SyMAX® Permanent Magnet AC Motors

The Most Sustainable Motor Available Today

ENERGY SAVINGS

Looking for the next level of efficiency?

SyMAX® PMAC motors deliver impressive energy savings by the elimination of rotor conductor losses, optimized fan design, precision-wound stator and variable speed operation. These Ultra Efficient™ motors exceed European IE4 efficiency levels, 5 years ahead of scheduled implementation, achieving efficiencies 25-35% over NEMA Premium™! The energy savings alone often pays for the motor in as little as two years.

Additionally, the SyMAX® efficiency profile remains flatter than an equivalent induction motor as the speed and load declines, allowing the user to capture even greater energy savings when operated at the application’s ideal speed.

Electric motors consume an estimated 25% of all electricity and up to 65% of all electrical energy consumed by industrials. Energy costs are projected to continue to increase in the future. A 1% gain in energy efficiency would reduce carbon emissions by an estimated 80 million tons per year. SyMAX® motors provide a very cost-effective way to reduce our carbon footprint and assure a cleaner environment.

THE ULTIMATE IN APPLICATION FLEXIBILITY

For retrofit applications, SyMAX® motors are a Direct Drop-In replacement for Induction motors, utilizing the same footprint, shaft height and other critical NEMA or IEC prescribed dimensions.

New or redesigned machinery installations can exploit the higher power density of Permanent Magnet AC, resulting in a 2-3 frame size reduction, while providing the same output torque … or if you prefer, more torque in the same frame size.
BEARING CURRENT REDUCTION

Wider air gap designs, coupled with optional shaft grounding devices assure you of many years of trouble-free service, while delivering the benefits of variable speed operation.

UNSURPASSED RELIABILITY AND LONGEVALITY

SyMAX® motors provide the highest level of reliability and longevity, coupled with low maintenance costs, due to their low operating temperature, high ingress protection levels and ultra-precision balancing techniques.

SyMAX® 48-140 frame have Class F insulation system with Class B temperature rise, while 180-280 frame are equipped with Class H system and B rise, resulting in long insulation life.

<table>
<thead>
<tr>
<th>System</th>
<th>Total Temp.</th>
<th>Rise</th>
<th>Life</th>
</tr>
</thead>
<tbody>
<tr>
<td>B</td>
<td>130°C</td>
<td>B</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>103,000</td>
</tr>
<tr>
<td>H</td>
<td>180°C</td>
<td>H</td>
<td>20,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>F</td>
<td>103,000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>B</td>
<td>650,000</td>
</tr>
</tbody>
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WIDE SPEED RANGE CONSTANT OR VARIABLE TORQUE

SyMAX® Permanent Magnet AC

Synchronous motors offer improved speed and torque regulation, dynamic performance, and higher torque/amp, for those mission critical applications requiring maximum system performance.

Variable Torque operation from 0-base speed
Constant Torque 20:1 sensorless vector
Constant Torque 2000:1 closed loop vector
Constant Power to 125% of base speed
SyMAX® Permanent Magnet AC Motors

<table>
<thead>
<tr>
<th></th>
<th>SyMAX® Commercial</th>
<th>SyMAX® Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>NEMA FRAMES</strong></td>
<td>48, 56, 143/145T</td>
<td>182-215T</td>
</tr>
<tr>
<td><strong>IEC FRAMES</strong></td>
<td>80</td>
<td>112-132</td>
</tr>
</tbody>
</table>

**Electrical and Mechanical Features**

- **Ingress Protection (IP Code)**: IP54, IP54 (IP55 or IP56 optional), IP54 (IP55 or IP56 optional)
- **Frame construction**: Steel, Cast Iron, Cast Iron
- **Enclosure**: TENV (TEFC optional), TEFC (TENV optional), TEFC (TENV or TEBC optional)
- **End Shield material**: Aluminum, Cast Iron, Cast Iron
- **Fan guard material (TEFC)**: Polypropylene, Cast Iron, Cast Iron
- **Terminal box material**: Steel, Cast Iron (Steel optional), Cast Iron (Steel optional)
- **Power termination (see note 1)**: Flying Leads (terminal board optional), Flying Leads (terminal block optional), Flying Leads (terminal block optional)
- **Standard terminal box position**: F1 (IEC F3)
- **Auxiliary grounding provision (on frame foot)**: None, Standard, Standard
- **Bearing system, C3 clearance**: Sealed, Shielded with bearing caps, Shielded with bearing caps
- **Shaft seals**: None, Slinger (V-Ring or Inpro optional), Slinger (V-Ring or Inpro optional)
- **Regreasing provisions**: None, Zerk fittings, Zerk fittings
- **Severe Duty features**: None, Interior epoxy paint, dual cycle varnish treatment, terminal box gaskets, brass drain/breather, Interior epoxy paint, dual cycle varnish treatment, terminal box gaskets, brass drain/breather
- **Exterior paint**: Black Powder (electrostatic), Black Epoxy, Black Epoxy
- **Overload protection**: None, N/C Thermostat, N/C Thermostat
- **Bearing Current Protection - OPTIONAL**: Internal Shaft Grounding Ring, Internal Shaft Grounding Ring, Internal Shaft Grounding Ring
- **Insulation System**: Class F, Max Guard, Class H, Max Guard
- **Encoder provisions**: Optional, Optional, Optional
- **Feedback devices - OPTIONAL**: Hall effect sensor, encoders, Encoders, resolvers, Encoders, resolvers
- **Agency Recognition**: UL, CSA, CE, UL, CSA, CE, UL, CSA, CE
- **Division 2 (CSA Certified) - OPTIONAL**: Class I, Div 2, Groups A, B, C, &/or D, Class I, Div 2, Groups A, B, C, &/or D
- **End-of-Line production test report**: Optional, Standard, Standard
- **Warranty term**: 3 years, 3 years, 3 years

**Performance Features**

- **Efficiency level**: NEMA Premium or higher, Ultra Efficient™ (IE4 or higher), Ultra Efficient™ (IE4 or higher)
- **Cogging torque**: Ultra Low, Ultra Low, Ultra Low
- **Operating temperature rise (maximum)**: Class B rise or less, Class B rise or less, Class B rise or less
- **Variable Torque speed range (see note 2)**: 1-100% of base speed, 1-100% of base speed, 1-100% of base speed
- **Constant Torque speed range (see note 2)**: 1-100% of base speed, 1-100% of base speed, 1-100% of base speed
- **Constant power speed range (see note 2)**: 100-120% of base speed, 100-120% of base speed, 100-120% of base speed
- **Reserve Torque capability (up to 1 minute)**: 150%, 150%, 150%
- **Duty Cycle**: Continuous, Continuous, Continuous
- **Ambient temperature range**: -20 to +40°C, -20 to +40°C, -20 to +40°C
- **Altitude - maximum**: 3300 ft (1000 meters), 3300 ft (1000 meters), 3300 ft (1000 meters)
- **Balance Specification**: NEMA Standard (Precision optional), NEMA Standard (Precision optional), NEMA Standard (Precision optional)

Note 1 - Optional terminal block (or board) is only available on single voltage motors. Terminal block requires cast iron terminal box.

Note 2 - Speed range is subject to VFD settings and capability. While the motor is fully capable of operating in a variable- or constant-torque mode from zero to base speed, performance characteristics such as speed or torque regulation are a function of the drive. Further, the maximum practical limit for most variable torque applications is 10:1. Constant power operation beyond base speed (“field weakening”) is limited to 120% of base speed to protect the VFD from high counter EMF voltages should the drive lose control at high operating speeds. Contact Marathon Electric for specific performance requirements with the proposed VFD.