

Fast four-pole solution in ABB medium voltage motors



ABB's new fast four-pole solution offers higher power density, reduced vibration level and extends the motor lifetime.

Strict requirements for energy efficiency are spurring the supply of an increasing number of medium voltage motor applications by variable speed drives. In principle, the speed of an electric motor is determined by the number of pole pairs and the network frequency. However, when the drive and motor are considered a single system, increasing the supply frequency of the drive and the number of poles in the motor can be a smart solution.

Increased power density

Many applications in the industry require continuous operation at speeds above the synchronous revolutions of a two-pole 50 Hz motor, meaning up to 3,000–4,000 rpm. At these speeds, a four-pole design at 100 Hz provides more power than a comparable two-pole motor at 50 Hz. Having a machine that is smaller by one frame size rather than a two-pole solution brings considerable savings. This is due to the fact that a four-pole design allows for a larger rotor diameter with more available space. A four-pole design can achieve up to 40% increased power compared to an equivalent two-pole solution.

Easy installation and integrability from a smaller footprint

A four-pole design yields more power per frame size and the motor is lighter than a two-pole design. It typically allows the same delivered power to be fitted with one smaller frame size. The smaller frame size provides a reduction of around 20% in mounting area, and even a reduction as high as 30% in motor weight. This reduced weight and footprint area allow easier installation, reduced space usage, and increased operational speed and power.

High reliability with lower vibrations

Rotor dimensioning and electrical design of four-pole solutions allow increased stiffness and lower excitation forces as well as the possibility to avoid the typical vibration for two-pole motors on double rotational frequency. ABB designs incorporate an advanced vibration cancelling technique which eliminates axial resonance. This way it is possible to guarantee a longer lifecycle of the motors with increased reliability throughout the continuous operation of the machine.

4-pole motors design overview

Output power	0.5 MW to 7 MW
Frame size	400 to 630
Number of poles	4
Voltage	up to 13.8 kV
Max. frequency (Speed)	100 / 120 / 135 Hz (3000 / 3600 / 4000 rpm) VSD only
Cooling	Air to Air / Air to Water Forced ventilation available
Protection	IP 55 (optionally up to IP66)
Bearings	Sleeve
Mounting	Horizontal
Ex Protection	Available on request
Standards	IEC, EN, NEMA, CSA, API

4-pole design applicable in major industries



Water

- High pressure pump
- Pumping station



Coal, Oil and Gas

- Oil and gas pipelines
- Pumps & Compressors



Power

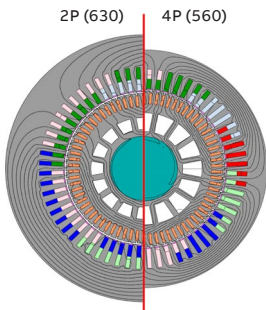
- Boiler feed water pump



Marine and Construction

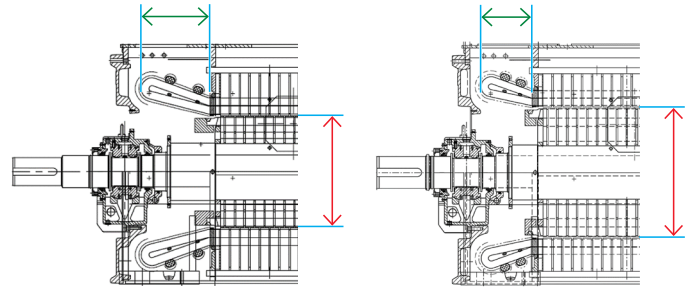
- Chiller system

A four-pole design can deliver an improved solution compared to a two-pole design



It has been commonly believed that higher frequencies lead to increased losses. However, a deeper study shows that losses remain almost unchanged provided that resistance losses in the coil ends decrease. In a four-pole motor, the coil ends are shorter, and the stator yoke is thinner compared to two-poles designs and allows for more space for the rotor's

active parts. In addition, there is an advantage of four-poles designs in the decrease in twice-line-frequency vibrations, which are a common problem in two-pole machines. There is no need for additional stiffening or mechanical vibration isolation of the stator core in a four-pole motor in order to achieve low vibration and low noise levels.



Two-pole

Four-pole

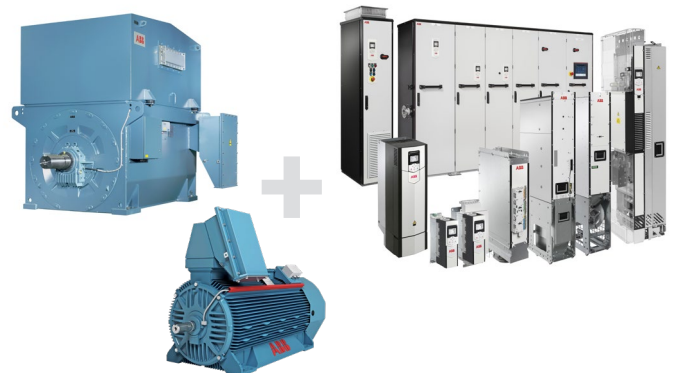
A four-pole design has shorter coil ends (green) and larger rotor diameters (red).

Compatible with Variable speed drives

Modern Variable Speed Drives allow for output frequencies well above 100 Hz enabling the operation of 4 poles motors at rotational speeds previously achieved by 2 poles designs only.

Optimal option with ABB Drives and Motors package

ABB Drives portfolio covers both LV and MV drives with optimum characteristics to safely drive and operate motors at speeds above their synchronous speed.



For more information please visit:
new.abb.com/motors-generators

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