

## Synchronous Speed

AC induction motors rotate at a speed defined by the supply frequency and the number of magnet poles within the motor. The stator of the winding is wound in a pattern that determines the number of poles or magnetic peaks of flux around the circumference. The position of the windings, with respect to the three phases of AC three phase supply, or the position of the main and auxiliary winding of a single phase supply, results in a rotating magnetic field around the stator.

The synchronous speed is determined by the following equation:

$$\text{Synchronous speed} = 120 \times \frac{\text{supply frequency (Hz)}}{\text{number of poles}}$$

This leads to the following speeds for 50Hz and 60Hz supplies.

Number of poles in motor	Rpm for 50Hz supply	Rpm for 60Hz supply
2	3000	3600
4	1500	1800
6	1000	1200
8	750	900
10	600	720
12	500	600

In reality AC induction motors do not attain these synchronous speeds due to slip between the stator and rotor. The size of the slip varies depending on the motor design and varies with load on the motor.