Pleuger® PMM
High-Efficiency Submersible Motor
With Permanent Magnet Technology for
Electrical Submersible Pumps (ESP)
Pump supplier to the world

Flowserve is the driving force in the global industrial pump marketplace. No other pump company in the world has the depth or breadth of expertise in the successful application of pre-engineered, engineered, and special purpose pumps and systems.

Life cycle cost solutions

Flowserve provides pumping solutions that permit customers to reduce total life cycle costs and improve productivity, profitability and pumping system reliability.

Market-focused customer support

Product and industry specialists develop effective proposals and solutions directed toward market and customer preferences. They offer technical advice and assistance throughout each stage of the product life cycle, beginning with the initial inquiry.

Broad product lines

Flowserve offers a wide range of complementary pump types, from pre-engineered process pumps to highly engineered and special purpose pumps and systems. Pumps are built to recognized global standards and customer specifications.

Pump designs include:
- Overhung process
- Between bearings
- Vertical
- Submersible motor
- Side channel
- Vacuum pumps and compressors
- Positive displacement
- Nuclear
- Specialty

Product brands of distinction

ACECTM
Aldrich™
Byron Jackson®
Calder™ Energy Recovery Devices
Cameron™
Durco®
Flowserve®
HALBERG™
IDP®
INNOMAG®
Lawrence Pumps®
Niigata Worthington™
Pacific®
Pleuger®
Scienco™
Sier-Bath®
SIHI®
TKL™
United Centrifugal®
Western Land Roller™
Wilson-Snyder®
Worthington®
Worthington Simpson™
The Flowserve Pleuger PMM permanent magnet motor has been developed for the highest possible energy efficiency.

The permanent magnet technology guarantees up to 14 percentage points better efficiency compared to asynchronous technology (AC), resulting in a lower elevated temperature rise of the motor windings, increasing power output more than 100%.

The PMM motor is available from 4 kW (5.4 hp) to 200 kW (268.2 hp) for 144 mm (6 in) and 186 mm (8 in) motors with efficiencies up to 95%.

Construction of the PMM motor is based on the reliable Pleuger three-phase AC submersible squirrel cage induction motor.

PMM motors are rewindable, synchronous electric motors. Variable frequency drives (VFD’s) must be used to start PMM motors and bring them up to synchronous speed.

Equipping a submersible pump with a PMM motor and a VFD ensures the pump operates at BEP (best efficiency point).

**Significantly increase motor efficiency and power output**

**Industries**
- Water Resources
- General Industry/Mining
- Agriculture
- Power

**Applications**
- Water Supply and Distribution
- Groundwater Development
- Dewatering
- Irrigation
- Cooling Water
Engineered to maximize efficiency

**PMM features and benefits**

- Electrical submersible motor, including permanent magnet technology, provides up to 14 percentage points better efficiency than induction (asynchronous, AC) motors.
- By increasing power output more than 100% compared to an AC, the required installation area for the motor can be reduced.
- Wide efficiency curve drastically reduces number of motors per size by 80%, significantly reducing storage area and simplifying motor selection.
- Developed for highest possible energy efficiency with a synchronous motor operated by VFD based on the reliable Pleuger asynchronous motor design.
- No special VFD required; standard VFDs from various manufacturers can be used.
- Low motor temperature increases lifetime and MTBF.
- No sinus filter or du/dt filter required, saving both money invested and energy cost.

**Synchronous Motor (PMM) Versus Asynchronous Motor (M-Series)**

- Power increase > 100%
- Up to 14% (PMM6) / or 10% (PMM8) points better efficiency
- Considerable improved partial load conditions

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**Efficiency PMM versus M-Series**

<table>
<thead>
<tr>
<th>Power Output [kW/hp]</th>
<th>Efficiency PMM</th>
</tr>
</thead>
<tbody>
<tr>
<td>67</td>
<td>0.70 PMM6-305-2</td>
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<tr>
<td>134</td>
<td>0.80 PMM6-650-2</td>
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<tr>
<td>150</td>
<td>0.85 M6-710-2</td>
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<tr>
<td>201</td>
<td>0.90 M10-880-2</td>
</tr>
<tr>
<td>268</td>
<td>1.00 PMM6-600-4</td>
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</tbody>
</table>

**Winding temperature PMM versus M-Series**

- Difference ≈ 25 K

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For more detailed specifications and data, please visit Flowserve.com.
Designed to minimize life cycle costs

**Flat or Round Cable**
Space-saving cable design for installation with limited space. Certified for drinking water application.

**NEMA Flange Connection**
Offers easy connection to standard hydraulics.

**Motor Housing**
Robustly designed cast housing ensures reliable strength, stiffness, corrosion resistance and durability.

**Permanent Magnet Rotor**
- Up to 14 percentage points higher motor efficiency compared to asynchronous motors due to no copper losses.
- Hermetic encapsulated rotor ensures protection of magnets against corrosion and mechanical damage.

**Rewindable Winding**
Provides maintenance cost savings; PVC or PE2 insulation.

**Mechanical Seal**
High-grade SIC/SIC/Viton® as standard ensures wear resistance and maintenance-free operation.

**Stator Tube**
Standard 316 stainless steel construction offers excellent corrosion resistance over the service life. Special materials available on request.

**Motor Shaft End**
Standard duplex stainless steel construction provides best combination of corrosion resistance, mechanical strength and stiffness. Special materials available on request.

**Motor Filling**
Prefilled and tested with water/glycol mixture or potable water on request.

**Thrust Bearing**
Heavy-duty, maintenance-free design to ensure long lifetime.

**Signal Cable (optional)**
Used with temperature sensor PT100 for monitoring motor temperature.
## Technical data

<table>
<thead>
<tr>
<th>Motor Type</th>
<th>Power Output* (kW)</th>
<th>Current* (A)</th>
<th>Efficiency* (%)</th>
<th>Cos Phi*</th>
<th>Length, L (mm)</th>
<th>Diameter, D (mm)</th>
<th>Weight (kg)</th>
<th>Maximum Permissible Thrust (kN)</th>
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<tbody>
<tr>
<td>PMM6-160-4</td>
<td>4.0 (5.4)</td>
<td>8.2</td>
<td>87.0%</td>
<td>0.995</td>
<td>696 (27.40)</td>
<td>144 (5.669)</td>
<td>46 (101)</td>
<td>27.5 (6182) 6 (1349)</td>
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<tr>
<td></td>
<td>5.5 (7.4)</td>
<td>11.0</td>
<td>89.0%</td>
<td>0.990</td>
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<td></td>
<td>9.2 (12.3)</td>
<td>17.9</td>
<td>91.0%</td>
<td>0.975</td>
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<tr>
<td></td>
<td>11.0 (14.8)</td>
<td>21.5</td>
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<td>13.0 (17.4)</td>
<td>25.5</td>
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<td>0.955</td>
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<td></td>
<td>15.0 (20.1)</td>
<td>29.0</td>
<td>91.0%</td>
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<td>PMM6-320-4</td>
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<td>28.5</td>
<td>92.5%</td>
<td>0.990</td>
<td>856 (33.70)</td>
<td>144 (5.669)</td>
<td>64 (141)</td>
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<td>18.5 (24.8)</td>
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<td>22.0 (29.5)</td>
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<td></td>
<td>26.0 (34.9)</td>
<td>48.5</td>
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<td>30.0 (40.2)</td>
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<td>33.0 (44.3)</td>
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<td>37.0 (49.6)</td>
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<td>40.0 (53.6)</td>
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<td>79.0</td>
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<td>0.980</td>
<td>1136 (44.72)</td>
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<td>101 (223)</td>
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<td>46.0 (61.7)</td>
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<td>50.0 (67.1)</td>
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<td>55.0 (73.8)</td>
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<td>60.0 (80.5)</td>
<td>121.0</td>
<td>94.5%</td>
<td>0.950</td>
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<td>68.0 (91.2)</td>
<td>137.0</td>
<td>94.5%</td>
<td>0.935</td>
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<td>75.0 (100.6)</td>
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<td>PMM8-610-4</td>
<td>75.0 (100.6)</td>
<td>140.0</td>
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<td>0.985</td>
<td>1438 (56.61)</td>
<td>186 (7.323)</td>
<td>179 (395)</td>
<td>80.0 (17 385) 12.5 (2810)</td>
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<td>83.0 (111.3)</td>
<td>153.0</td>
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<td>0.985</td>
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<tr>
<td></td>
<td>90.0 (120.7)</td>
<td>166.0</td>
<td>94.0%</td>
<td>0.985</td>
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<td>110.0 (147.5)</td>
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<td>0.975</td>
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<td>140.0 (187.7)</td>
<td>260.0</td>
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<td>170.0 (228.0)</td>
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<td>190.0 (254.9)</td>
<td>360.0</td>
<td>93.0%</td>
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<td>200.0 (268.2)</td>
<td>380.0</td>
<td>92.5%</td>
<td>0.915</td>
<td></td>
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</tbody>
</table>

* at 120 Hz and 3600 1/min

### Motor Technical Specification
- Driven by VFD
- VFD Input Voltage: 400–500 V
- Operating Frequency: 70–120 Hz
- Operating Speed: 2100–3600 1/min; max. 3800 1/min
- Motor Flange: NEMA
- Protection: IP68
- Installation: Horizontal/Vertical
- Motor Lead: PMM6 = 3 m (9.8 ft); PMM8 = 7 m (23 ft)
- Operating Ambient Temp: -15°C to 50°C (5°F to 122°F)
- Cooling Velocity: 0.2 m/s @ 20°C (0.66 ft/s @ 68°F) or 0.5 m/s @ 30°C (11.6 ft/s @ 86°F)
- Starts per Hour: PMM6 = 20; PMM8 = 10
- Drinking Water Approval for Power Cable: German KTW certificate suitable for drinking water applications

### Construction Materials
- Cast Housing Materials: Cast Iron, Bronze, 316 Stainless Steel, Super Duplex Stainless Steel
- Shaft End: Duplex Stainless Steel (Standard), Super Duplex Stainless Steel
- Rubbers: NBR
- Mechanical Seal: SIC/SIC/Viton
- Stator Tube: 316 Stainless Steel, SMO
- Radial Bearing: Carbon
- Thrust Bearing: Synthetic/stainless steel
- Fasteners: 316 Stainless Steel, Super Duplex Stainless Steel
- Diaphragm: NBR

### Motor Options and Filter
- PT 100 (directly built-in or retrofittable)
- Higher or lower temperature
- VFD: On request or any on the market suitable to operate synchronous motor
- Filter du/dt or Sinus Filter: Not required, on request.
Typically, 90% of the total life cycle cost (LCC) of a pumping system is accumulated after the equipment is purchased and installed. Flowserve has developed a comprehensive suite of solutions aimed at providing customers with unprecedented value and cost savings throughout the life span of the pumping system. These solutions account for every facet of life cycle cost, including:

**Capital expenses**
- Initial purchase
- Installation

**Operating expenses**
- Energy consumption
- Maintenance
- Production losses
- Environmental
- Inventory
- Operating
- Removal

**Innovative life cycle cost solutions**
- New pump selection
- Turnkey engineering and field service
- Energy management
- Pump availability
- Proactive maintenance
- Inventory management

While exact values may differ, these percentages are consistent with those published by leading pump manufacturers and end users, as well as industry associations and government agencies worldwide.
Flowserve Corporation has established industry leadership in the design and manufacture of its products. When properly selected, this Flowserve product is designed to perform its intended function safely during its useful life. However, the purchaser or user of Flowserve products should be aware that Flowserve products might be used in numerous applications under a wide variety of industrial service conditions. Although Flowserve can provide general guidelines, it cannot provide specific data and warnings for all possible applications. The purchaser/user must therefore assume the ultimate responsibility for the proper sizing and selection, installation, operation, and maintenance of Flowserve products. The purchaser/user should read and understand the Installation Instructions included with the product, and train its employees and contractors in the safe use of Flowserve products in connection with the specific application.

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