

Permanent Magnet Motors

Better efficiency, improved reliability, lower ESP operating costs

Applications

- Artificial lift using
 - Electric submersible centrifugal pumps
 - Electric submersible progressing cavity pumps

Benefits

- Lower ESP operating expense through reduced power consumption
- Lower motor heat rise improves equipment longevity and run life
- Reduced equipment string length for
 - Deeper pump setting depths
 - Improved wellbore access through doglegs

Features

- Available in 319, 406, 456, 512, and 562 series sizes
- Wide operating speed range:
 - Low-speed PMM: 120 – 1,500 rpm
 - Standard-speed PMM: 500 – 3,900 rpm
 - High-speed PMM: 3,000 – 6,000 rpm
- Motor efficiency up to:
 - Low-speed PMM – 83%
 - Standard-speed PMM – 93%
 - High-speed PMM – 93%
- High power factor (very close to 1)
- No rotor slip
- Locked rotor bearing design

The proven technology of permanent magnet motors (PMMs) has shown to reduce operating expenses attributable to ESP power consumption up to 20% or more. PMMs also experience lower heat rise than an equivalent horsepower (HP) induction motor (IM) contributing to improved reliability and longer run life. The higher HP rotor density means PMMs are also significantly shorter than an IM equivalent, which enables deeper pump setting depths as well as facilitating better clearance through severe doglegs or tortuous well paths.

Borets PMM performance is optimized using a proprietary vector control algorithm in the surface variable speed drive (VSD). Key motor performance characteristics – determined under a controlled lab tuning process – are uploaded to the control algorithm enabling the VSD to optimize motor power consumption and control stability uniformly across the full spectrum of motor load variation.

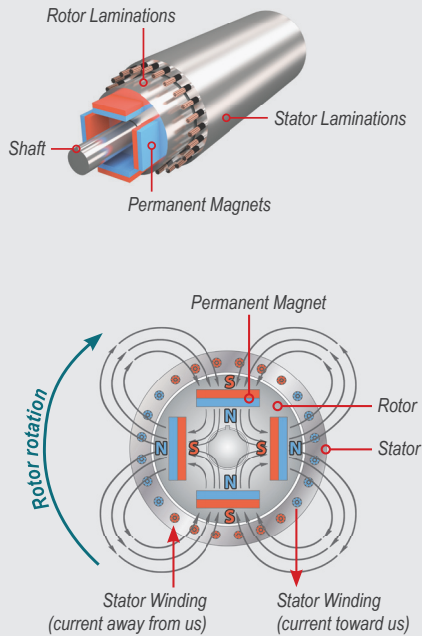
Borets has the industry's largest portfolio of proven PMMs across a range of series size and ranging from low-speed (120 rpm) to high-speed (6,000 rpm) in support of standard (PMM-ESP), high-speed (Slimline and WR2) and low-speed (PMM-PCP) applications. All Borets PMMs come as single section motors.

As the global leader in PMM technology development and experience, Borets first introduced PMM technology in 2006 and has since deployed more than 14,800 PMMs worldwide. The maximum recorded PMM run life is 2,708 days.

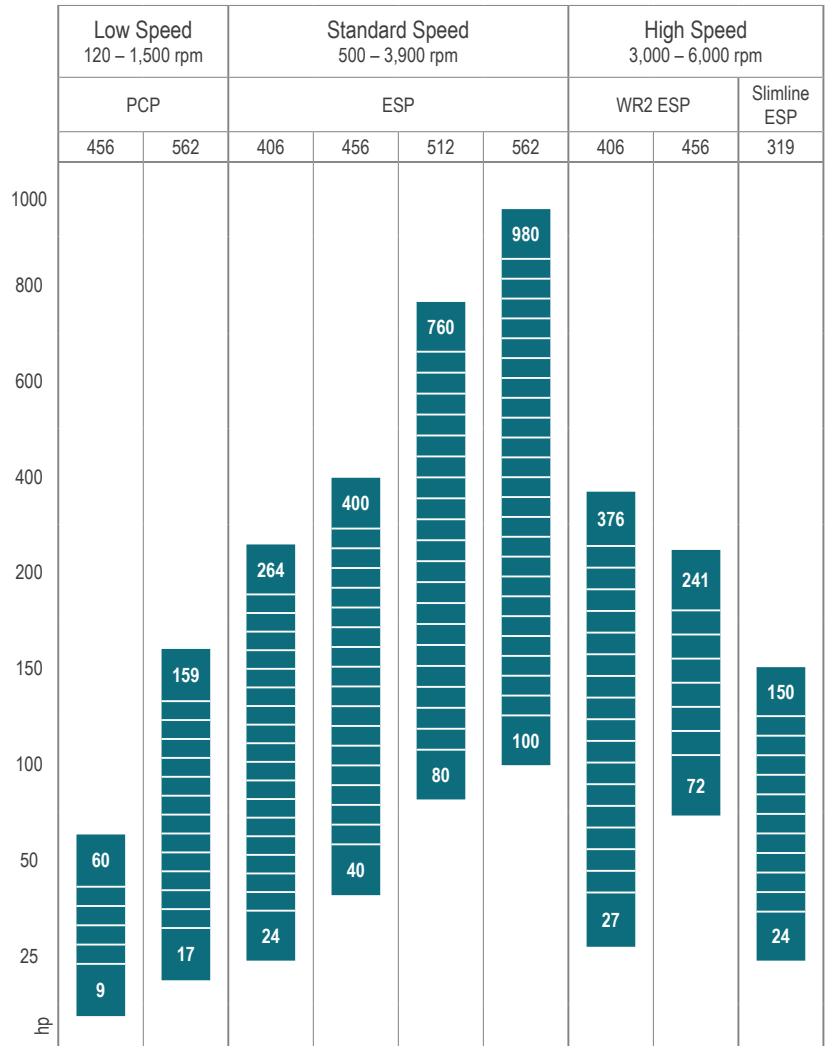


PMM Operating Principle

Permanent magnets made of sintered hard-magnetic materials are incorporated into the design of the PMM rotor. It is the rotor flux produced by these magnets that interacts with the stator magnetic field to produce motor torque. Power consumption and heat rise are both reduced since no current is induced in the PMM rotor.



Available PMM Sizes and Horsepower Range



PMM vs. IM Advantages

Results of field test comparisons of PMM to IM performance conducted by Borets and lab testing conducted by five major operators are summarized in the graphic.

The tests confirmed the superior performance of PMMs, including better efficiency, higher power factor, and 15% average energy savings.

