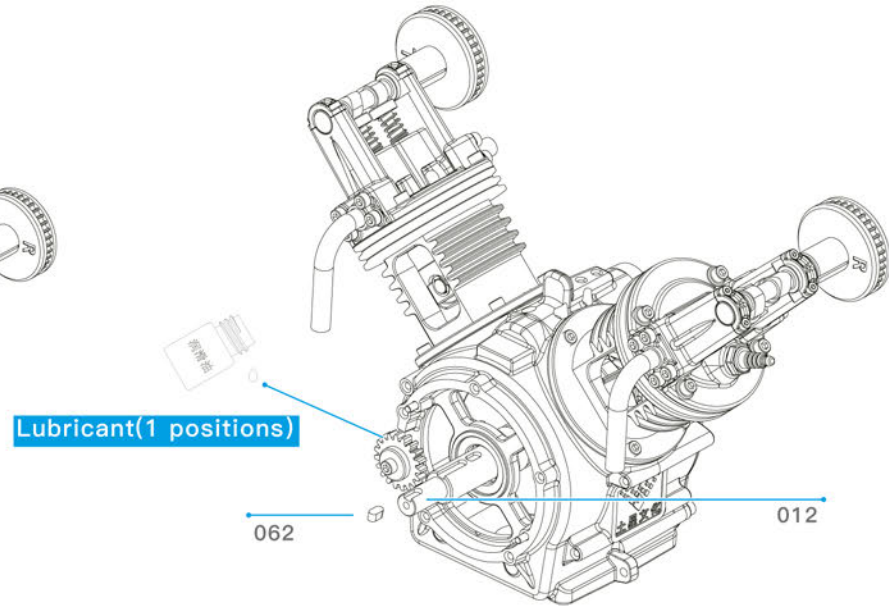


## 4. Installing Flywheel

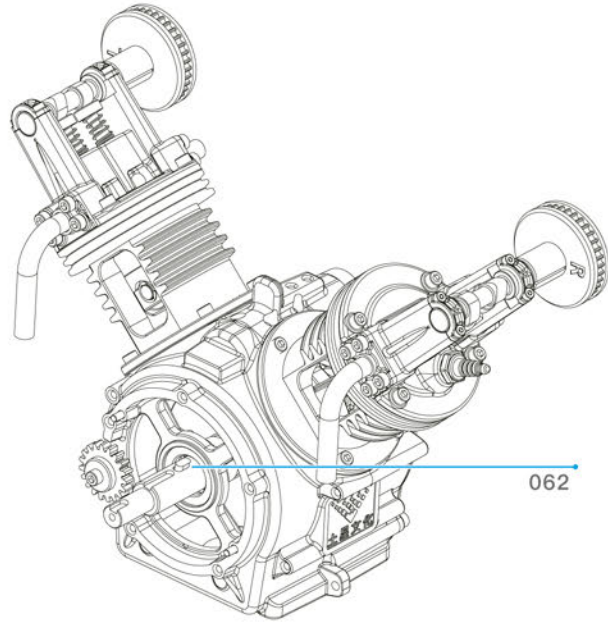
### 4.1 Installing Transitional Gears



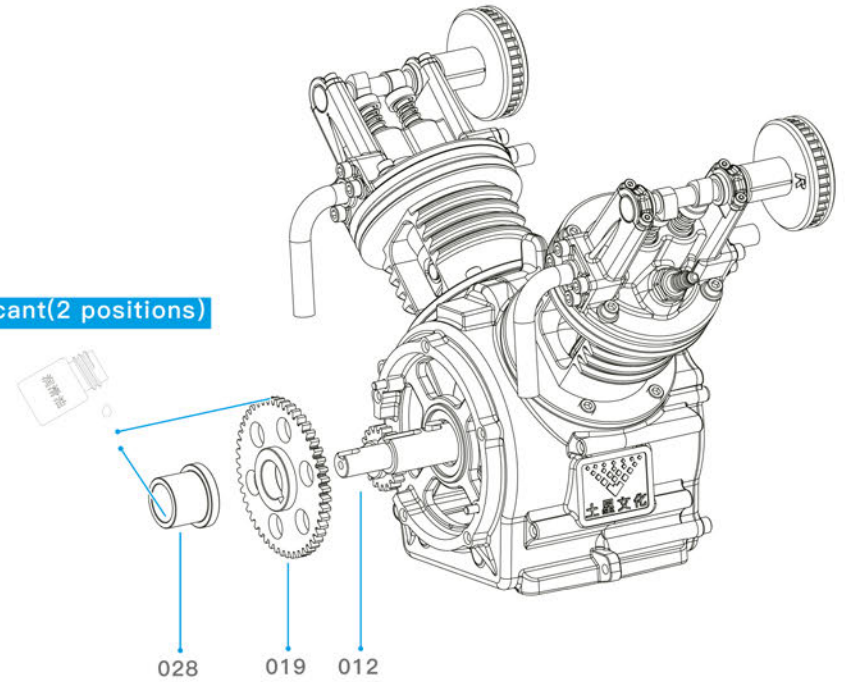
### 4.2 Fitting key



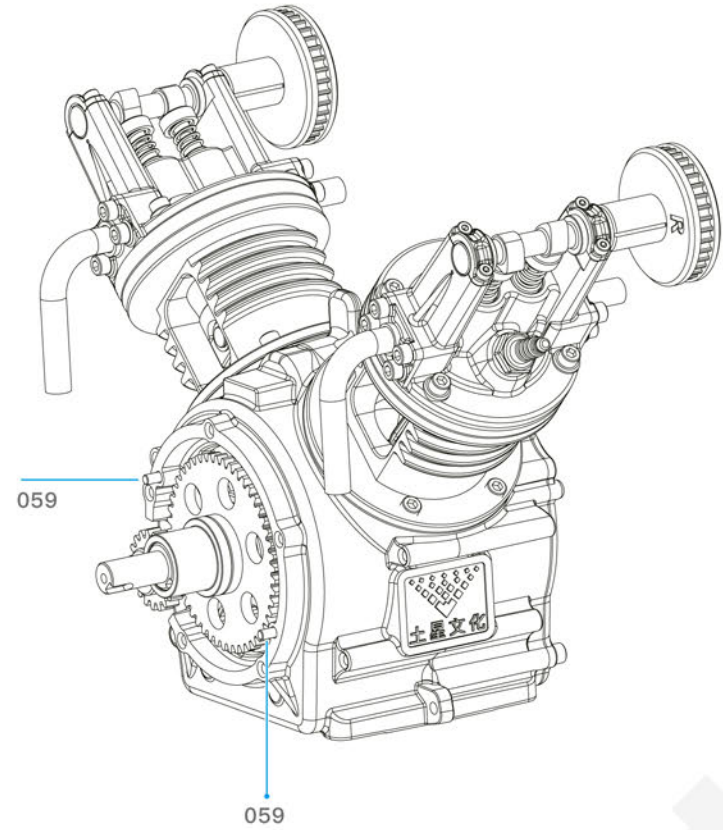
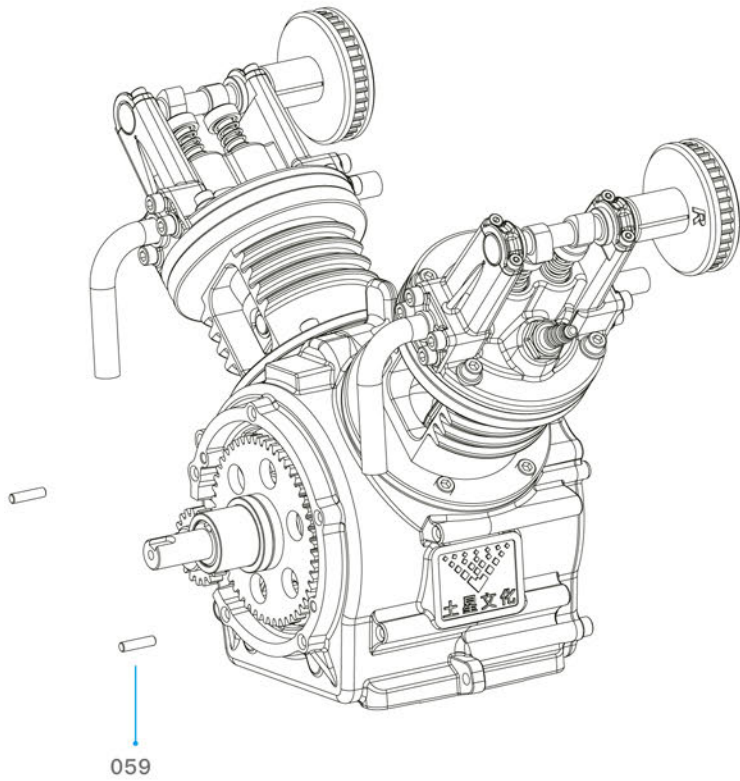
### 4.3 Installing Flywheel and shaft sleeve



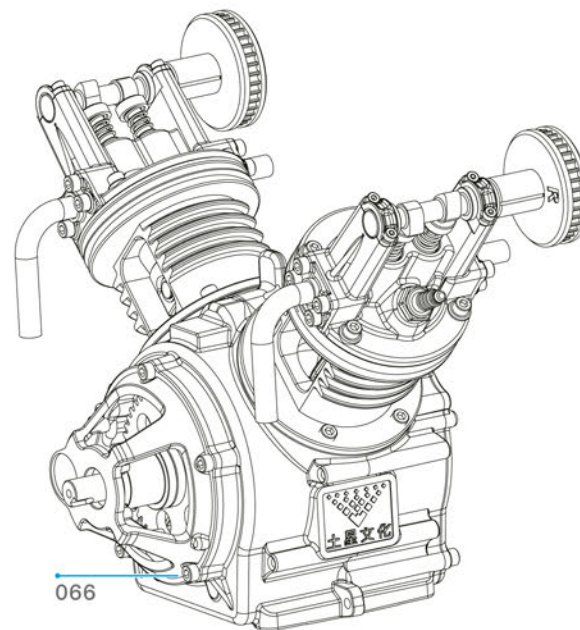
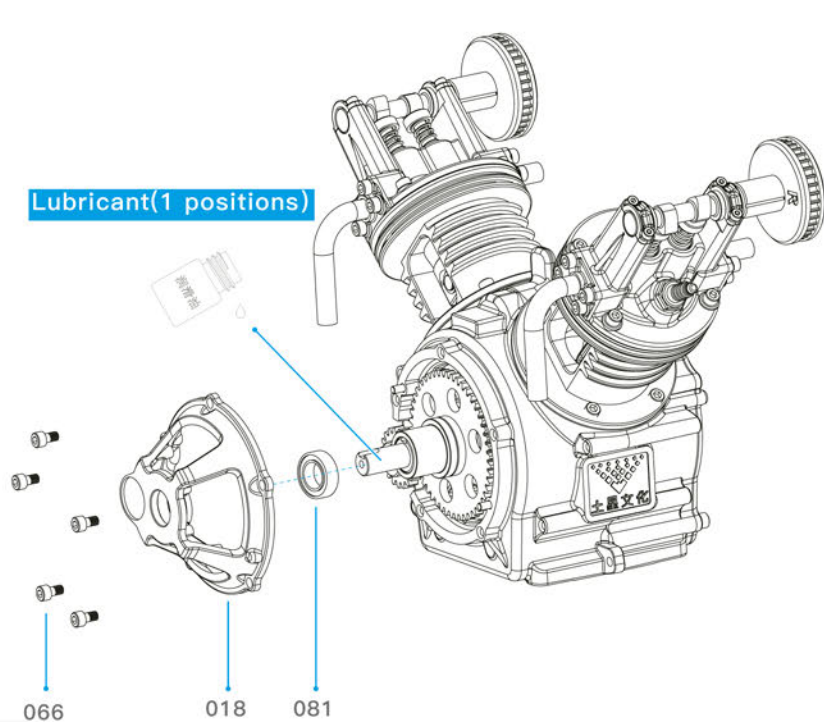
Lubricant(2 positions)



#### 4.4 Installing Dowel Pins



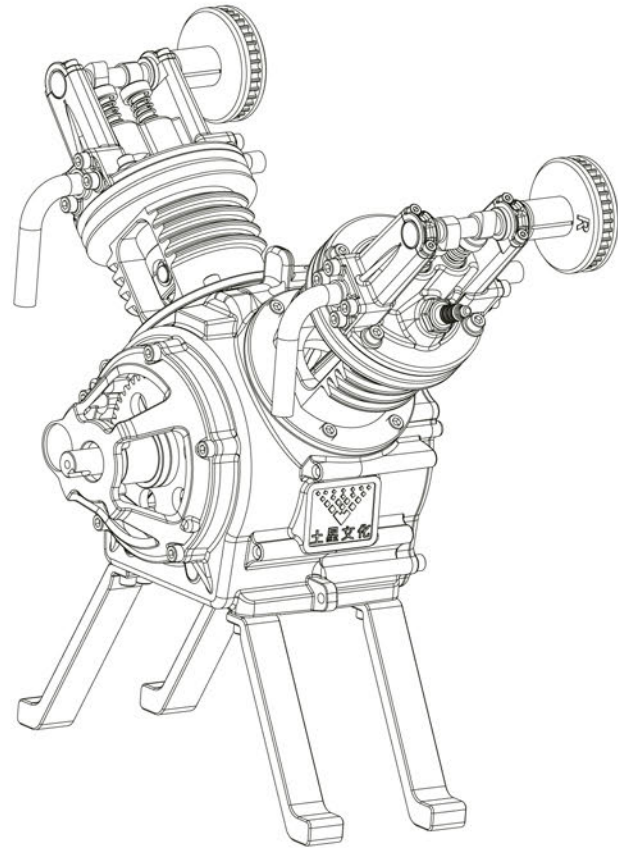
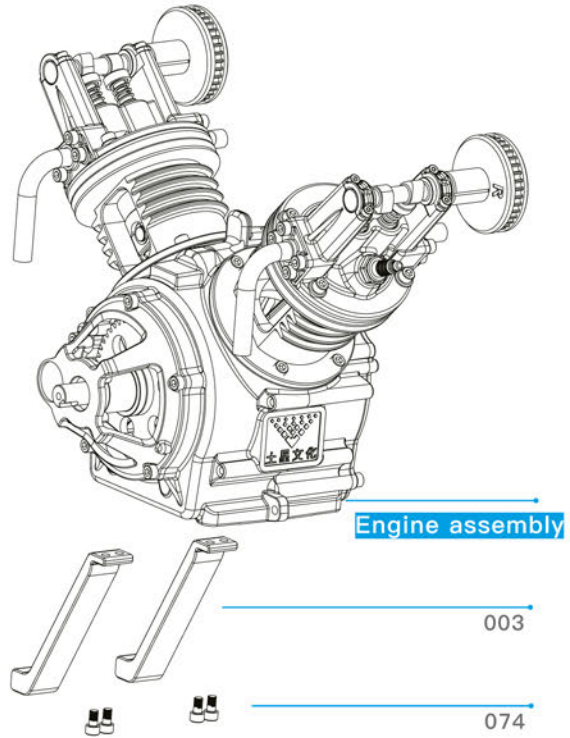
## 4.5 Installing Flywheel Plate



Engine assembly



## 5. Installing Supporting Base

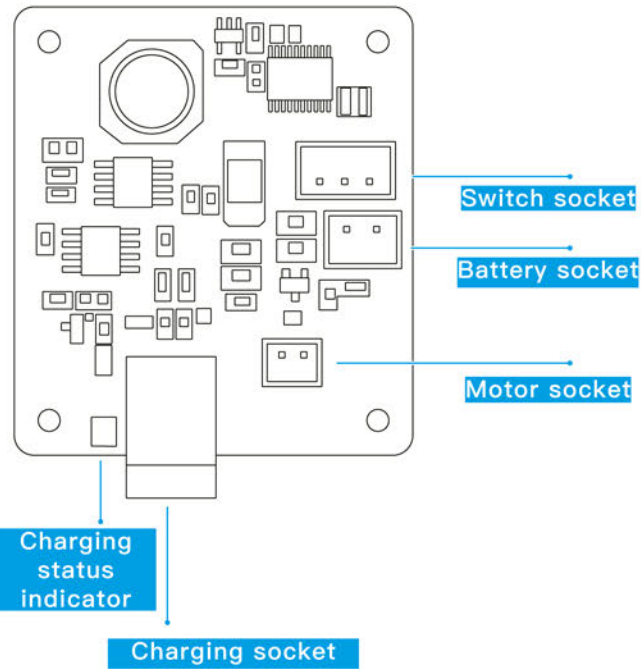


Supporting Base Installed

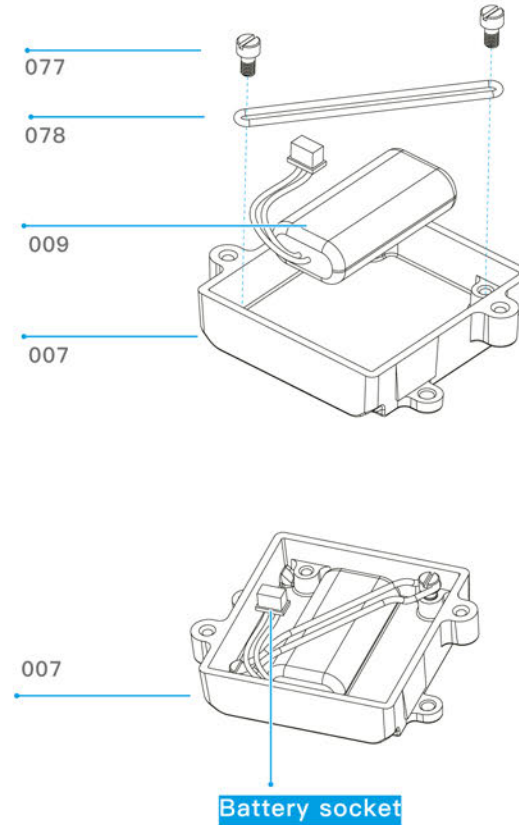
## 6. The Circuitry

### 6.1 Ports On The Circuit Board

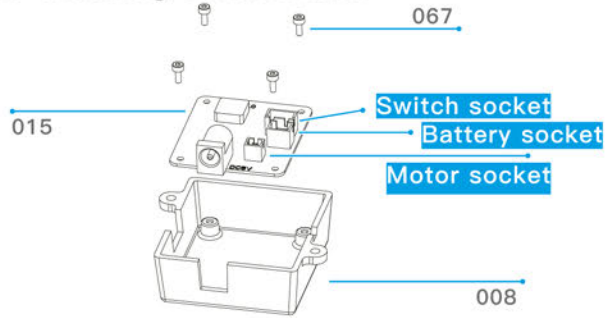
015 Board identification diagram



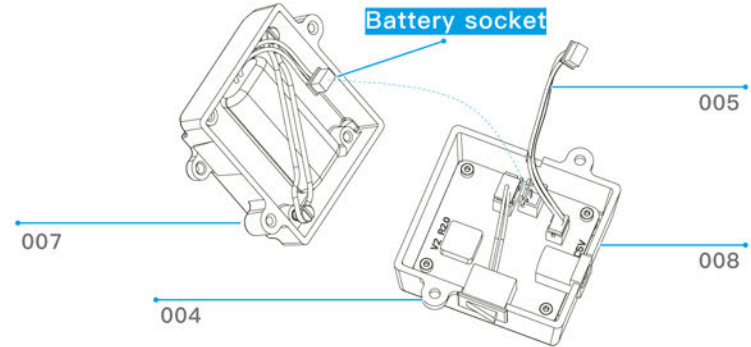
### 6.2 Installing Batteries



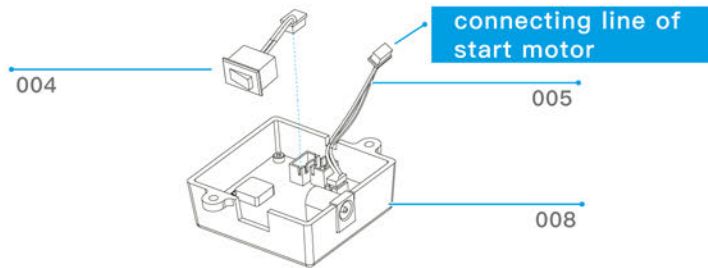
### 6.3 Installing Circuit Board



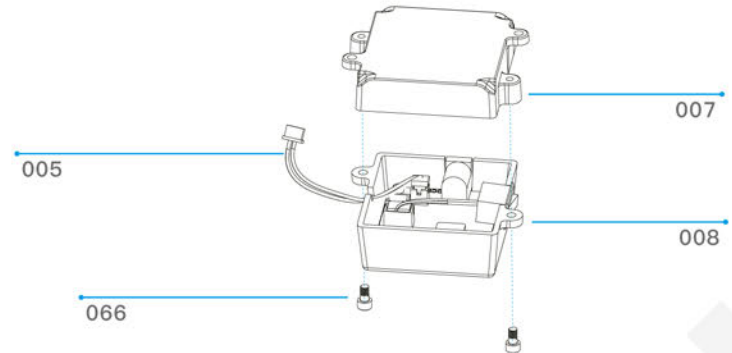
### 6.5 Wiring



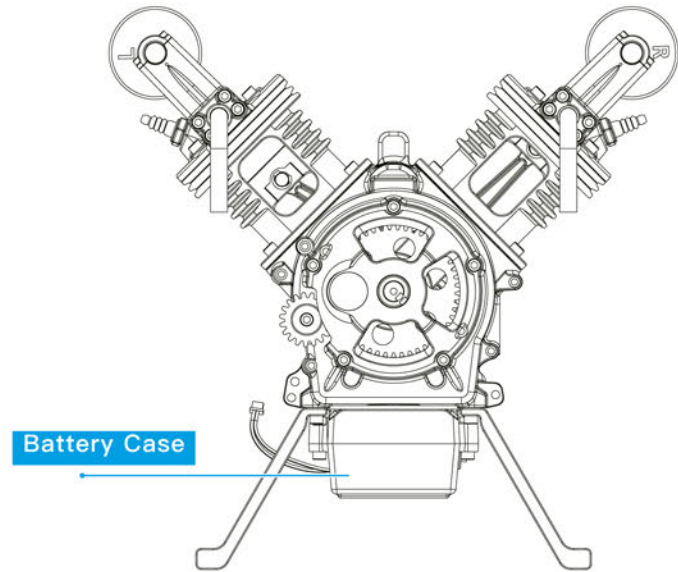
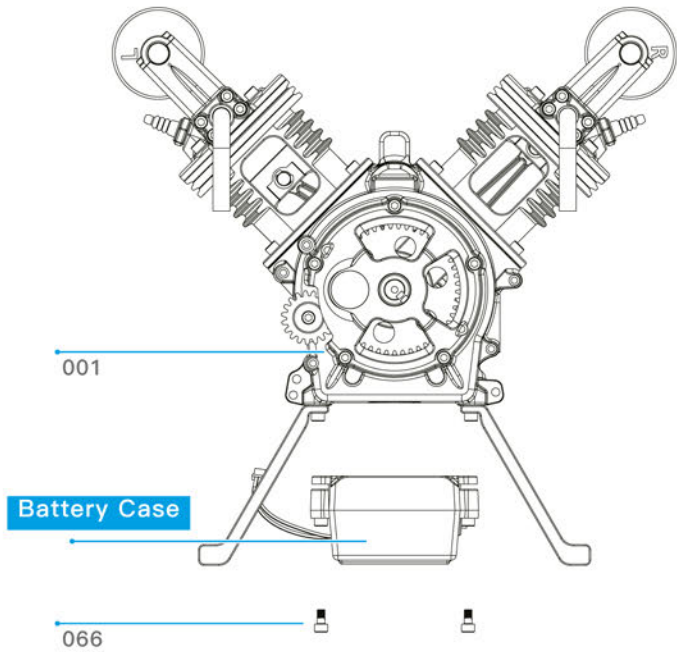
### 6.4 Installing The Power Switch



### 6.6 Installing Top And Bottom Plates



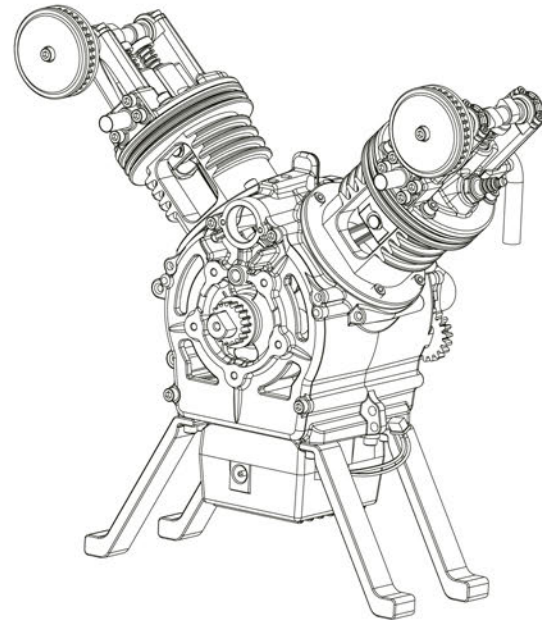
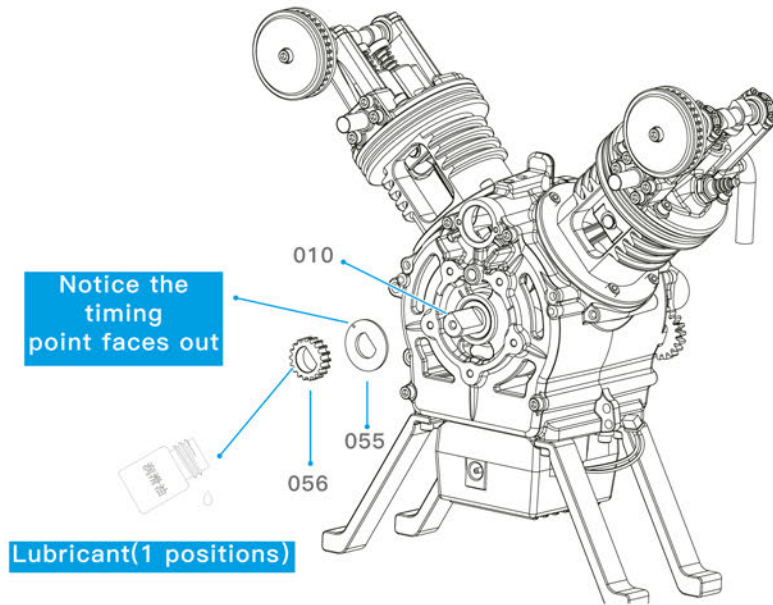
### 6.7 Screw the battery case to the base



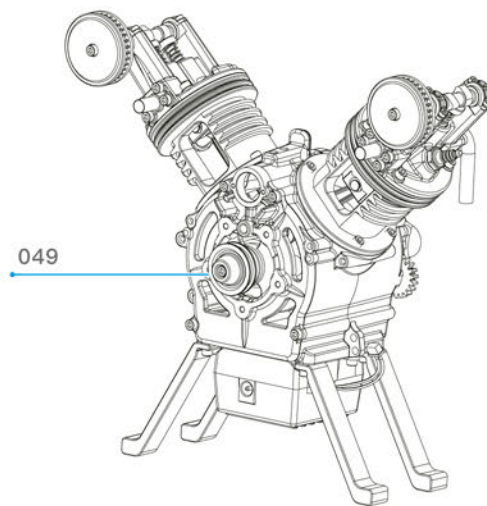
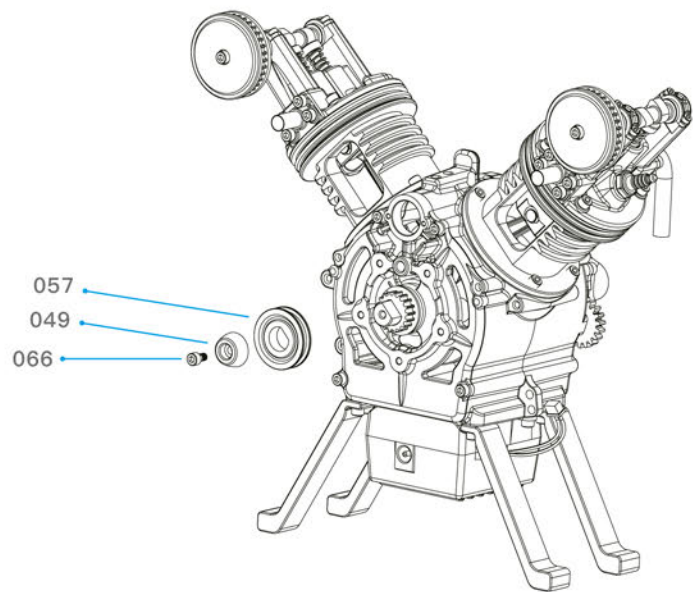
The Circuitry Installed

## 7. Installing Crankshaft and synchronous wheel

### 7.1 Installing synchronous and Synchronous wheel seat



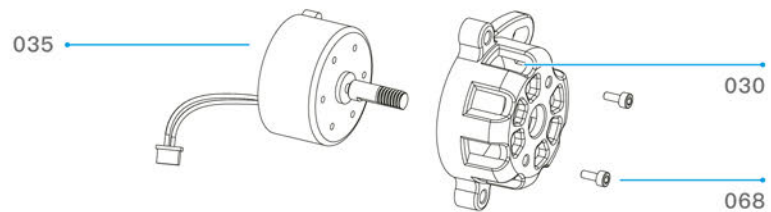
## 7.2 Installing crankshaft pulley and crankshaft cap



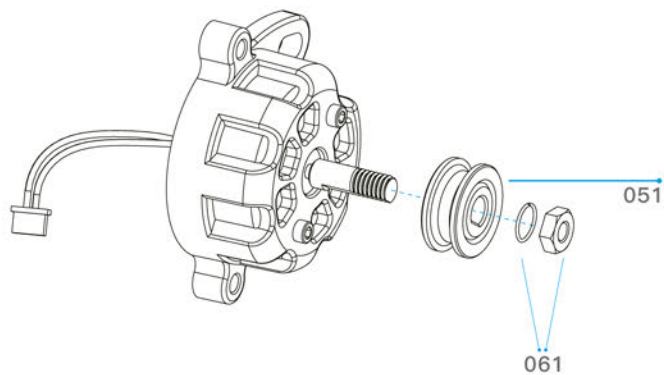
Crankshaft pulley and Crankshaft cap  
Installed

## 8. Installing Generators

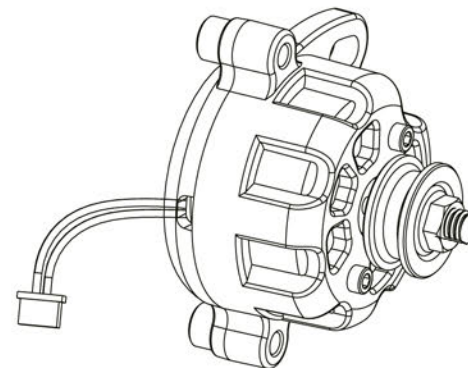
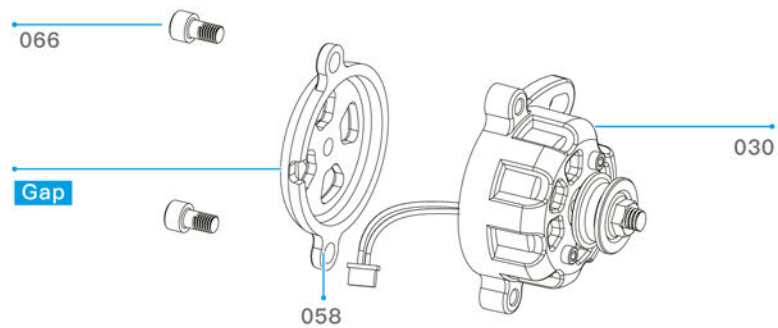
### 8.1 Installing the generator assembly



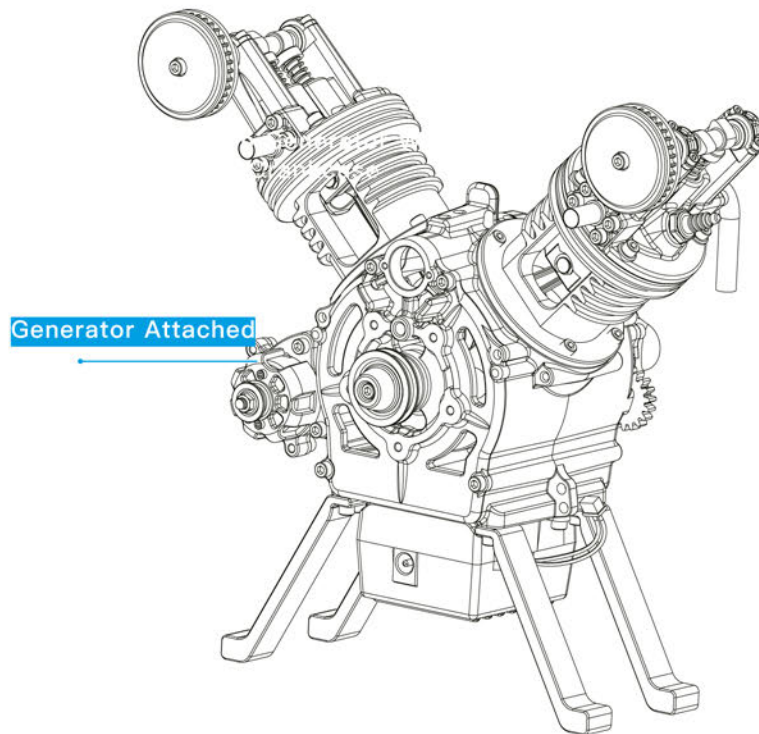
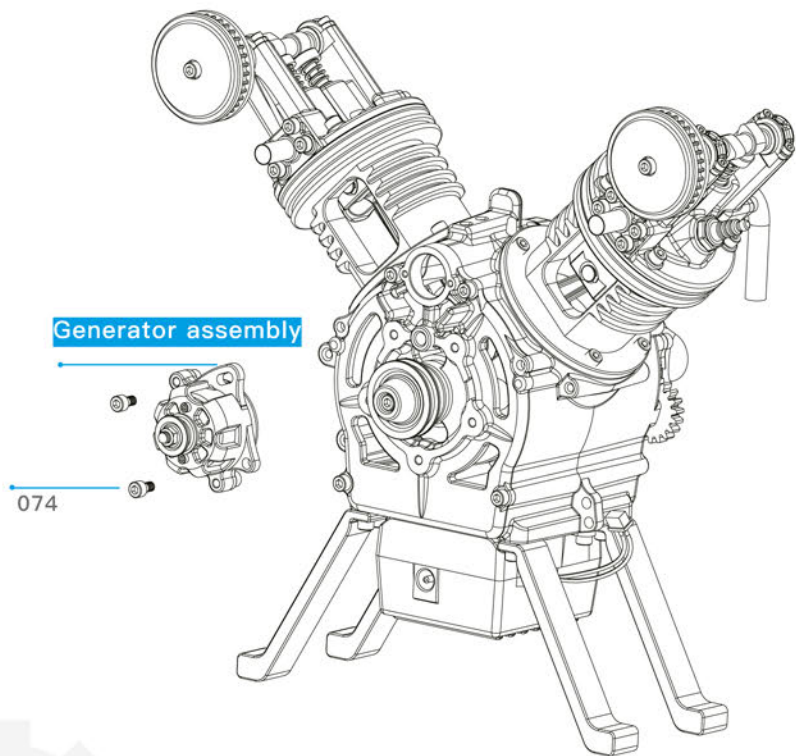
### 8.2 Installing Belt Pulley



### 8.3 Installing Generator Back Plate



## 8.4 Attach Generator With Crankcase

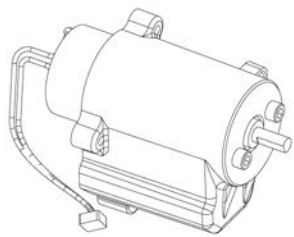
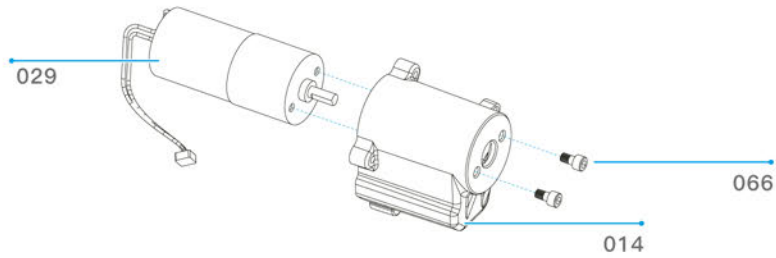


Generator Attached Instilled

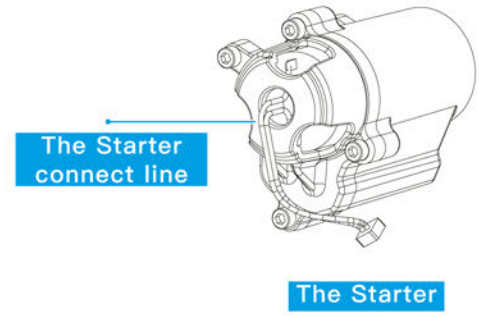
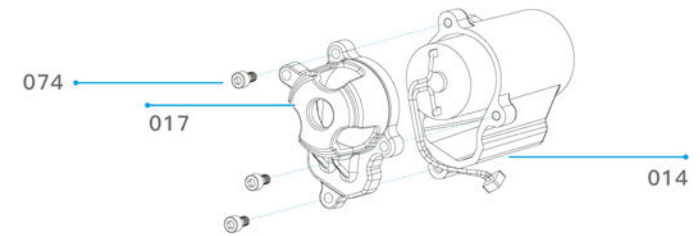


## 9. Installing The Starter

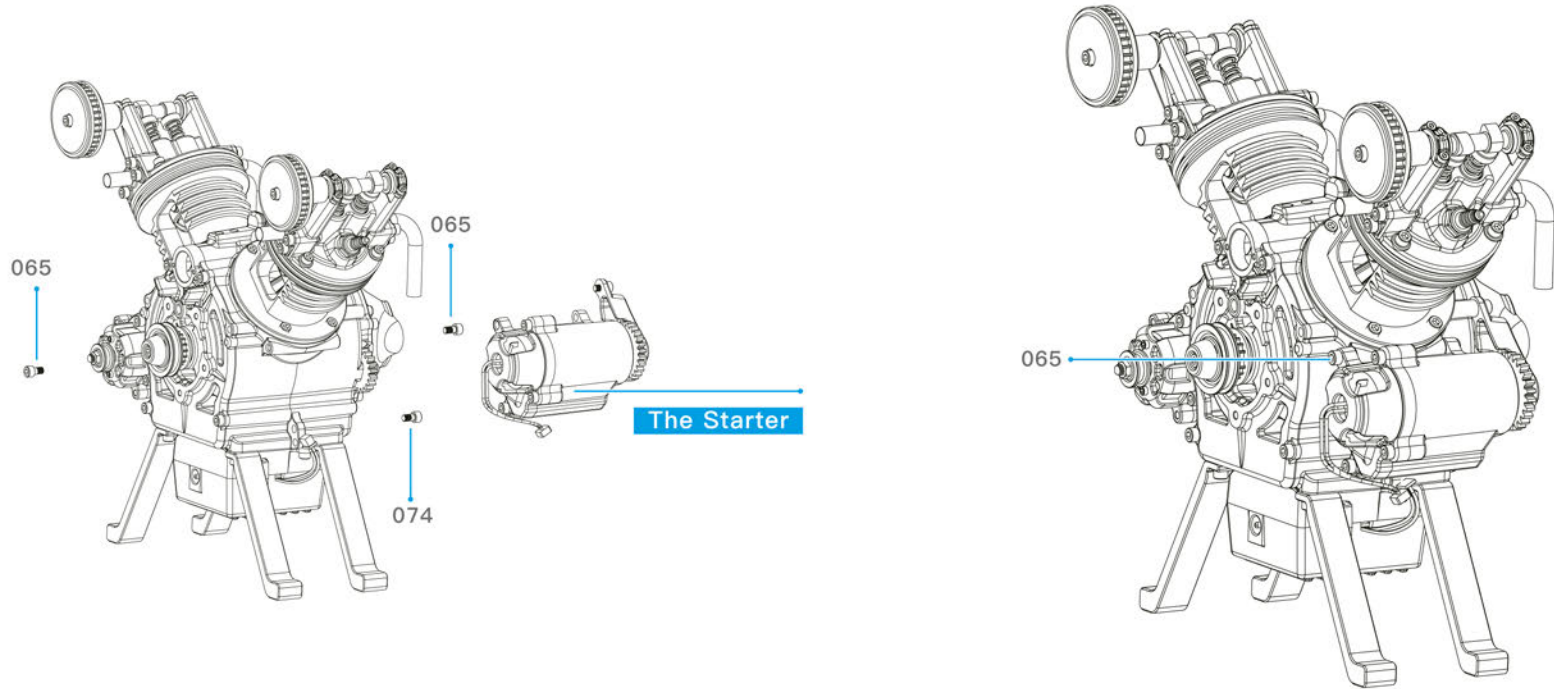
### 9.1 Attach Front Plate To The Starter



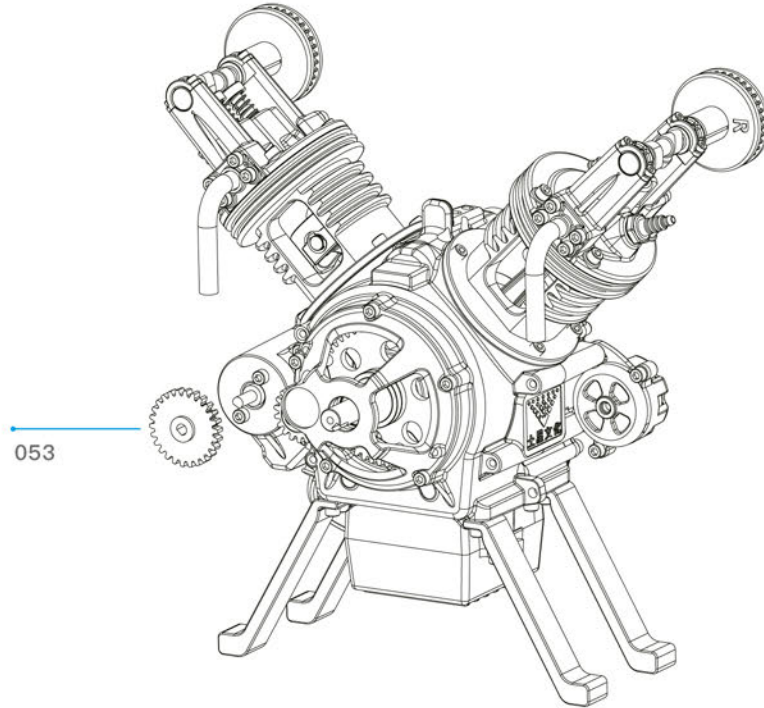
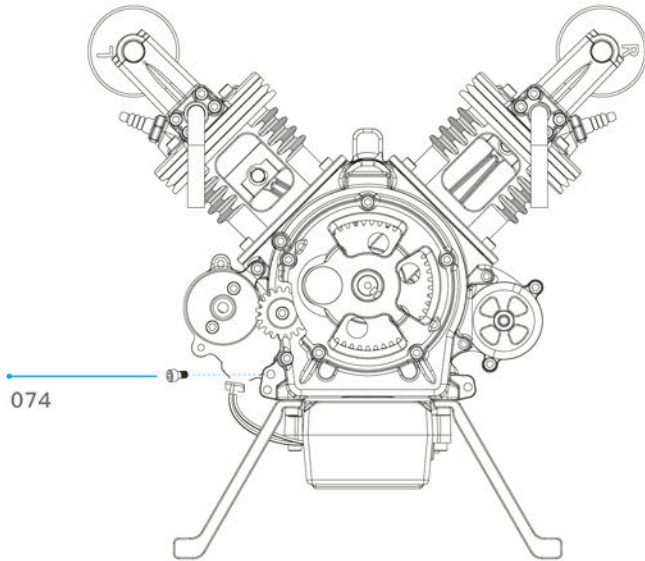
### 9.2 Installing The Starter Back Plate



### 9.3 Butt the starter motor assembly



## 9.4 Installing The Starter Gear

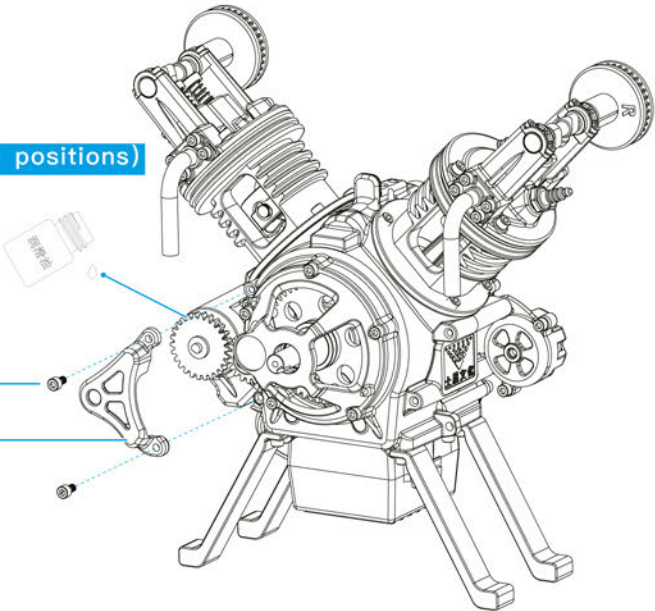


### 9.5 Attaching The Protective Plate

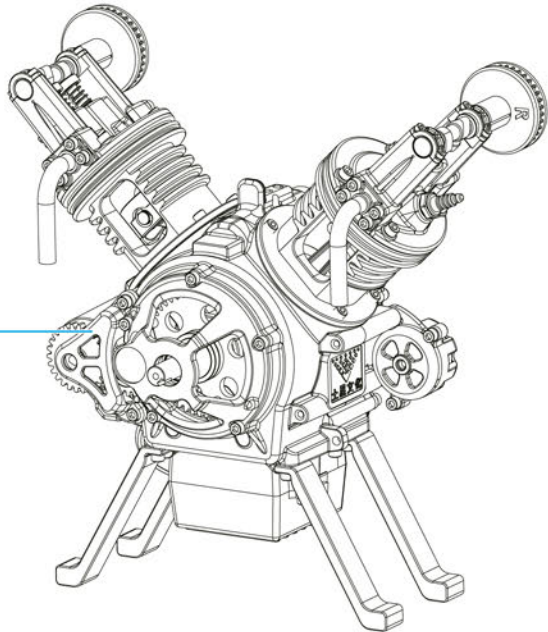
Lubricant(1 positions)

074

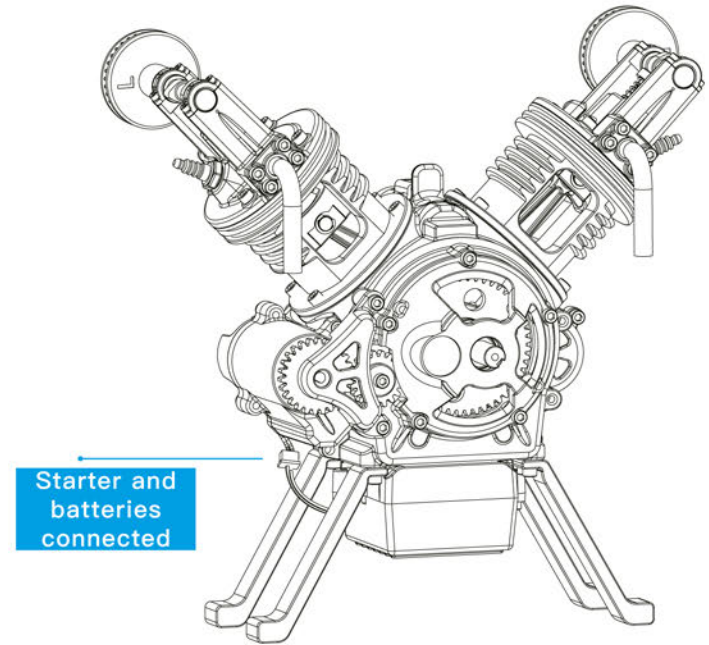
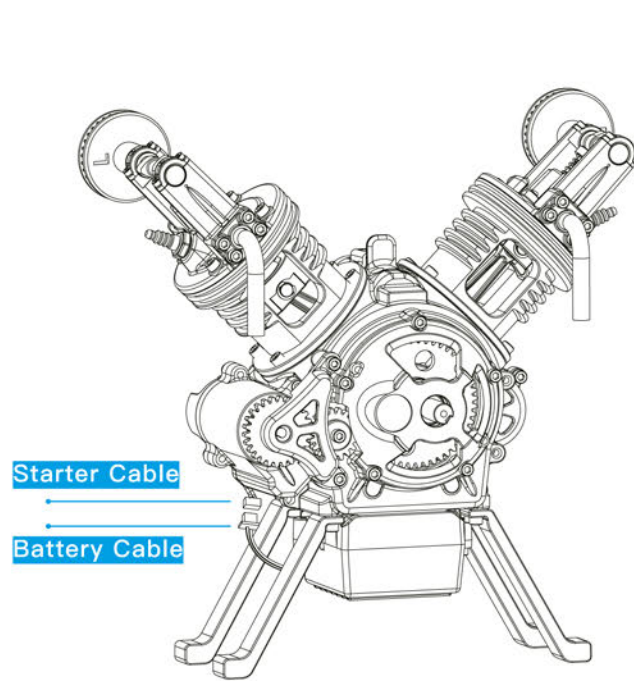
022



022



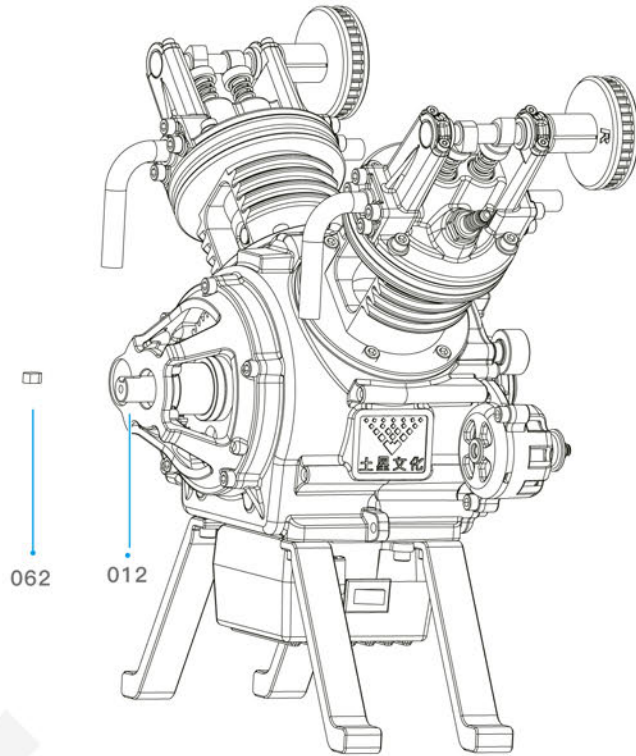
## 9.6 Connect Starter With Batteries



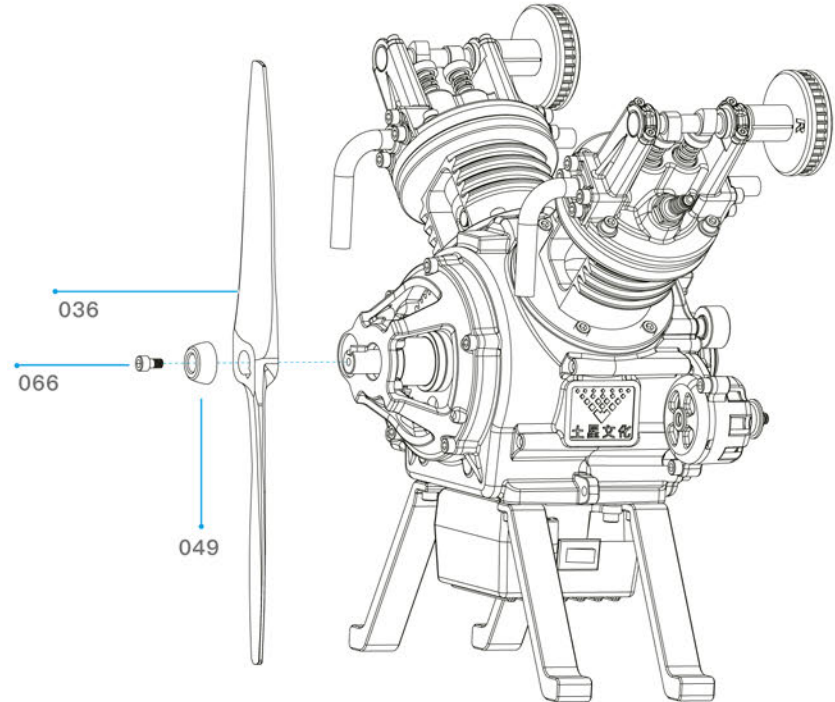
The Starter Installed

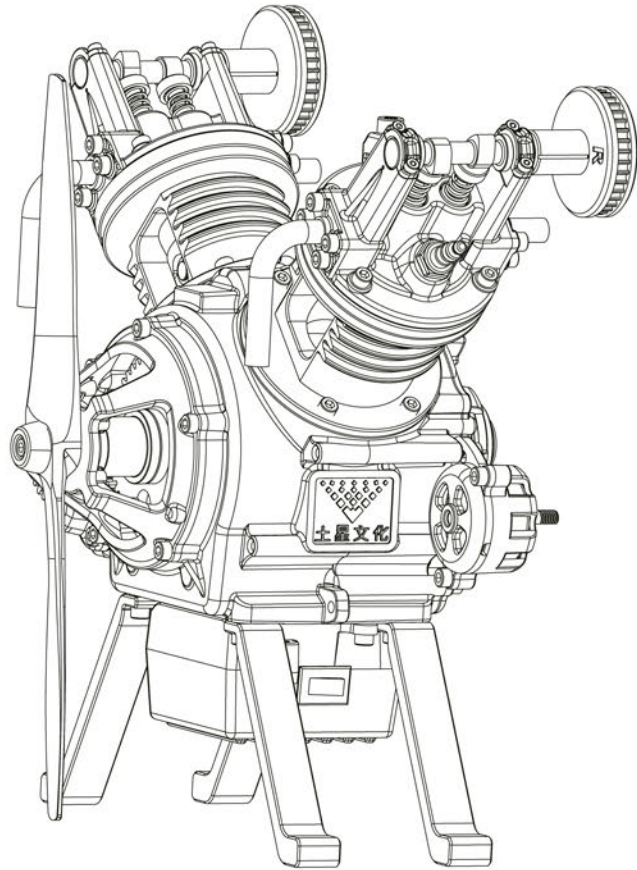
## 10. Installing The Propeller

### 10.1 Fitting key



### 10.2 Installing Propeller and Crankshaft Cap

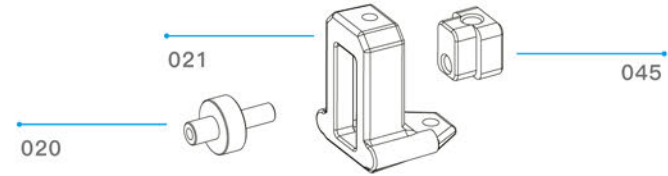




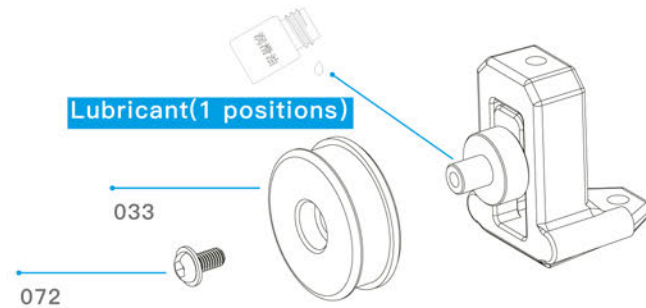
The Propeller Installed

## 11.Installing The idler pulley Assembly

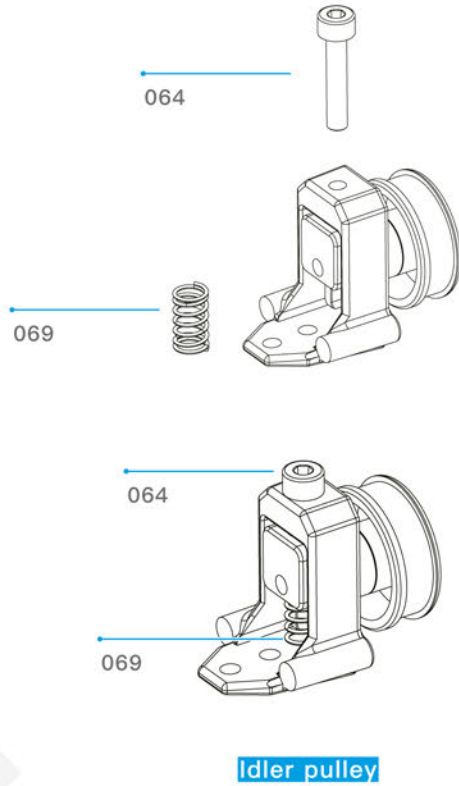
11.1 Connect The idler pulley block and The idler pulley axle



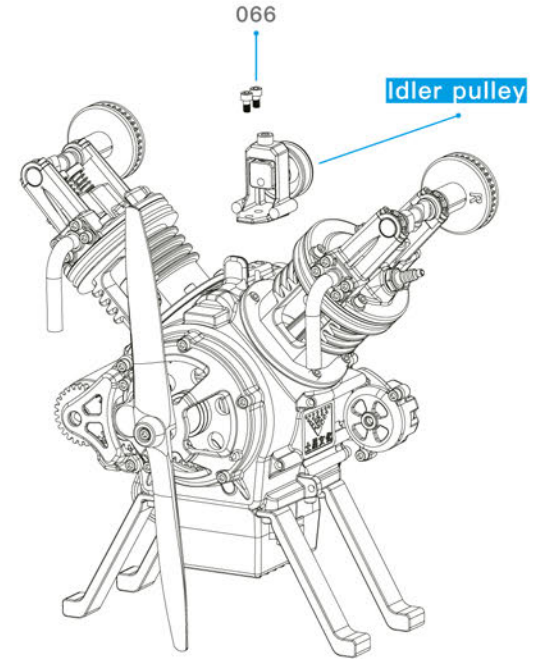
11.2 Connect The idler pulley and The idler pulley stand



### 11.3 Installing The Spring and The Regulating screw



### 11.4 Attach The idler pulley Assembly With Crankcase

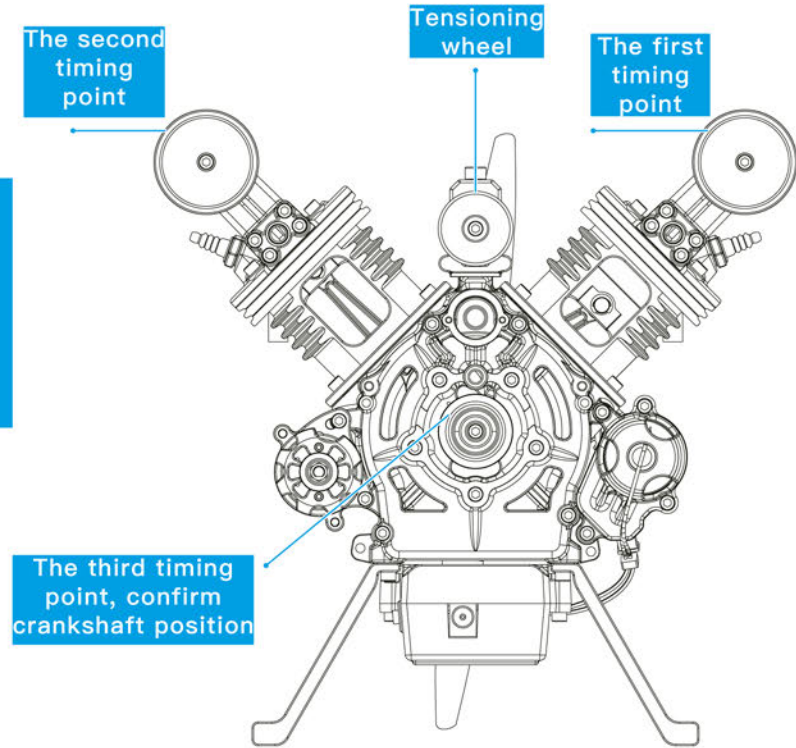




## 12.Distribution principle

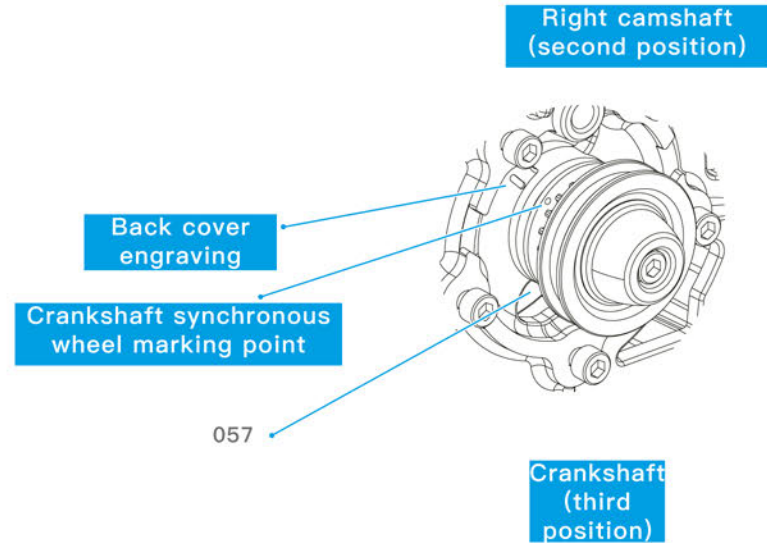
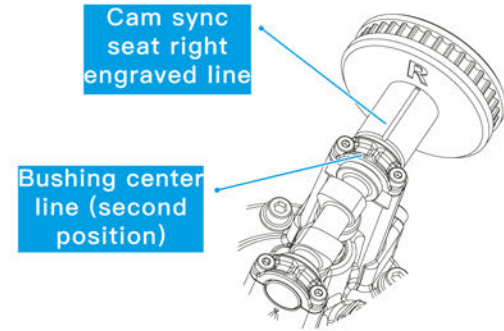
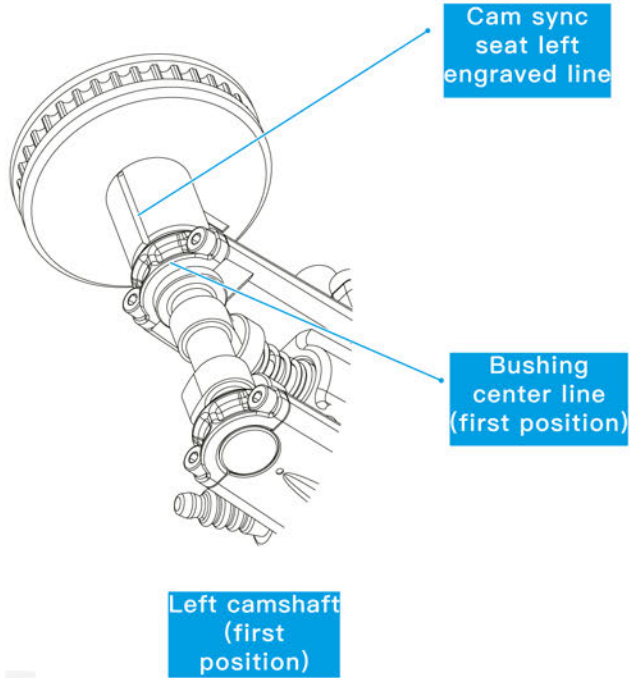
### 12.1 Timing Calibration

1. Adjust the idler pulley to the highest position.
2. Rotate the crankshaft and adjust the crankshaft to the timing position, that is, align the mark points according to the picture.
3. Rotate the camshaft to ensure that the crankshaft mark points are aligned while the left and right CAM timing mark points are aligned.
4. Make sure all three positive time points are aligned.

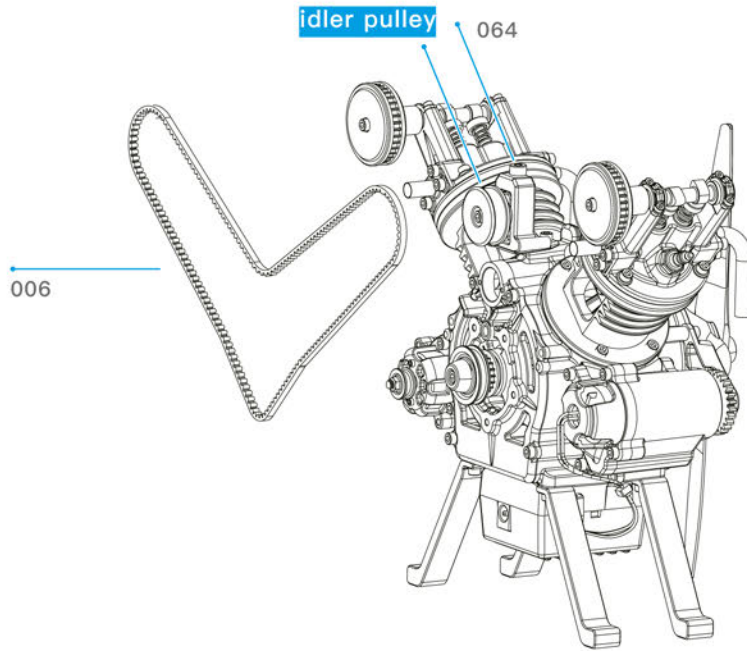


**[Note] Three positions need Timing:**

First position: the timing mark arrow of the left camshaft corresponds to the mark point on the cylinder head  
Second position: the timing mark arrow of the right camshaft corresponds to the mark point on the cylinder head  
Third position: the timing mark of the crankshaft corresponds to the mark of the back cover

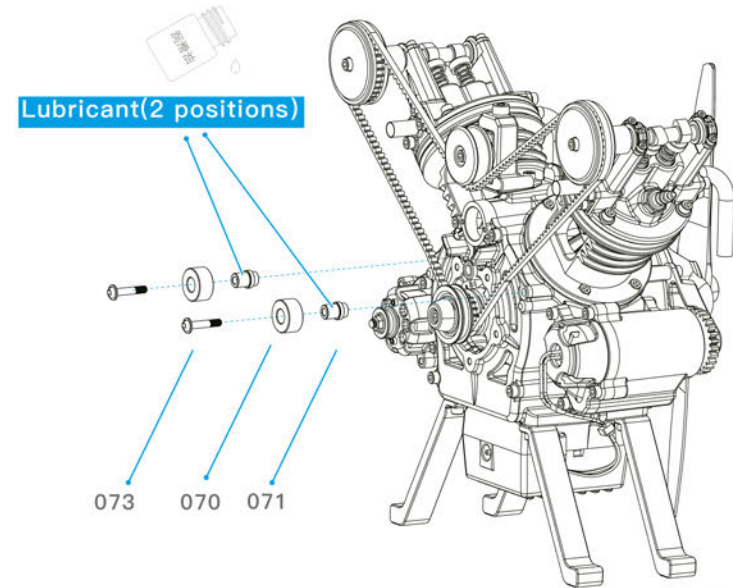


## 12.2 Installing Synchronous belt

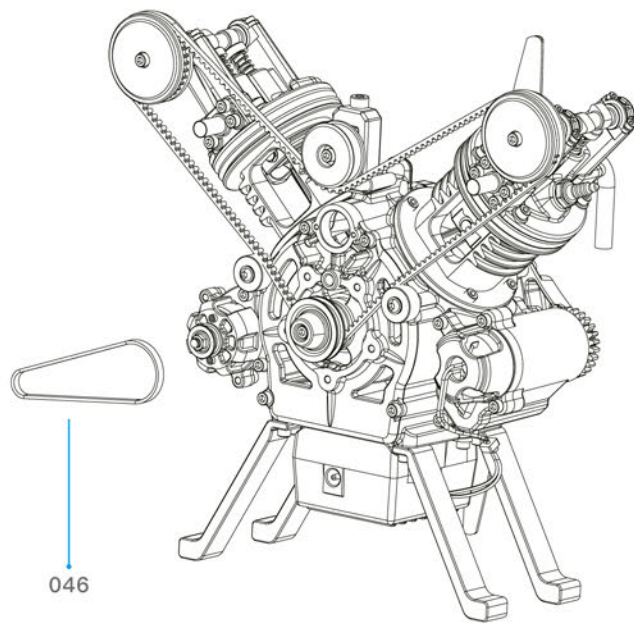


1. Slide the timing belt into the timing wheel on the crankshaft and camshaft and tighten it slightly.
2. Make sure all three points are aligned, press the belt with the Idler pulley, and then press the Idler pulley under the adjusting Regulating screw.

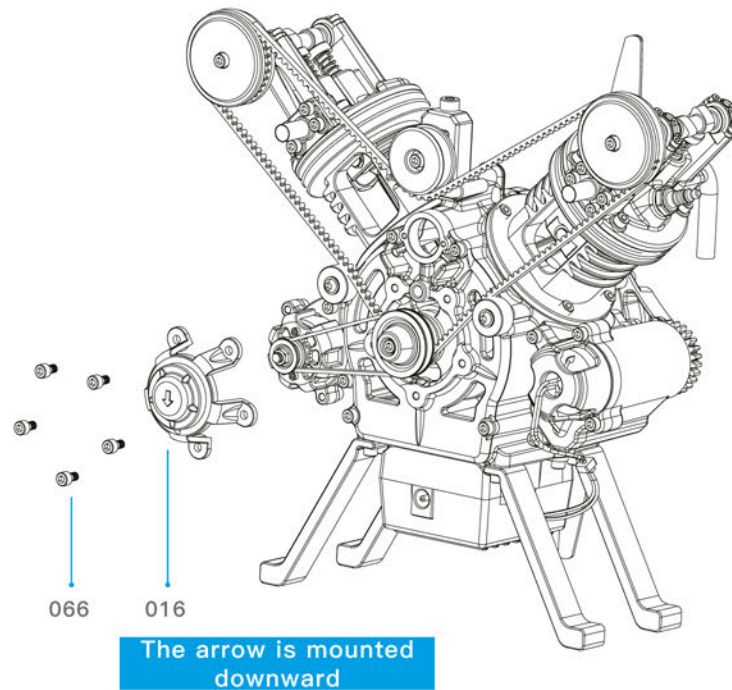
## 12.3 Installing Guide wheel

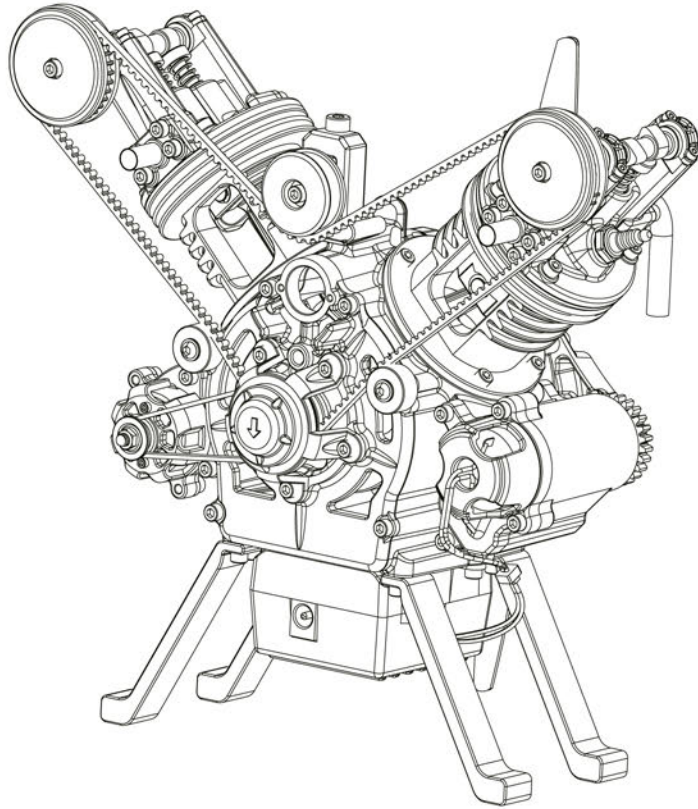


## 12.4 Installing the belt



## 12.5 Installing the back cap of belt



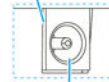


The engine assembly is complete

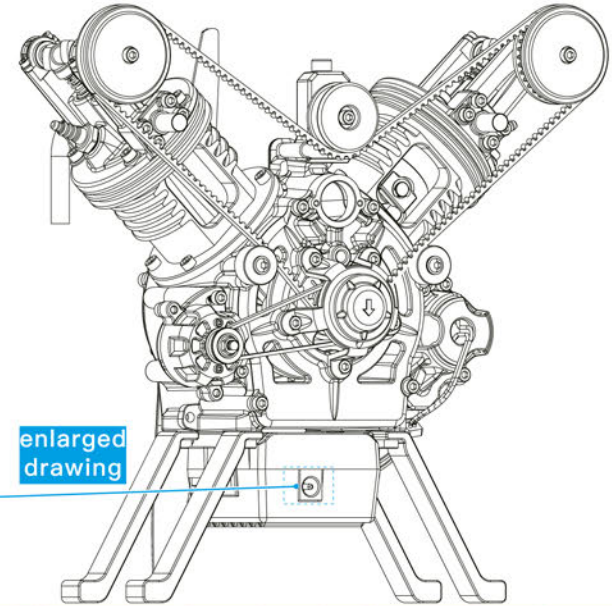
### 13 Charging state attention

Note: after assembly, charge before use.

indicator  
light



Charging  
Port



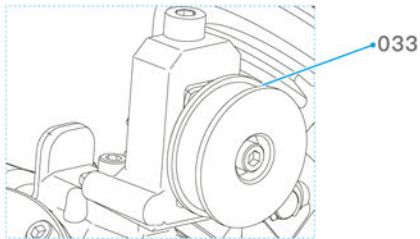
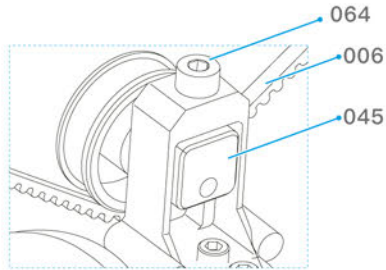
enlarged  
drawing

1 > This product is equipped with a dedicated charging cable. User-supplied power adapter, Its output DC voltage needs 5V, and its output DC current is not less than 1000mA. Do not use an adapter higher than 6V to charge the product;  
2 > For other precautions, please refer to the second item in the "Notes" section of this manual;  
3>Normal charging state:  
◇ the red lamp is ON during charging;  
◇ the blue lamp is ON when fully charged;  
◇ the max. charging time is 2h.

## Troubleshooting

### — > Mechanical troubleshooting:

Motion is exceptional after assembly. First check whether the relevant moving parts are coated with lubricating oil as shown in the figure, and then check the assembly sequence one by one according to the instructions; if no problems are found, please follow the steps below to find the problem and solve the problem.



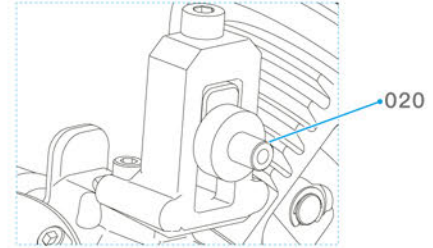
1> Check whether the part installed in the correct direction.

2> Check whether the screws are too tight or too loose.

3> Check if similar parts are installed in reverse.

4> If 006 synchronization with slipping or not moving, turn the 064 screw to adjust the position of the tensioning pulley 033, and check if the 045 tensioning block is reversed according to the manual. If it is installed, it must be adjusted.

5> If there is abnormal noise in the movement, loosen the 006 timing belt, then use the 033 tensioning wheel to check whether the movement is smooth. If it is not smooth, please remove the tensioning wheel and check if the 020 tensioning shaft has burrs or rubbish. If so, use a knife to scrape the burrs, clean up the trash, and add lubricant.



## 二 > Electronic troubleshooting

### 1 Charging failure

#### ① Charger does not match

Solution:

Charge the product with a standard USB charger. The charger requires an output of 5V 1A (inclusive) or more. Use the USB head of TECHING's dedicated charging cable to plug into the USB port of the phone charger. Plug the round plug into the charging port of the product and charge it. As shown in Figure 1-1.

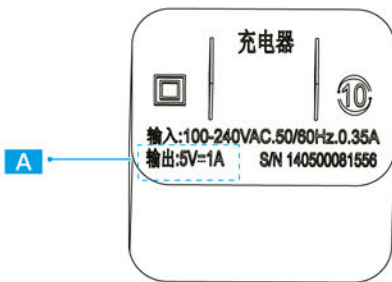


Figure1-1



A

#### ② Whether the Charging cable round plug is inserted in the end.

Solutions:

Check if the round plug of Teching's special charging cable and the charging plug of the product are inserted into the end; as shown in Figure 1-2

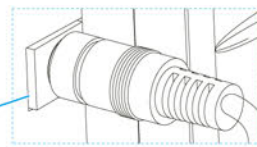
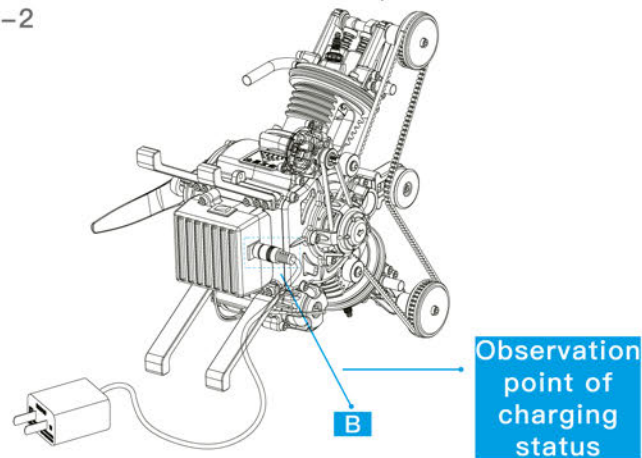


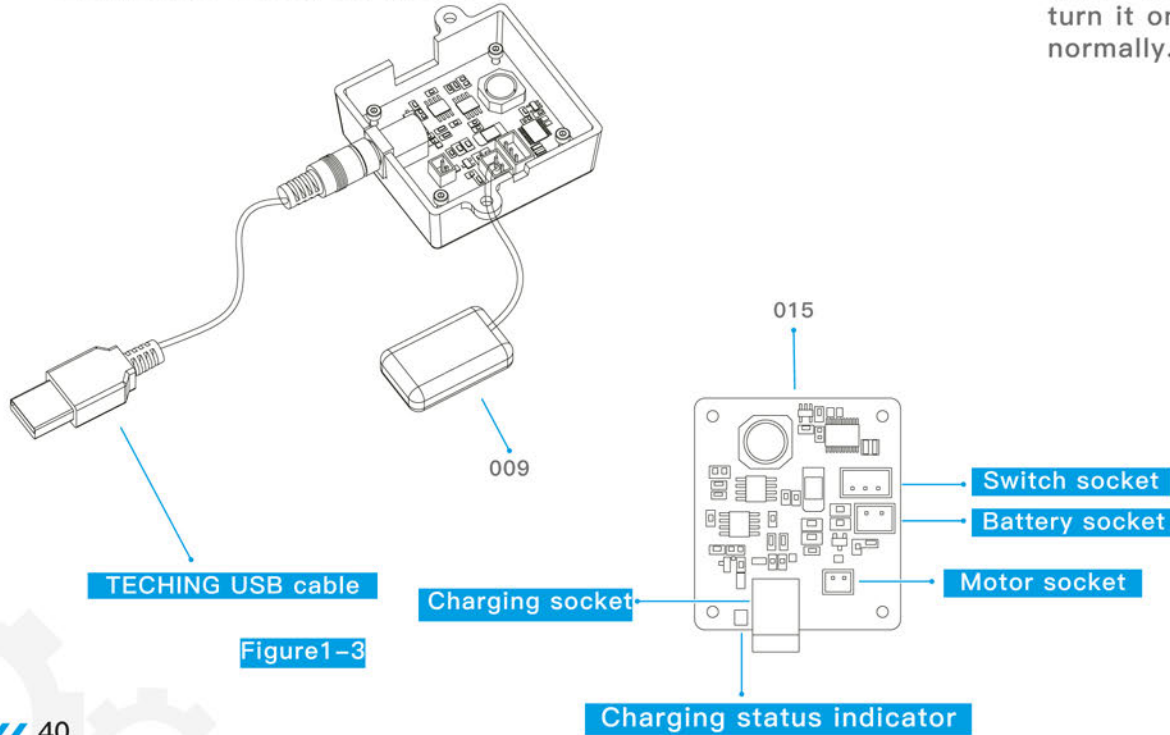
Figure1-2



### ③ Charge status check

Solution:

Remove the bottom case of the board and charge the product. Observe the charging light on the board (number 015). The red light is on when charging, and the blue light is on when fully charged. As shown in Figure 1-3

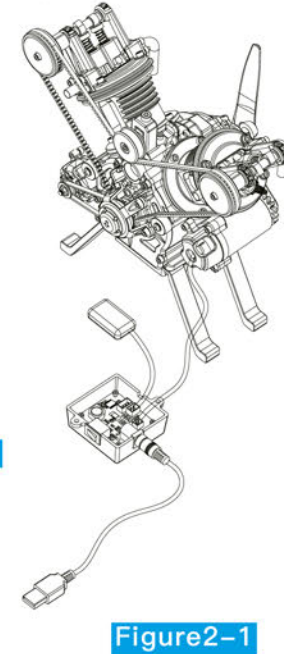


### 2 The motor does not turn

#### ① Battery is dead

Solution:

Use TECHING dedicated charging cable to charge the product. The red light is on when charging, and the blue light is on when fully charged. After fully charging, turn it on again to see if the motor can run normally. Figure 2-1





② Mechanical causes the motor does not turn

Solution:

Remove the start gear of the motor (No. 53) and test whether the motor can run smoothly. As shown in Figure 2-2. Note: If it can run smoothly, check the mechanical part according to the mechanical troubleshooting method. If it still does not work, please consult our after-sales support or return to factory for repair.

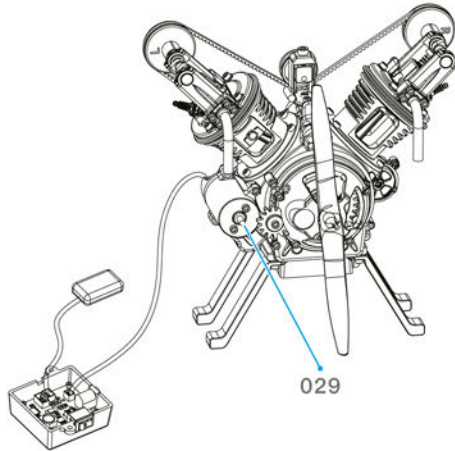


Figure 2-2

③ Motor (serial number 029) plug position is not correct

Solution:

Please check whether the motor (No. 029) plug is in the correct position (see page 18 of the manual); Figure 2-33

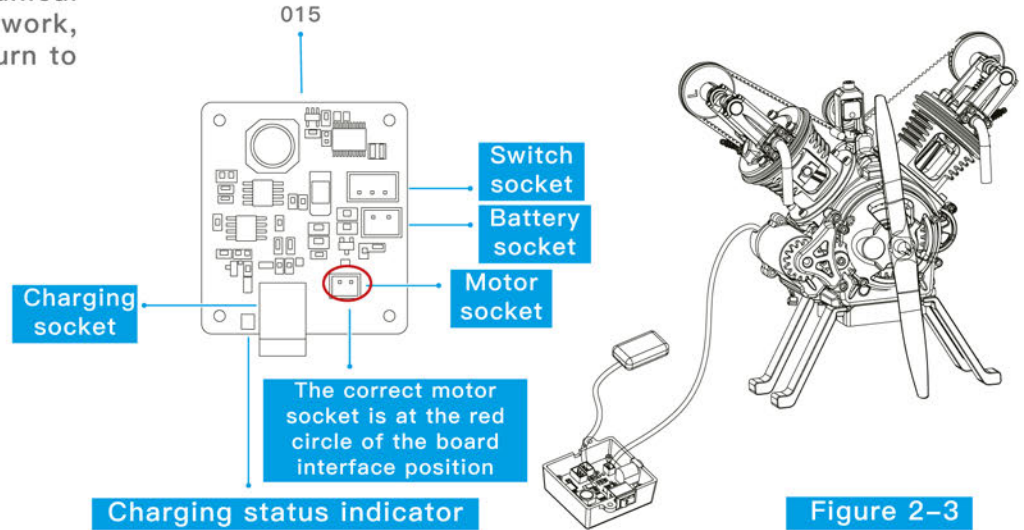


Figure 2-3

3 other

If the above solutions can not solve the problem, please consult Our after-sales support or return to factory for repair.

## Testing The V2 Engine

### 1. Clearance Fits

Pay attention to the clearance between moving parts. You can make small adjustments based on your own observation and judgement with tools such as sandpapers and caliper

Here are a few places you could start from:

- 1.1 The crankshaft and its nearby moving parts.
- 1.2 The camshaft and its nearby moving parts.
- 1.3 The starter and its nearby moving parts
- 1.4 The piston connecting rods and their nearby

moving parts

### 2. Lubrication

Lubricant not included in this product. Running without lubricant may cause machine to be stuck due to excess friction. It is recommended to apply appropriate amount of lubricant on moving axles based on need and preference.

### 3. Reducing Engine Noise

Moving Axles included in this product are made of anodic oxidated aluminium. Some parts might be loosely fitted. Therefore, some newly assembled products might run noisier than other. User may modify noisy parts with sandpaper and rasp, or apply lubricant to reduce noise.

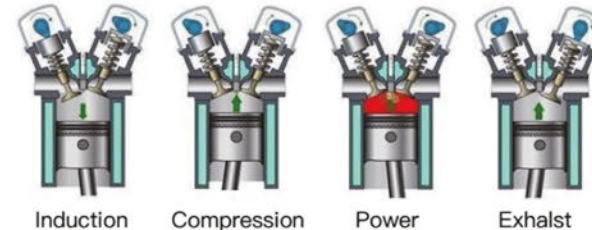
## The Working Principle Of V2-T Engine

(4-strook piston gasline internal combustion)

### 一、 Basic Principle Of Piston Combustion

1. Piston moves down -> pulling in air and gasline.
2. Piston moves up -> compressing air and fuel mixture.
3. Piston moves down -> compressed gases. ignited, combustion gases expands and pushes piston downward.
4. Piston moves up -> leftover combustion gases expelled from cylinder.

Graphical Illustration:



Stage Three was the only work-doing stage. The work is done through the power of expanding combustion gases. Thermal energy was converted into kinetic energy of the downward moving piston. Piston movements are converted into rotation of the crankshaft and finally into torque and revolution of the axle by engine mechanism. Then inertia of the crankshaft completes the rest of the engine movements.

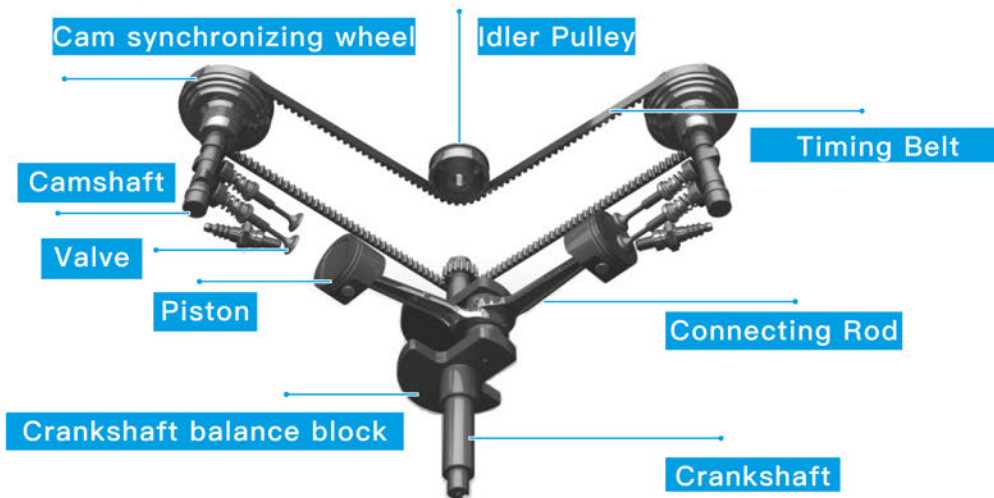
## Mechanism Of The V2 Engine

1. Two pistons are arranged in 90 degree angle. Both pistons are connected to the same crankshaft by two connecting rods.

2. There are two valves for each cylinder. One for induction, the other for exhalst.

## Advantages And Disadvantages Of V2 Engine

Significant increase of power without much increase of size in comparision to single piston engines



## Applications Of V2 Engine









### Definition Of V Engine

• A V engine, or Vee engine is a common configuration for an internal combustion engine. The cylinders and pistons are aligned, in two separate planes or “banks”, so that they appear to be in a “V” when viewed along the axis of the crankshaft. Such configuration makes it easy to increase power and displacement of the engine through increasing the number and size of the cylinders. The Vee configuration generally reduces the overall engine length, height and weight compared with an equivalent inline configuration.









### Applications:

- High power and displacement motorcycles.
- Various small general purpose engines.




No.	Product picture	Product name	Qty.
001		Crank Box	1
002		Cylinder Cap	2
003		Crank Box Support	4
004		Switch	1
005		Cable	1
006		Timing Belt	1
007		Battery Case Upper Plate	1
008		Battery Case Lower Plate	1

No.	Product picture	Product name	Qty.
009		Battery	1
010		Back Crankshaft	1
011		Cylinder Body	2
012		Front Crankshaft	1
013		Transitional Axle	1
014		Starter Front Plate	1
015		Circuit Board	1
016		Back Cap of Belt	1


No.	Product picture	Product name	Qty.
017		Starter Back Plate	1
018		Flywheel Plate	1
019		Flywheel	1
020		idler pulley axle	1
021		Idler Pulley Stand	1
022		Gear Protective Cap	1
023		Right Exhalst	1
024		Left Exhalst	1

No.	Product picture	Product name	Qty.
025		Synchronous wheel Stand(R)	1
026		Synchronous wheel Stand(L)	1
027		Synchronous wheel	2
028		Axle sleeve	1
029		Startere	1
030		Engine Front Plate	1
031		Induction Pipe	2
032		Synchronous wheel Cap	2

No.	Product picture	Product name	Qty.
033		Idle Pulley	1
034		Piston	2
035		Generator	1
036		Propeller	1
037		Valve	4
038		Piston Connecting Rod	2
039		Crankcase Back Plate	1
040		Spring	4

No.	Product picture	Product name	Qty.
041		Valve Bearing	4
042		Valve Cap	4
043		CAM bearing	4
044		Camshaft	2
045		Tension Block	1
046		Generator belt	1
047		Piston Pin	2
048		Spark Plug	2

No.	Product picture	Product name	Qty.
049		Crankshaft Cap	2
050		Pipe Stabler	4
051		Generator Pulley	1
052		Transitional Gear Cap	1
053		Starter Cogwheel	1
054		Starter Transitional Gear	1
055		Crankshaft Synchronous wheel Stand	1
056		Crankshaft Gear	1

No.	Product picture	Product name	Qty.
057		Crankshaft Synchronous wheel	1
058		Engine Back Plate	1
059		Dowel Pin 2.5*8	4
060		M3 snap ring	4
061		M4 Screw nut+M4 Locking washer	1
062		Key 3X3X6	2
063		M4X25	1
064		M4X20	1

No.	Product picture	Product name	Qty.
065		M3X10	2
066		M3X6	51
067		M2X5	12
068		M1.6X4	2
069		Valve Spring	1
070		Guide wheel	2
071		Guide shaft	2
072		Round head M3X6 screw	1

No.	Product picture	Product name	Qty.
073		Round head M3X16 screw	2
074		M3X8	28
076		Crankshaft Sleeve	1
077		M3X5.5 Half Screw	2
078		Rubber band	1
079		Bearing 18X12X4	2
080		Bearing 15X10X4	1
081		Bearing 14X8X4	1