

## I. Motor 電動機

1. There are two types of motors: Direct Current Motor (DC) and Alternating Current Motor (AC).

電動機可分為直流電動機和交流電動機。

2. AC Motor can be divided into two types: single-phase AC motor and three-phase AC motor.

交流電動機又分為單項交流電動機及三項交流電動機。

3. The way to start a motor is using the concept of “like poles repelling, unlike poles attracting”

啟用電動機是用到「同極性相斥、異極性相吸」的概念。

4. The way to rotate a motor is to set a rotating magnetic field.

讓電動機旋轉的條件則是建立「旋轉磁場」

5. Two magnetic fields are interacting inside a motor: fixed poles (called Stator) and rotating poles (called Rotor)

電動機內有兩個磁場交互作用，一個為固定磁場，我們稱之為定子(Stator)，另一個為旋轉磁場，我們稱之為轉子(Rotor)。

## II. Single-Phase induction motor



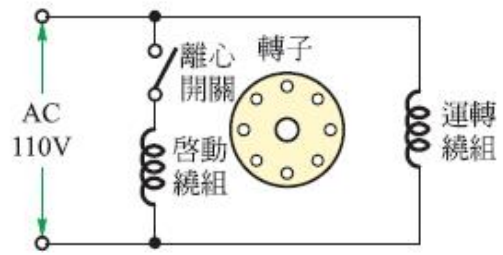
(a) appearance of a single-phase induction motor  
單項感應電動機外觀



(b) structure of a single-phase induction motor  
單項感應電動機結構



(c) running winding and starting winding  
運轉繞組與啟動繞組

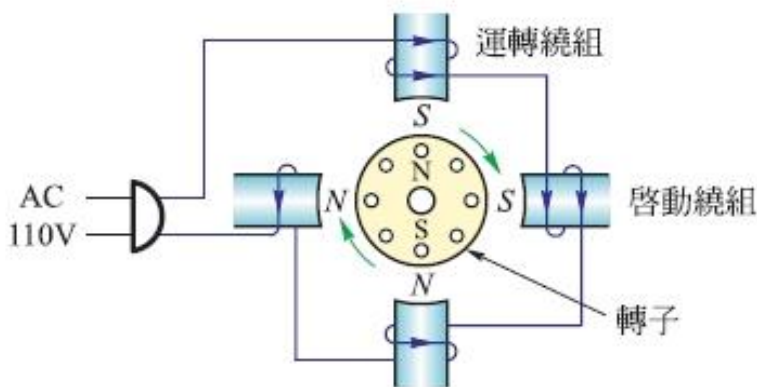


(d) wiring  
接線圖

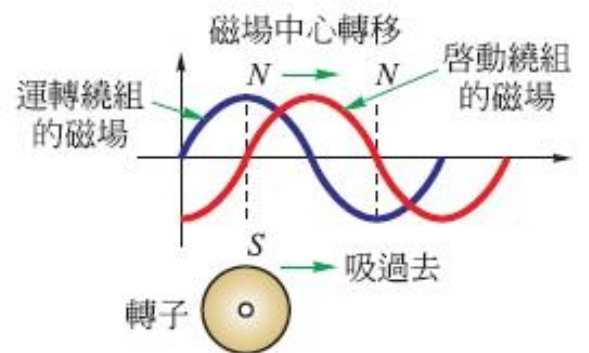
1. Start a single-phase induction motor:

啟動單項感應電動機：

- Make the running winding and the starting winding separate for  $90^\circ$ ; the space difference of the magnetic fields the two windings generate is also  $90^\circ$ .  
將運轉繞組與啟動繞組在空間上互差  $90^\circ$ ，兩組繞組產生的磁場也會因此差  $90^\circ$ 。
- After we connecting the motor to current, the center of the magnetic force will move and it will create a rotating magnetic field, activate rotor, which therefore can start the motor. See the pictures below.  
接上電源後，磁力中心會移動，進而產生旋轉磁場，啟動轉子，電動機因而轉動。參照下圖。



(a) 繞組產生的磁場



(b) 旋轉磁場的形成

2. Washing machines, refrigerators, juice blenders, air conditioners and pumping motors are the applications of this type of motor.

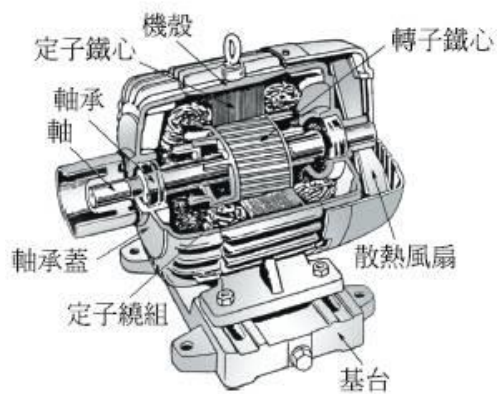
洗衣機、電冰箱、果汁機、冷氣機、抽水馬達等都是此種電動機的應用。

### III. Three-Phase Motor 三項電動機

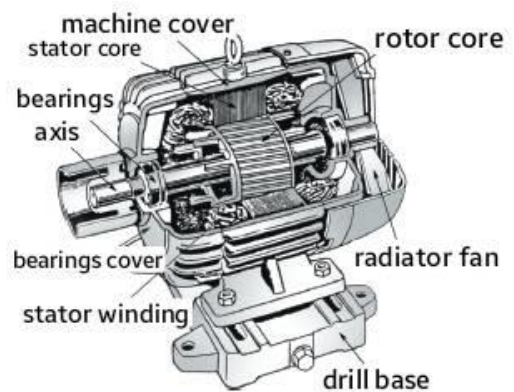


(a) appearance of a three-phase motor

三項感應電動機外觀



(b.1) 三項電動機結構



(b.2) structure of a three-phase motor

1. Start a three-phase induction motor:

■ The three windings are  $120^\circ$  in space and magnetic fields.

三繞組在空間及磁場上都互差  $120^\circ$ 。

- The moving of the center of magnetic force activates the moving of the rotor, which makes three-phase motor rotate. See the pictures below.

磁力中心的轉移帶動轉子的轉移，這使得三項電動機順利運作旋轉。請參照下圖。

