

What is an AC and DC Motor? | TECO

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Glossary

What is an AC and DC Motor?

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Electric motors convert electrical energy into mechanical motion, but the way they use electrical energy differs significantly. The two broad categories, Alternating Current (AC) and Direct Current (DC), use different power supplies, construction principles and control methods. Understanding these differences is essential before selecting a motor that is technically suitable and compliant for your application.

At TECO, we bring more than 50 years of experience supplying motors engineered for industrial reliability across Australia and New Zealand. Our range covers motors used in Mining, Oil and Gas, Coal, Agriculture, Power and Energy, Food and Beverage, Water Infrastructure and Hard-Rock Mining, supported by local stock across 6 branches in Australia and New Zealand and TECO ModShop capability.

So, what makes AC and DC motors different? Let's take a detailed look.

What is an AC Motor?

AC motors use alternating current to produce a rotating magnetic field in the stator. In the most common design—the squirrel cage induction motor—this rotating field induces current in the rotor bars, producing torque. Torque is generated by the interaction between the induced rotor currents and the stator magnetic field, with the rotor operating at a small slip relative to synchronous speed.

AC motors used in Australian and New Zealand industry are typically IEC 60034 / AS-NZS compliant induction motors, available in IE2, IE3 and IE4 efficiency classes. Their construction is brushless, mechanically robust and suited to continuous-duty applications such as pumps, fans, compressor motors, conveyors and general industrial drives.

In VSD (Variable Speed Drive) applications, AC induction motors offer stable operation across a wide speed range without requiring brushes or commutation maintenance.

Motor Families

Squirrel-cage induction motors – the industry standard for robust, low-maintenance continuous duty. TECO's IE3 and IE4 designs offer high mechanical strength, dependable starting performance and compatibility with any VSD.

Wound-rotor induction motors – used where high starting torque or controlled acceleration is required. These remain AC induction machines and are suited for mills, crushers and heavy-load applications.

Synchronous motors – selected for constant-speed operation or where power factor correction is beneficial.

Speed and Torque Control

Variable Speed Drives (VSDs) enable precise management of motor speed and torque while improving system energy efficiency. AC induction motors paired with VSD control are now the dominant approach in industrial pumping, HVAC, conveyors and process control across Australia and New Zealand.

Thermal and Environmental Ratings

TECO motors use Class H insulation systems with temperature-rise limits tuned to AS/NZS and IEC 60034 requirements. Mining-duty and water-industry variants are available up to IP66 , ensuring long service life in abrasive, wet or corrosive environments.

Applications

TECO AC motors are widely applied to pumps, compressors, conveyors, fans and agitators, where reliability, efficiency and long-term mechanical stability are essential.

What is a DC Motor?

DC motors use direct current and rely on either mechanical commutation (brushed DC motors) or electronic commutation (brushless DC motors). Brushed designs use a commutator and brushes to switch current direction in the armature; this introduces wear and requires periodic inspection. Brushless DC motors avoid this limitation using electronic switching.

Motor speed is determined by the armature voltage and field flux. Modern DC drives employ chopper or PWM control for precise speed regulation. DC motors are commonly used where battery supply is required or where specific torque characteristics suit small machinery, vehicles or specialised automation.

It is important to note that wound-rotor motors are AC induction motors, not DC motors. They are used where high starting torque or variable slip characteristics are necessary.

Engineering Characteristics

DC Motor Families

Brushed DC motors – employ a commutator and brushes to switch armature current. They offer simple torque production but require periodic brush and commutator maintenance, making them less suited to harsh or continuous industrial duty.

Brushless DC (BLDC) motors – use electronic commutation, eliminating brush wear and improving reliability, efficiency and service life.

Wound-field DC motors – provide adjustable torque and reversible operation through separate field control. These are used where fine speed regulation or controlled starting characteristics are required.

Control Precision

DC motor speed is regulated through armature voltage variation or PWM (Pulse Width Modulation), providing linear torque characteristics across a broad speed range. Field weakening can be applied for extended speed capability in wound-field machines.

Maintenance Considerations

Brushed DC motors require routine inspection involving brush wear checks, commutator cleaning, lubrication of bearings and field-coil condition assessment. These factors must be included in the planned maintenance schedule, especially in high-duty environments.

Applications

DC motors continue to serve specific roles in traction drives, battery-powered systems, cranes, hoists and specialised process equipment demanding tight speed regulation and rapid torque response.

What are the Key Differences?

So, AC and DC motors operate differently and are applied for different applications, but what are the key differences that set them apart?

Power Source: AC motors use alternating current from grid supply or VFD-conditioned sources. DC motors use direct current from batteries or DC power systems.

Key Components: AC induction motors: stator, squirrel-cage or wound-rotor, fully brushless. DC motors: armature, field system, and—if brushed—commutator and brushes.

Maintenance: AC motors require minimal maintenance aside from bearings. Brushed DC motors require brush and commutator maintenance.

Durability: AC induction motors generally offer longer service life due to their sealed, brushless construction and high-IP enclosure availability.

Speed Control: AC motor speed is controlled via supply frequency through a VFD. DC motor speed is controlled through armature voltage and field regulation.

Identifying these differences is essential in helping you choose the right motor for your application. It's not a question of better or worse, but which is right for you.

Engineering Considerations for Industrial Specification

When specifying motors for critical infrastructure or process plants, evaluation should include:

Duty Type and Load Profile – Continuous (S1) or variable/intermittent duty, and expected load peaks.

Thermal and Environmental Limits – High ambient temperature, contamination, humidity, or water ingress; select IP66 or higher protection as required.

Drive Integration – Compatibility with VFDs or soft starters ; consideration of bearing insulation and surge protection on inverter duty.

Energy Efficiency – Compliance with IEC 60034-30 IE3/IE4 standards to meet Australian MEPS requirements .

Maintenance and Lifecycle Planning – Balancing ease of service against required uptime.

Compliance and Safety – IECEx/ATEX certification where explosive atmospheres or hazardous gases are present.

Which Motor Do You Need?

The appropriate motor depends on power supply, duty cycle, environmental conditions and control method. DC motors are used for battery-powered systems or specific torque characteristics. For most industrial applications in Australia and New Zealand—particularly pumping, HVAC, conveyors, compressors and mining—AC induction motors are the most robust and cost-effective choice, offering long-term reliability and compatibility with any VFD brand.

TECO's range includes IE3 and IE4 TECO Squirrel Cage induction motors, designed as drop-in IEC replacements, as well as TECO Wound Rotor AC motors for high-torque heavy-load applications.

Explore your high-quality electrical motor options with TECO, or contact our team for further advice on which motor will work best for your application.

TECO: Your Motor Provider

At TECO, we're committed to providing you with options for your electrical motor demands. With our range, you can explore high-performance motors with industry-leading technology. Choose reliability when you explore our range of electrical motors.

Whether you're looking for an AC motor or a DC motor or want to explore our other options, we have you covered.

If you're not sure what you're looking for, our team can help you get started. Contact us today.

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Electric motors are critical to industrial operations across sectors such as mining, water & wastewater, oil & gas, and manufacturing. Designed for high reliability and energy efficiency, modern motors are

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When specifying an electric motor, one of the lines on the specification is routinely IP rating. It is very common for industrial specifications in particular to specify IP66, but

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