

# Filling the motor capability gap

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## PM Motors for Motion Applications

Permanent magnet motors are ideal for automated equipment applications where induction motor performance falls short of the mark, or servo motor cost and complexity is impractical. We at Lafert have developed a series of motors that are well suited to filling this motor capability gap; the motor construction integrates the cost-effective induction motor stator housing and stator winding with high-performance permanent magnet servo motor rotor technology. The hybrid design is a highly efficient synchronous motor which outperforms induction motors and offers tremendous value for speed control applications. Lafert is an industry leader in permanent magnet motor technology and has proudly manufactured the HPS Series motors for over fifteen years. They are available from stock with standard power ratings to 50 HP for 230, 460, 575 V input. Mounting options include modular base mounts with or without standardized IEC and NEMA flanges.

## Reduced Losses, Increased Reliability

Energy efficiency has not been a traditional performance consideration for motion control applications, but efficiency has direct reliability and performance implications for motors and systems. All HPS Series motors significantly exceed the current requirements for induction motor efficiency (NEMA Premium®) with motor efficiency performance at or above the “Ultra Premium” (IE5) level. The increased motor efficiency is due to the HPS Series permanent magnet rotor construction, which reduces the electrical rotor losses to zero. Induction motor rotor losses are defined as the electrical power converted to heat by current flow ( $I^2R$ ) in the rotor, which typically accounts for 10 – 15% of total losses. Eliminating the rotor losses delivers a dual benefit of increased energy efficiency and reduced heat generation; HPS Series motors create less heat per unit of mechanical power delivered to the load. This explains the reduced thermal rise and thermal time constant, and the increased maximum ambient temperature and overload capability of HPS Series motors. The industry rule of thumb, which states that each 10°C rise in motor winding temperature reduces insulation life by half, establishes the case for correlation of reduced motor losses with longer field service life. With less waste heat to be eliminated from the enclosure, HPS motors require less material volume and surface area to remain cool. Space and weight savings will vary, but a reduction of approximately 50% can be expected compared to induction motors.



Lafert HPS Series Permanent Magnet Motor

## High Performance, Without Feedback

The synchronous motor construction of the HPS Series means the shaft speed is synchronized with the rotating magnetic field developed by current in the stator windings. This contrasts against the asynchronous operation of induction motors, where the shaft speed lags the rotating stator field speed by a value proportional to the motor load (the “slip”). HPS Series motors address the speed control uncertainty inherent to asynchronous motors, and can eliminate the need for costly and complex slip mitigation measures, like encoders. The motors are engineered and optimized for sensorless control by variable frequency drives, with near-universal support from drive manufacturers.

## Leveraging Lineage

In addition to the benefits of synchronous operation, HPS Series motors inherit two characteristics from the servo motor with performance implications for motion applications. First, the reduced weight and dimensions of HPS Series permanent magnet rotors yield higher torque-to-inertia ratios than induction motors. Higher torque-to-inertia ratios are desirable because they support higher system dynamic response and repeatability. Second, the synchronous motor torque-producing mechanism enables the flat torque curve across a wide speed range and a short-time 300% peak torque capability. The unique construction and capabilities of HPS Series motors can drive top performance from your next motion control application.

Rating	Motor Type	Frame Size	Weight (lbs)	Inertia ( $10^{-3}$ lb-ft <sup>2</sup> )	Volume (ft <sup>3</sup> )
3 HP, 3600 rpm	HPS	71	14.5	22	0.19
	NEMA Premium® (Aluminum Body)	90	40.3	43	0.38
7.5 HP 3600 rpm	HPS	90	35.2	31	0.38
	NEMA Premium® (Aluminum Body)	112	78.1	204	0.71

Click [here](#) to download Lafert's HPS Series Technical Catalogue

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