3. Electric Motors & Generators

In the electrical motor service industry, top quality and problem solving ability are crucial to maintain profitability and customer loyalty. When bearings do not solve the customer's reliability problems, it will erode customer loyalty easily.

The preferred brand for virtually all leading electric motor manufacturers, HCH is widely recognized as the leader of bearing suppliers in the electric motor industry. By working with HCH, you gain access to the resources of a proven leader that has earned OEM quality awards from many quality-conscious corporations.

Our product range offers extra benefits to the manufacturers of electric motors and electrical appliances:

> High reliability and long life through proven product design, excellent material quality and production technology
> Reduced energy consumption due to special bearing solutions and lightweight design
> High power density due to space-saving solutions
> Safety in bearing selection through the proven knowledge of our application experts
> Customized solutions developed in close cooperation with the customer using the latest technologies and continuous further development

In recent years, the demand for electric motors has grown. At the mean time, requirements for improving quietness, durability and efficiency in these motors have become increasingly stringent. You can rely on HCH to improve your motor quality performance.

General requirements for electric motors

Noise & vibrations level reduction

Electric motors for consumer applications especially household appliances are usually working in indoor places. Excessive vibration and noise levels associated with these applications are strongly required to be eliminated. Excessive vibrations can cause premature equipment failure. High vibration levels also increase energy consumption. High noise levels, in turn, result in a poorer living environment for personnel and family. HCH offers a range of solutions for exceptionally smooth and quiet bearing operation.

Maintenance elimination

Consequently, electric motor's long-term performance and maintenance free are important and critical since the repair is comparatively costly and not convenient. Thus, long bearing life is a key requirement. Low operating temperature, high quality raw material, adequate lubrication and avoiding contamination are important factors in extending bearing service life. HCH offers a range of sealed bearings that will extend bearing service life and improve cost-effectiveness as well as reduce the total cost for the application.

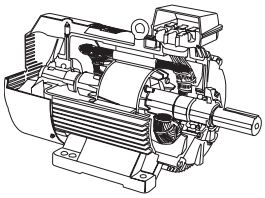
Environment concerning

When it comes to the important issue of environment protection, reduced energy consumption is of ever increasing importance. HCH states our commitment to endeavor to reduce the impact of our bearings on the environment and to maintain a safe environment for the future. In connection with its manufacture of bearings for electric motors, HCH takes into account protection of the environment, preservation of resources and more efficient use of energy.

Avoid electric current damages

In an electric motor, stray currents can cause cratering in the bearing raceways and in the rolling element surfaces. The damages from bearing currents lead to increased noise and heat levels, reduced effectiveness of the lubricant, excessive vibration and possible bearing failure. HCH's high quality bearing material as well as the most advanced heat treatment and full automatic Japanese grinding and super finish machineries guarantee the bearing reliable performance and prevent bearings from early fatigue failure from current damages.

3.1 Blush Motors



The magnetic field comes from either wound coils or a permanent magnet. This type of motor has a mechanical switch or commutator, which reverses the current in the armature of the machine. The "speed per torque" characteristic is constant and the slope of the speed/torque curve depends on the strength of the magnetic field.

Universal motors

Universal motors are commutator fitted machines adapted to work with AC voltage. They can achieve high speeds. However, the speed is sensitive to the load applied. The main advantage is the flexibility to adjust speed to an appliance needs. This type of motor is widely used to drive horizontal axis washing machines and vacuum cleaners.

Permanent magnet DC motors

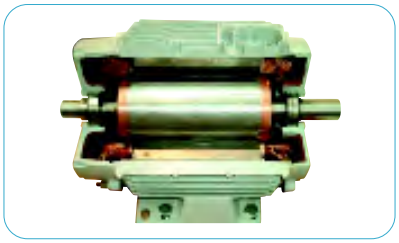
Permanent magnet DC motors are commutator fitted machines in which the magnetic field source is a permanent magnet. They require a DC power source and therefore are typically used in cordless appliances. In addition, speed control can be made available.

HCH bearings for brush motors

Except for the common requirements, HCH bearings used in brush motors are usually with non-contact rubber seals incorporating a special labyrinth design to meet high running speeds and provide good protection against ingress of brush dust contamination. Decades of research and development in the industry, HCH has produced several technological breakthroughs, setting new industry standards for performance:

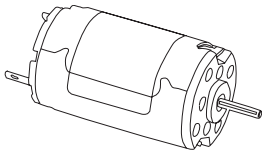
> Noise free operation
> Increased dent resistance
> Ultra long life
> Elimination of bearing creep

Universal motors driving washing machines are fitted with metal shielded deep groove ball bearings. The internal radial clearance is optimized to meet the requirements of high speed and low noise. Bearings are typically charged with grease combining high speed lubrication capability and low noise properties. The design requirements on wet and dry vacuum cleaners are for deep groove ball bearings that can provide protection against ingress of brush dust contamination and humidity. Where brush dust is the contaminant, bearings are fitted with metal shields incorporating a special labyrinth design. In conditions where humidity is a problem, heavy contacting rubber seals are the preferred solution.



Conventionally, the blush motors are wide accepted and applied in many industries, e.g. they are common for a driving system or a steering system in an automobile. Cooperating with HCH, we offer you solution to optimize blush motors°Ø low noise and durability performance.

3.2 AC Single-phase Induction Motors



Induction motors are the most used driving system, from fractional horsepower to hundreds of horsepower, where speed rotation does not require varying. Single-phase induction motors are largely used in low power applications. Split phase, capacitor start and permanent split capacitor motors are commonly used to drive washing machine drums. Shaded pole and permanent split capacitor motors are used to drive dishwasher water pumps. Thus bearing design strongly depends upon the final application of the motor. The types of fractional horsepower motors are designed to match the requirements of each application.

Split-phase induction motors

This type of motor has good efficiency and moderate starting torque. They are widely used as drive motors for washing machines, tumble dryers and dishwashers.

Capacitor start induction motors

They have the same running performance as split-phase motors but a higher starting torque. They are mainly used in washing machine drive systems.

Permanent split capacitor motors

With characteristics of high efficiency, quiet operation and continuous reversibility, they are suitable for washing machines, tumble dryers, fans, air-conditioners, and dish washer pumps.

Shaded pole motors

They are suitable for low power applications (less than 200 W). Typical use is in small domestic fans, which can be found in home appliances such as range hoods, air conditioning systems.

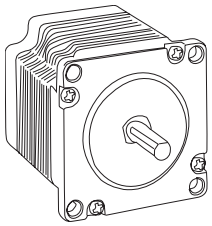
HCH bearings for AC single-phase induction motors

The normal bearing arrangement for these types of motors is two HCH deep groove ball bearings. The required performances for these types of motor bearings are low noise and vibration, low torque and wide temperature resistance. HCH R&D department efforts have been done to develop various greases and optimized bearing designs that meet such performance requirements.

Grease suitable for low and high temp operation together with low noise capacity and special requirement (e.g. anti-water, rust-prevention, no reaction with surrounding environment) is used. HCH has abundant knowledge about the grease characteristics. For your various application demands, we supply you a wide range of greases. The bearing design is dependant upon the motor application. For horizontal axis washing machines metal-shielded bearings are commonly used. For vertical axis washing machines light contacting rubber seals are preferred. The internal radial clearance is optimized to achieve the best compromise between speed and noise requirements.

The motor performance is greatly influenced by bearing performance. Requirements for bearings are low noise and vibration operation, low/high temperature and high speed durability, low torque and anti-fretting properties.

3.3 Advanced Motors



The main advantage with this type of machine is the absence of brushes. This means that they can give good performance in service life with low noise and low contamination (from brush dust).

Switched reluctance motors

The rotor is made of a laminated soft steel armature. Rotation is generated by the interaction of the rotor armature lobes and stator coils which are energized in sequence. A sophisticated electronic control ensures the current commutation. The absence of permanent magnets and rotor coils allows high performance levels in terms of absolute speed and efficiency. SRM can be used in many fields of applications including washing machines, as servomotors in aerospace designs and in the automotive segment.

Controlled induction motors

Typically they do not use a rotor-speed sensor. The speed characteristic is controlled by using predefined volts/Hz profiles and slip-compensation techniques. A good low noise level can be achieved with proper pulse width modulation techniques.

Brushless permanent magnets motors

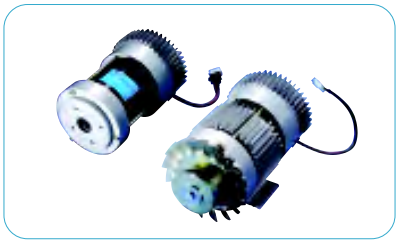
The stator is similar to that of an induction motor. The rotor has permanent magnets mounted on a ferromagnetic core. A hall sensor encoder or similar device is frequently used to sense rotor position. The motors are used in refrigeration compressors, washing machines, fans and blowers.

HCH bearings for advanced drive systems

HCH can offer bearings to meet the high performance requirements of advanced drive systems.

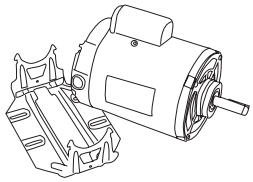
The absence of brush dust contamination enables the use of metal shields as a capping solution. The internal radial clearance is selected to meet the requirements of high speed and low noise. Bearings are usually lubricated for life with grease that has low noise properties. To achieve the required service life, special attention needs to be focused on the grease specified and the grease fill used. A plastic cage can be chosen to increase the speed rating. If necessary, bearing component tolerances and internal geometry can be developed to meet specific application requirements.

Please contact HCH application engineers to determine the appropriate bearing arrangement for your motor design.



With the improvement of technology for safety, energy saving and global environment, the advanced motors are more and more popular. HCH bearings are contributing to satisfy your more diversified and intensified performance requirements.

3.4 Industrial Electric Motors & Generators



HCH has a long and vast experience in the electric motor industry as well as in most of the industries where electric motors and generators are used. In this highly competitive industry, the profound knowledge of HCH has been used to develop solutions to meet the ever increasing demands for higher quality, shorter delivery time, lower noise levels and improved technical support.

Motors for specific applications are high volume products, which are typically small to medium sized, ranging from 1 to 500 KW. These motors are used within specific applications e.g. fans, pumps and compressors where the reliability and trouble-free operation of the motor are of high importance. Also generators have to cope with the same or even tougher needs. The three-phase induction motor is a robust and maintenance-free solution that is the most commonly used type in industrial applications. For application specific motors, it is very important to select the right bearings and bearing arrangements to optimize performance for the specific application operating conditions. HCH's expertise in this field could add further benefits with significant improvement in motor reliability and performance, thus improving machine profitability.

HCH bearings for industrial electric motors

Longer service life, smaller motors, no re-lubrication, low vibration, energy saving, low weight and low heat generation all can find their answer in HCH's full range of bearings.

Improper lubrication or relubrication will lead to excessive wear and shortened bearing service life. Even premature bearing breakdowns might occur resulting in substantially increased operation costs. For optimal reliability and long service life, lubrication is crucial. Either grease or oil can be used as lubricant. Grease should be used when simplified maintenance, improved cleanliness (i.e. fewer leaks) and better protection against contamination are required. However, to meet all demands in the same time is not an easy job. As grease is composed of base oil, thickener and additives, it is important to select optimum composition for such performance requirement. Oil lubrication should be used where normal operating temperatures are high as a result of an external heat source or excess heat generated by the machine itself in high speed applications. Industrial electric motors are usually hard to access, which makes maintenance procedures difficult. Fully automatic lubrication systems can be specified by HCH, to attain maximum bearing service life and lower operating costs.

Proper sealing is also an important part of the bearing lubricating function. HCH offers a range of sealed bearings that will improve cost-effectiveness and reduce the total cost for the application.

The use of motors is expected to grow more and more in every industry. Along with the growth, operating conditions will become severer which will ultimately require better performing bearings. We would like to continue our efforts to enhance our technology that will exceed future requirements.