

## Constant Force Springs for Carbon Brush Application



# MINGTAI

Since 1966

Constant Force Spring & Power Spring  
Specialized Manufacturing from Taiwan

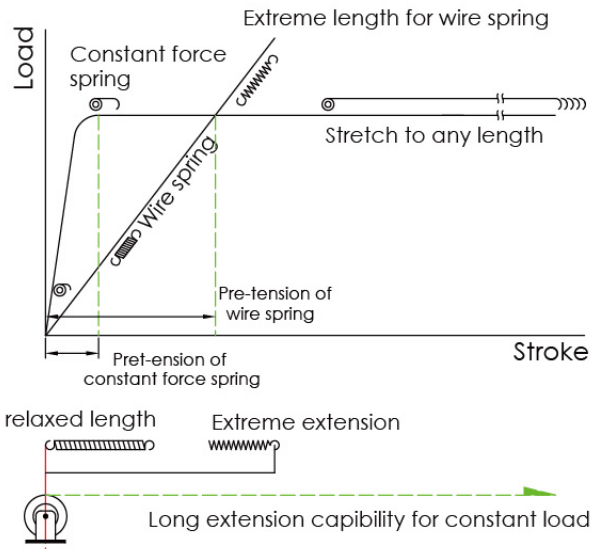


# CONSTANT FORCE SPRING FOR CARBON BRUSH APPLICATION



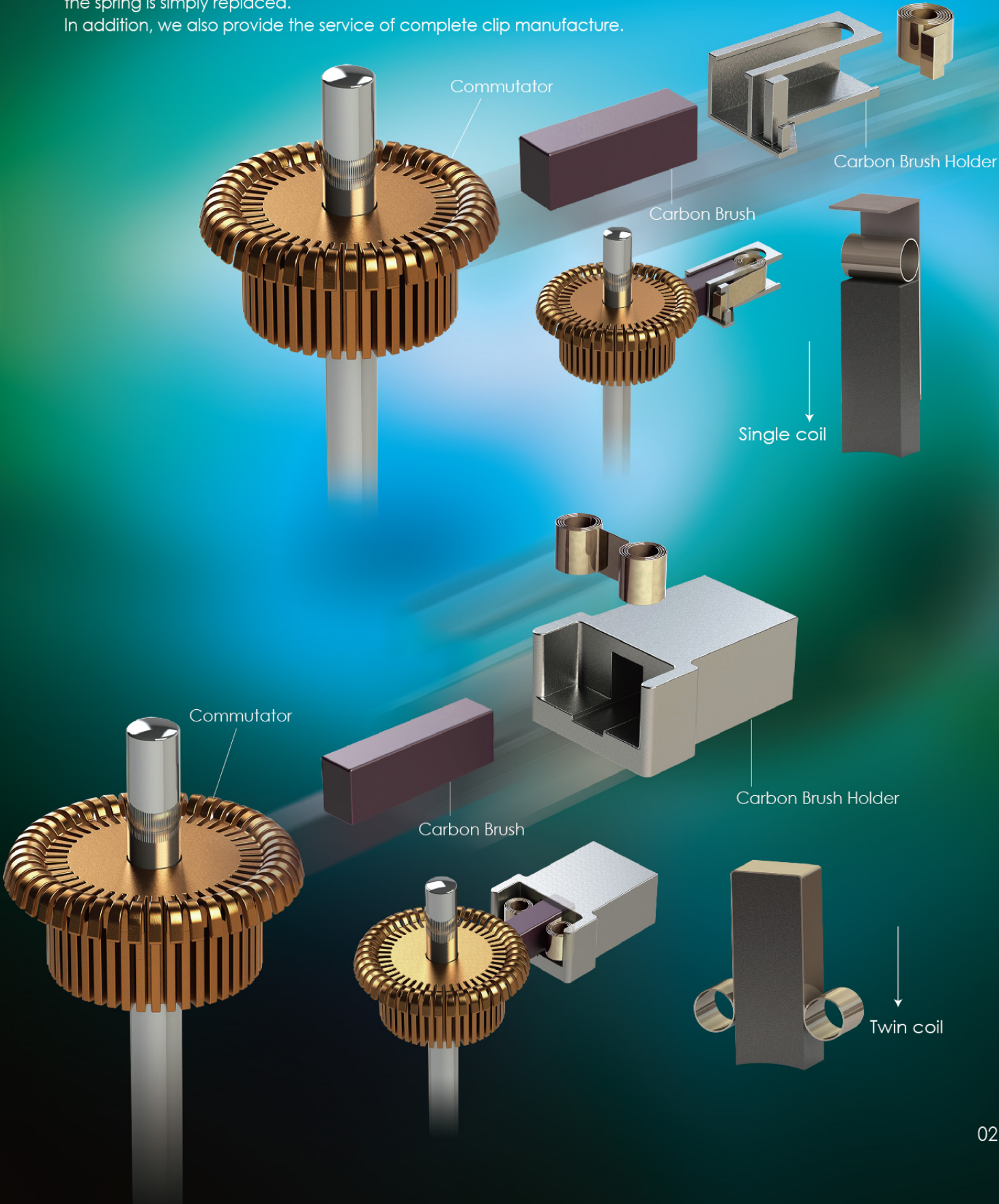
Ming Tai Industrial Co., develops a wide range of constant force springs with clips for carbon brush holder application. Constant force springs are used to hold carbon brush to make electrical connection steady to rotor of slip ring, or to commutator of brush motor. Constant force springs with specially constructed ensure the carbon brush works consistently by dependably exerting constant pressure to increase brush life and to reduce electrical wear. Furthermore, constant force spring features following advantages

1. To exert constant pressure for commutator and slip ring in any brush length.
2. Compact design for overall motor size and slip ring.
3. Allows longer brushes to meet large commutator and slip ring requirement.
4. Reduces spark, lower influence of electromagnetic interference (EMI).



Ming Tai Industrial Co. manufactures both single coil type constant force springs and twin coil type constant force springs for carbon brush application.

Carbon brush is responsible for conducting current between rotating parts and stationary parts. The constant force spring keeps brush sliding to contact commutator, rotor, slip ring steady. It features sliding smoothly, wear-resistant, good conductivity. Ming Tai provides two different types of constant force spring for carbon brush holder, single and twin coils. Customer can choose from them in terms of their application. For massive equipment, such as locomotive, wind turbine, convenient replacement of consumable component is important for these devices. Combining the spring with clip is a way to achieve this goal. By taking out the clip and inserting a new clip, the spring is simply replaced. In addition, we also provide the service of complete clip manufacture.





# THREE MAIN APPLICATIONS OF SPRING IN THE CARBON BRUSH INDUSTRIES

## Commutator

Commutator is one common component in certain electric motors and electrical generators. For example, traction motor is used for propulsion of vehicles, locomotives. Historically, the series wound DC motor was the most common type for the traction motor.

The motor consists of two parts, the fix field coils and the armature. The two parts are joined electrically through the commutator which collects all the terminations of the armature coil and it will rotate with the armature. It will periodically reverses the current direction between the rotor and the external circuit.

**The springs play a role of pressing against the brushes to contact with the commutator. So that the sequence of current flow can passed through the motor circuit, and causes the armature to turn.**

## INDUSTRIES

## Grounding

Take railway system as example, earth return current unit is aim to protect the bearings and increase the life cycle. It directs the path of the current away from the bearings through the wheels or axles.

**The springs which inside the end return brushes and holders provide the thrust force to press against the brush contacting on a track.**

## Slip ring

The slip ring can be found in electrical generators alternating current (AC) systems, like air compressor, blower motor and ventilator. AC induction motor is an AC electric motor which contains a static and a moving part. A slip ring facilitates the transmission of electrical power and signals from a static to a moving part.

**The springs play a role of pressing against the brushes to contact with the slip ring. So that the slip ring becomes the connector between the stator and rotor.**

In addition, Slip ring is also an important component for any rotary application where there is a need to transfer current from static to 360° continuous rotating parts. For example, rotating table, surveillance systems like radars, medical machines like microscope and support arm lamps, renewable energy sources like wind turbines, automation equipment and so on.

## Lightning protection

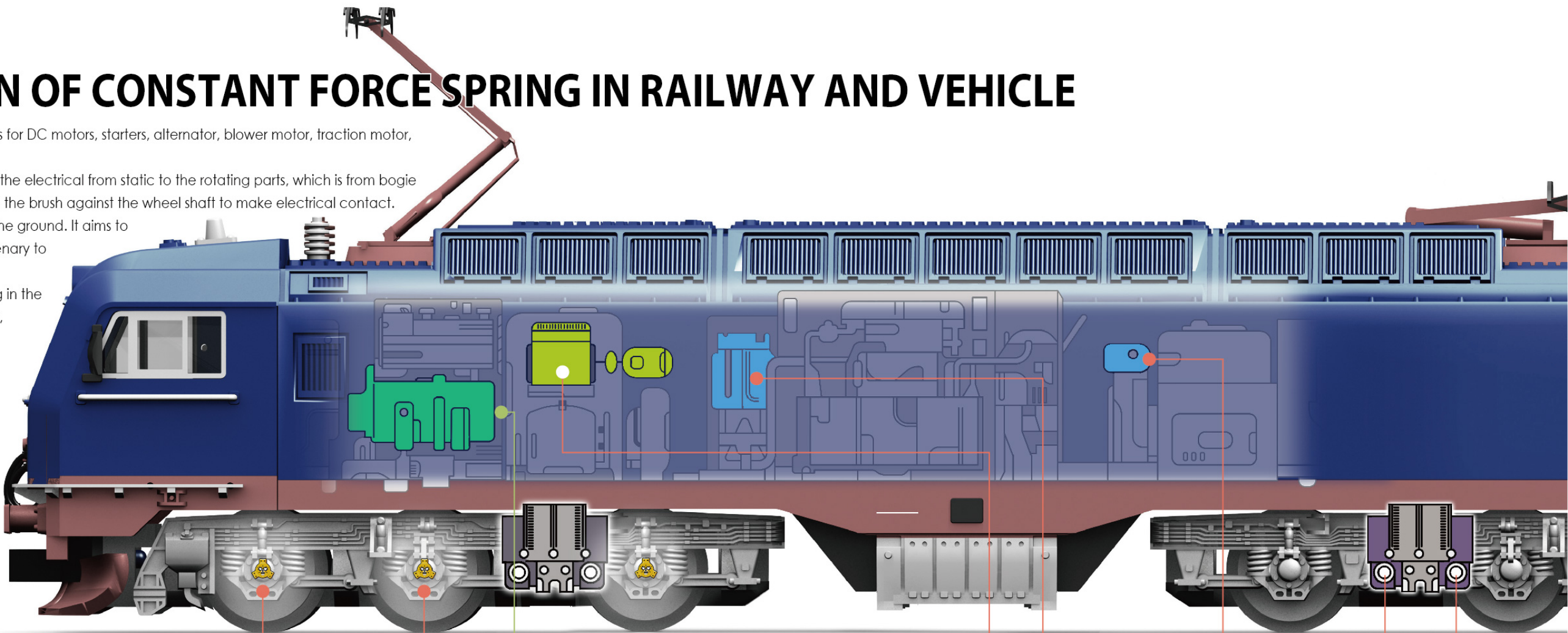
In addition, brush holder and slip ring also play an important role for the lightning protection system. For example, the wind turbines, which are easily damaged by thunderstorms and lightning strikes.

**The spring will provide the trust force to ensure the carbon brushes contact with the slip rings to allow lightning currents to bypass main and yaw bearings**



# All APPLICATION OF CONSTANT FORCE SPRING IN RAILWAY AND VEHICLE

Railway vehicles generally use carbon brushes for DC motors, starters, alternator, blower motor, traction motor, and earth return current units. Grounding contacts are devices that transfer the electrical from static to the rotating parts, which is from bogie to the wheel in train system. The spring presses the brush against the wheel shaft to make electrical contact. The current is transferred from the brushes to the ground. It aims to ensure that the electrical circuit from the catenary to the wheels to the rails is closed. The benefits of adapting constant force spring in the above devices are good mechanical stability, low friction coefficient as well as effectively protecting bearing from damage. Thanks to character of constant output force of our constant force spring. A small constant force spring play a big role of ensuring reliable electric current transfer in railway traffic.



EARTH RETURN CURRENT UNIT

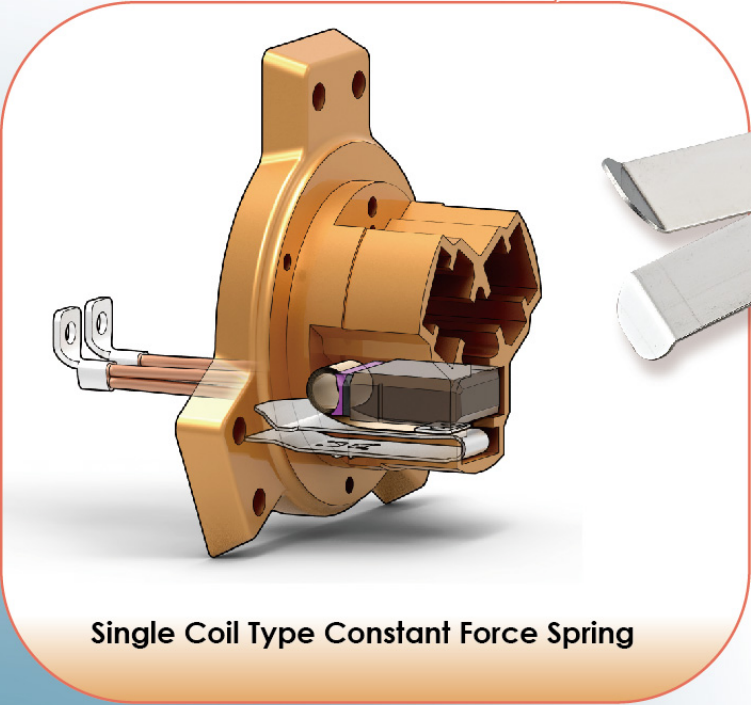
ALTERNATOR

Ventilator

Auxiliary Motor

Traction Motor

Blower Motor



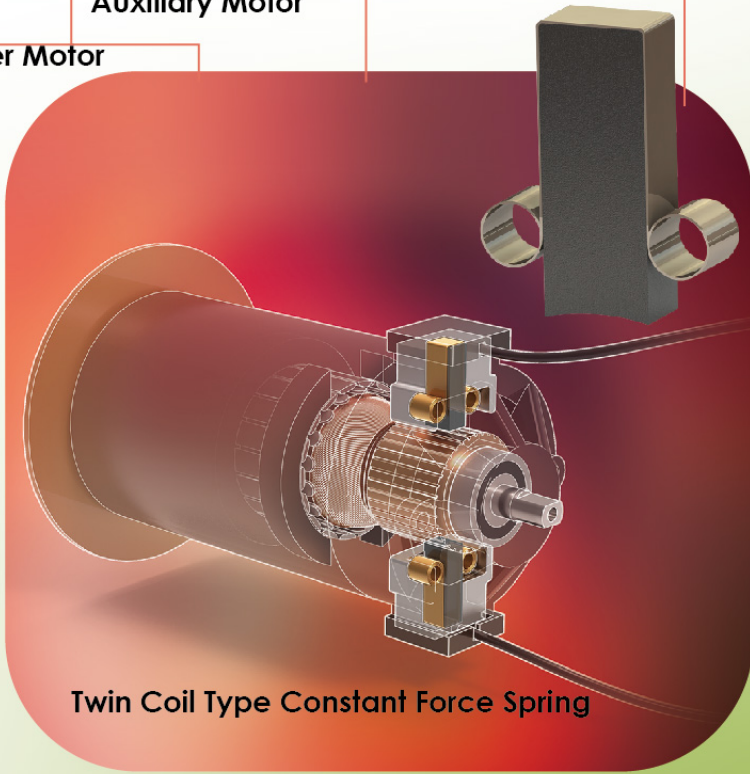
Single Coil Type Constant Force Spring



Constant force spring with mounting clip



Single Coil Type Constant Force Spring



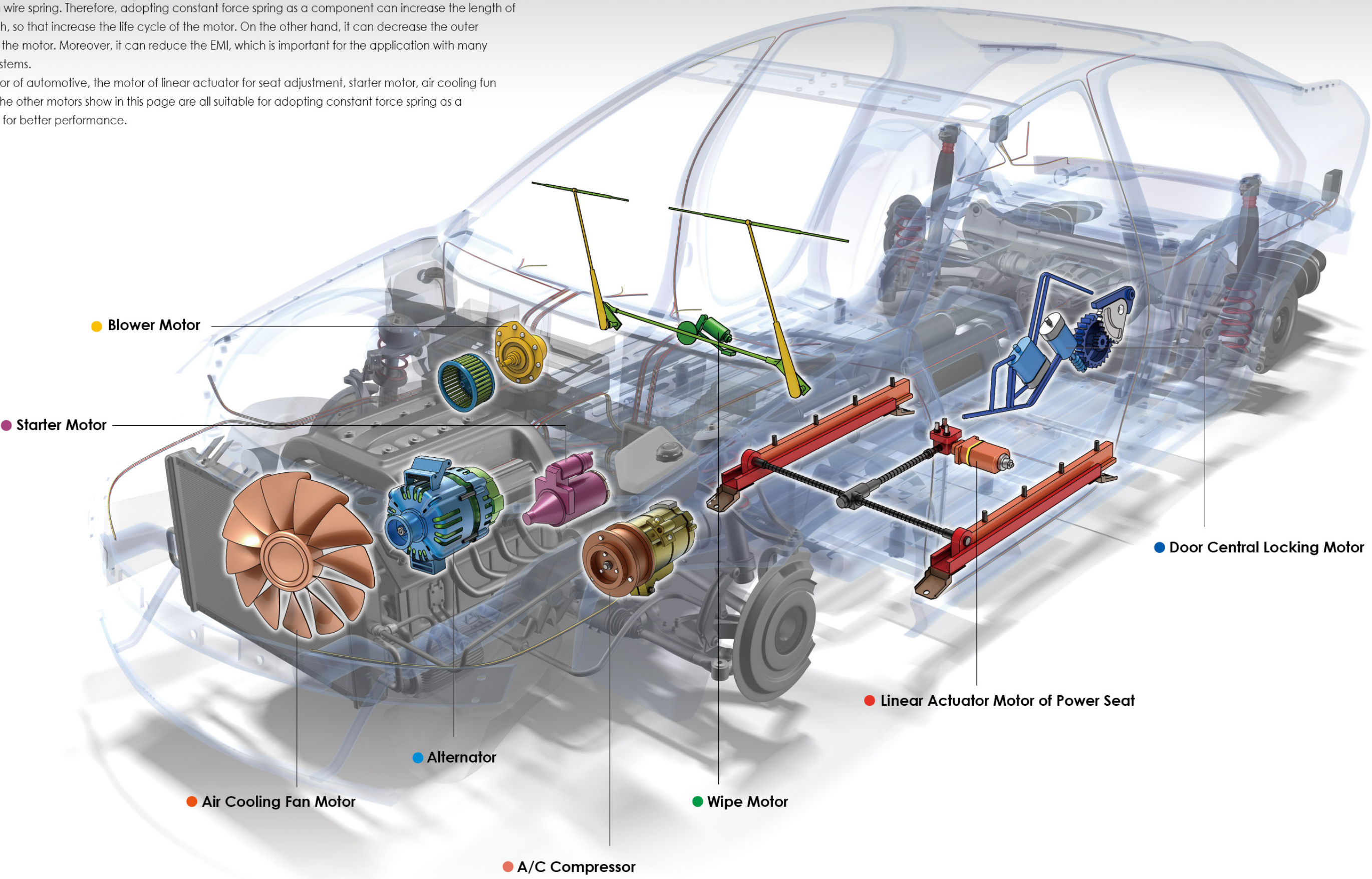
Twin Coil Type Constant Force Spring



# ALL APPLICATIONS OF CONSTANT FORCE SPRING IN AUTOMOTIVE VEHICLE

Constant force spring as a component is beneficial to the motors. The pretension of the constant force spring is smaller than wire spring. Therefore, adopting constant force spring as a component can increase the length of carbon brush, so that increase the life cycle of the motor. On the other hand, it can decrease the outer diameter of the motor. Moreover, it can reduce the EMI, which is important for the application with many electrical systems.

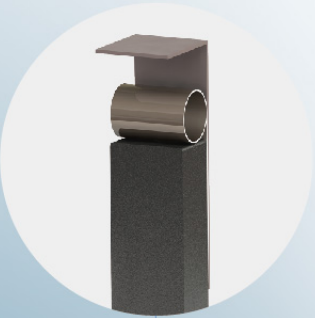
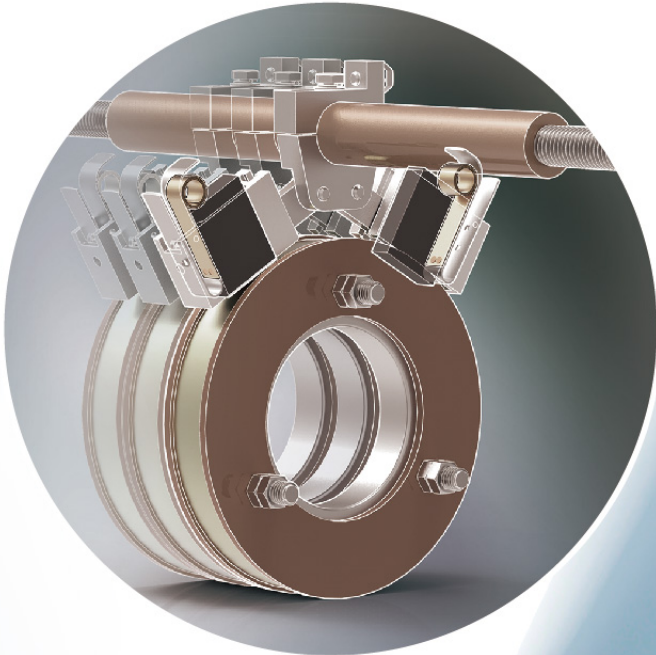
The fan motor of automotive, the motor of linear actuator for seat adjustment, starter motor, air cooling fan motor and the other motors show in this page are all suitable for adopting constant force spring as a component for better performance.





# ALL APPLICATION OF CONSTANT FORCE SPRING IN WIND POWER

Slip ring of pitch drive system keeps transferring electrical power and signal from a static (nacella) to moving part (hub). Constant force spring clip is capable of reducing electrical wear to down maintain cost.



Large constant force springs with clip can push large carbon brushes that applied to huge slip ring of generator, in which the current between the rotor and external circuit is periodically reversed. In wind turbine, constant force spring can be applied to slip ring, grounding system, lightning arrestor brush as well.

Slip ring of generator transmits electrical current through the generator to external circuit.



Yaw drive commutator



Main shaft lightning arrestor brush (protect the bearing)

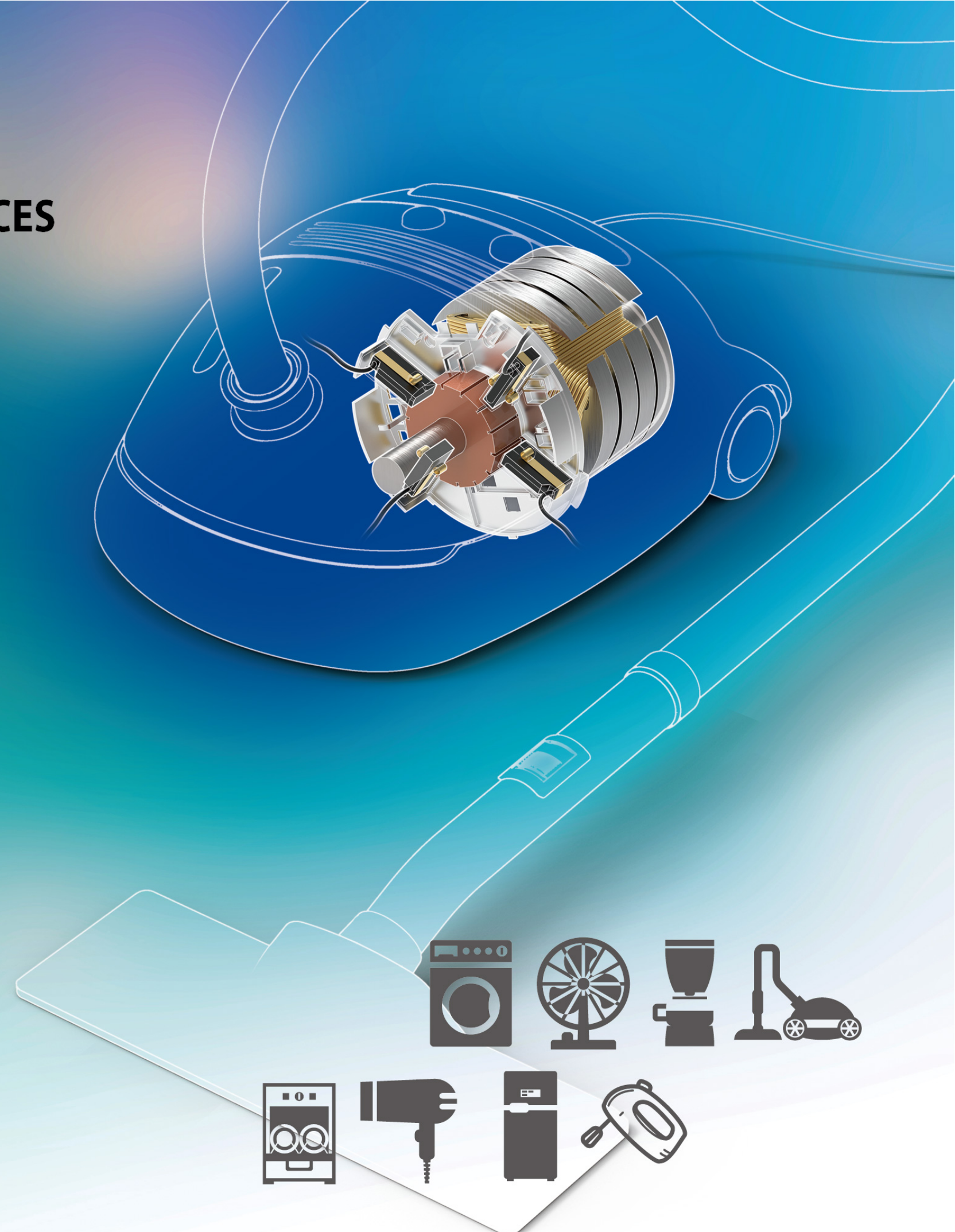
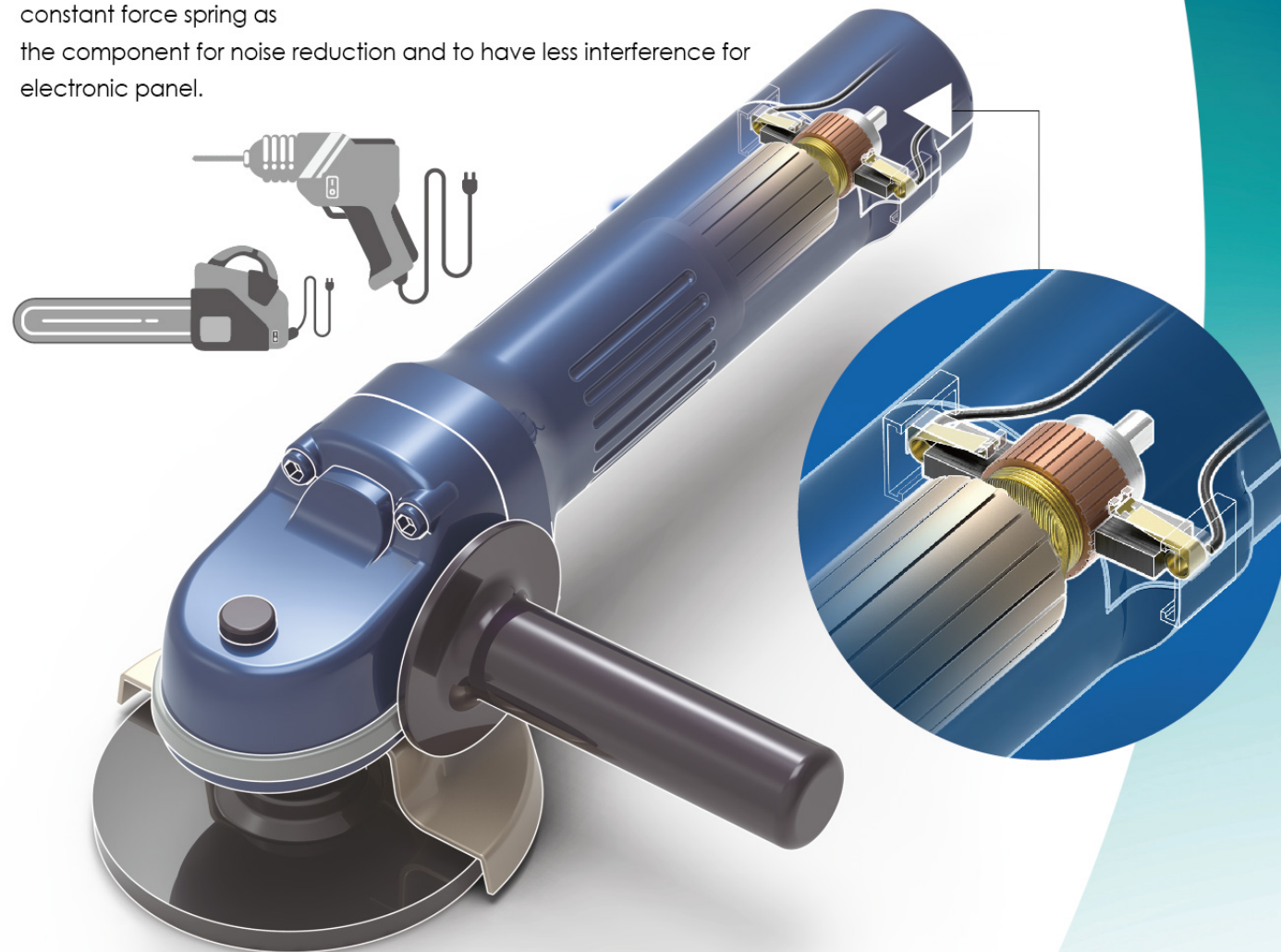


# APPLICATIONS OF CONSTANT FORCE SPRING IN MOTOR DEVICES

Constant force spring is ideal for motor application. For example, household appliances, garden tools, handhold electric tool and also the kitchen devices.

Using the constant force spring can increase the life cycle of the brush. Especially, vacuum machine and hand dryer, the rotating speed for these devices are very high; therefore, carbon brushes have to take a lot of wear and tear. The pretension of constant force spring is smaller than wire spring; as a result, there are two major advantages. Firstly, the outer diameter of the motor can be decreased. Secondly, a longer carbon brush can be adopted, so that a longer life cycle can be achieved.

Moreover, the other advantage of constant force spring is it can reduce EMI, because of the characteristic of constantly pressing brush against the commutator, which has better performance than the wire spring. The application, like treadmill and linear actuator of automotive, contains many electrical systems. It is better to use constant force spring as the component for noise reduction and to have less interference for electronic panel.

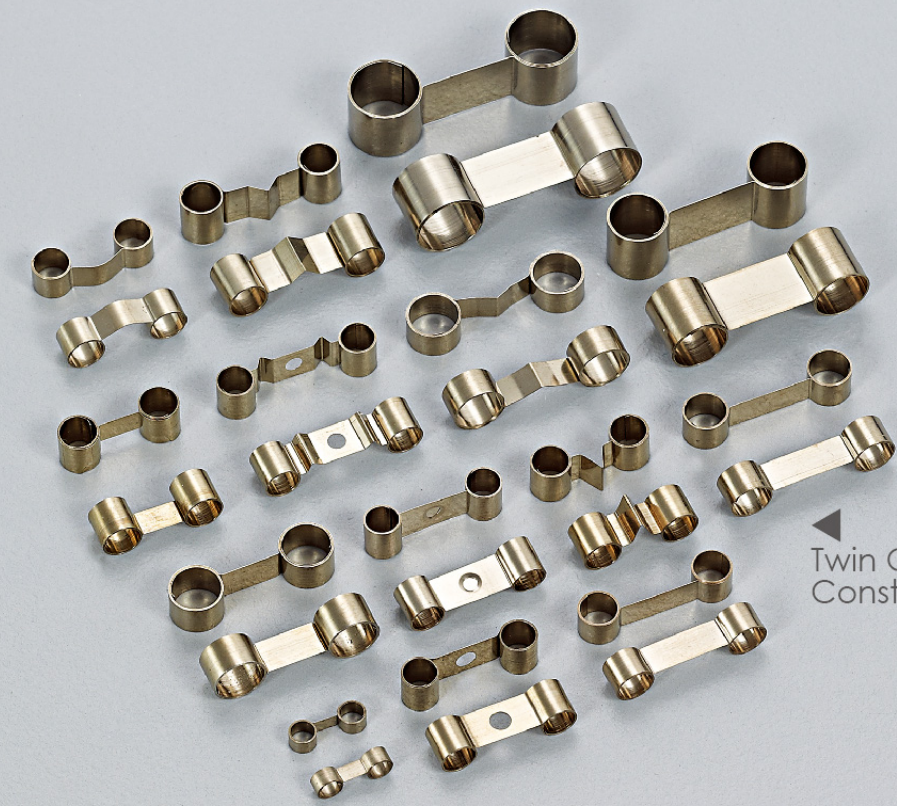




Single Coil Type  
Constant Force Spring



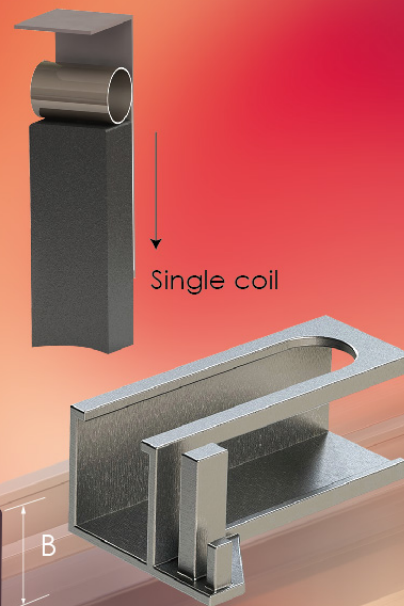
Twin Coil Type  
Constant Force Spring



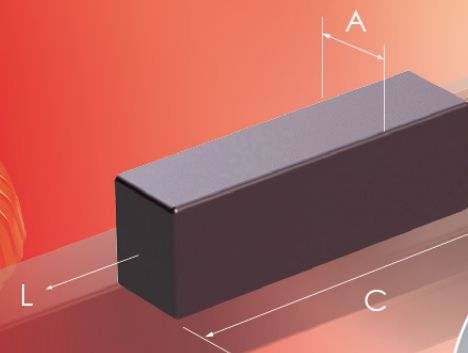
## HOW TO CHOOSE SUITABLE CONSTANT FORCE SPRING FOR CARBON BRUSH

### Single Coil Type

1. Width of carbon brush (A)  
: O.D (D) must smaller than Spring width(A)
2. Height of carbon brush (B)  
: Spring width must smaller than brush height
3. Wearing length of carbon brush (C)  
: Stroke must bigger than brush wearing length
4. Pressure on commutator  
: The load of the spring (L)

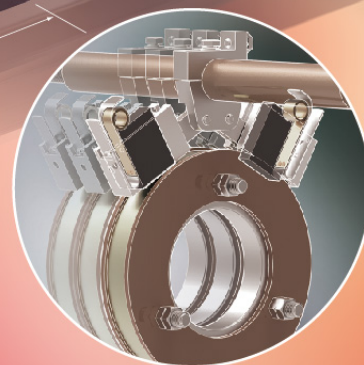


Single coil



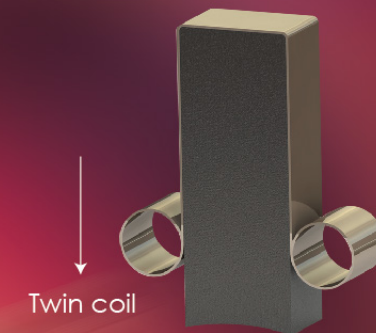
### Advantages of Twin Coil Comparing with Single Coil

1. To afford maximum brush length and double the load of single coil.
2. To allows a minimum motor size.
3. To offer better load for its symmetry.

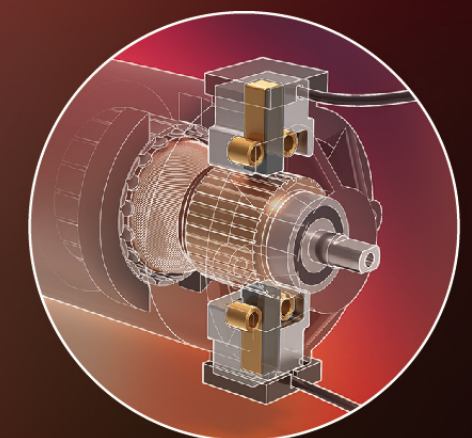
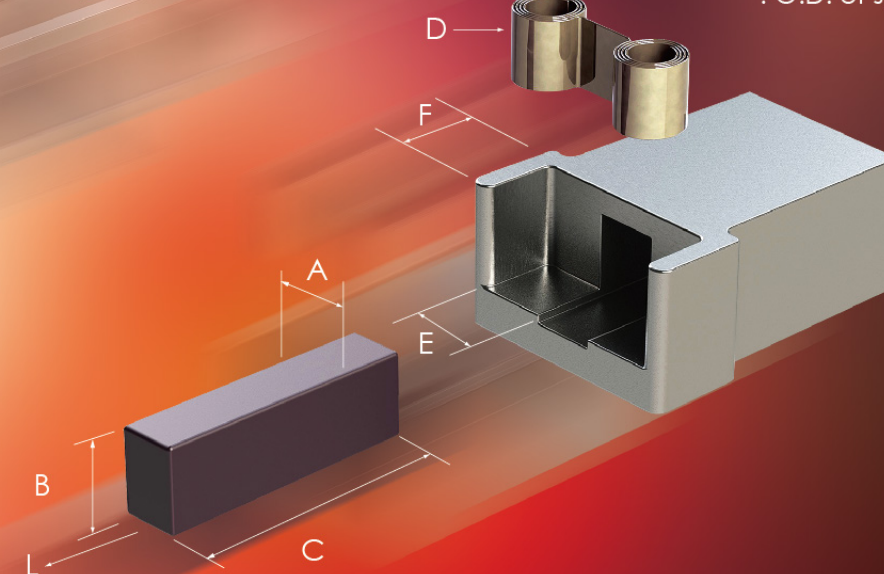
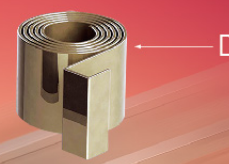


### Twin Coil Type

1. Width of carbon brush (A)  
: Spring width must smaller than brush height
2. Height of carbon brush (B)  
: Spring width must smaller than brush height
3. Wearing length of carbon brush (C)  
: Stroke must bigger than brush wearing length
4. Pressure between commutator and carbon brush (L)  
: The load of the spring
5. Mounting room of brush holders (E) and (F)  
: O.D. of spring (D) must smaller than both



Twin coil







Together for win-win future!

**MIN**  **TAI**

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