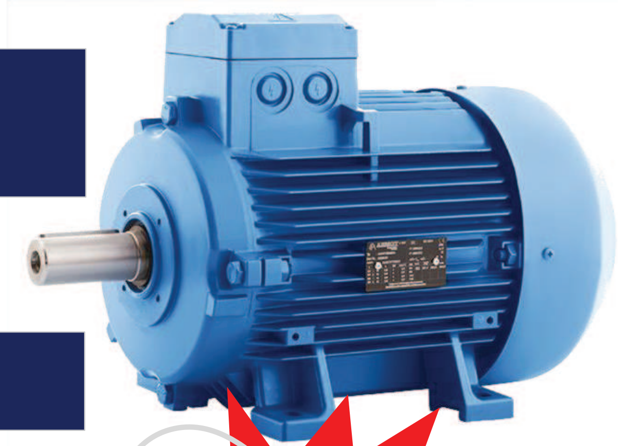
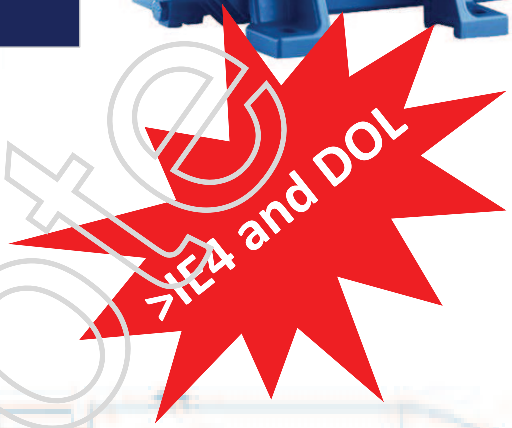
Line Start Permanent Magnet Synchronous Motor

PROMOTE
ARAŞTIRMA VE TEKNOLOJİ GELİŞTİRME

DirectSyn



Asenkron Kalkışlı Sürekli Mıknatıslı Senkron Motor
Line Start Permanent Magnet Synchronous Motor



High efficiency >IE4

High efficiency at partial load

Direct On Line

Constant speed independent of load

High kW/kg ratio

High power factor >0.95

One to one interchangable with equivalent induction motor

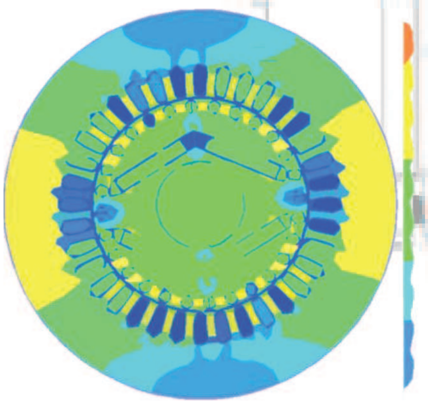
Running with standard U/f scaler motor driver

Automatic speed control without any sensor

Low bearing temperetaure and more reliability

Low phase current (%20 lower than induction)

The same stator lamination and winding in equivalent induction motor are used and lower investment



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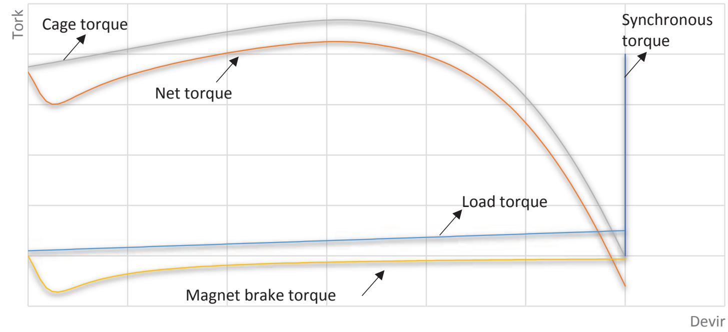
In **DirectSyn** motor design, main properties of two different motors are combined in one motor that can run direct on line without any driver with high efficiency level greather than IE4 efficiency class.

Asynchronous and permanent magnet synchronous motor technologies are combined in one motor. Direct on line property of asynchronous motor and high efficiency running property of synchronous motor are gathered so that motor can be used instead of asynchronous motors without any driver electronic. This type of motors are called LSPMSM.



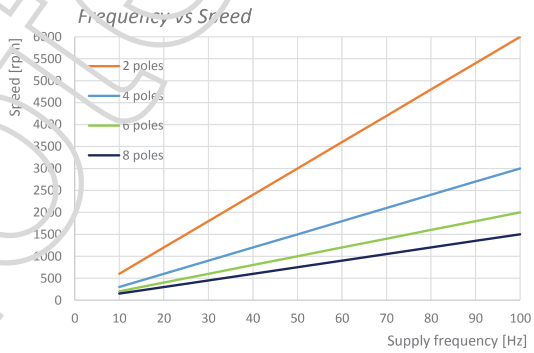
Constant Speed Application

LSPMSM can run at constant speed independent of load torque for constant speed applications without any need of driver electronic. The motor makes its speed constant by the means of synchronous motor running principles. For 50Hz main supply voltage, motor runs at different constant speed levels of 750, 1000, 1500 and 3000rpm depending on pole numbers of motor. It can run at constant speed up to rated torque and %50 more.

50Hz supply voltage	
2p	Speed [rpm]
2	3000
4	1500
6	1000
8	750

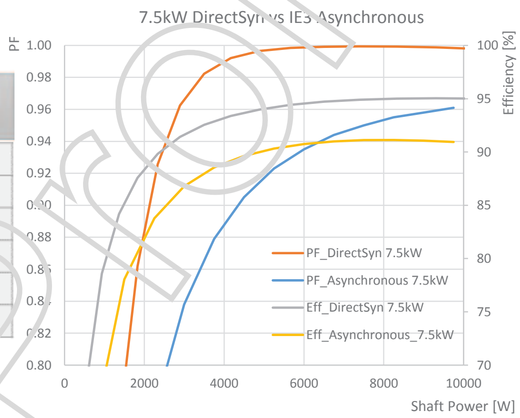
Variable Speed Application

For variable speed appliction, DirectSyn motor can be used with standart U/f scaler control driver used with conventional industrial asynchronous motor. Synchronous speed is changed with the same method of U/f ratio used in asynchronous motors. Synchronous speed can be calculated as ns = driver output frequency[Hz] x 60 /pole pair of motor. For precise speed setting (<±50rpm), encoder or resolver are used in asynchronous motor to give speed feedback to motor driver. There is no need to use encoder or resolver with DirectSyn motor. It can run at constant speed independent of load and speed can be changed only by supply voltage frequency of motor. If supply frequency is constant, motor speed should be constant. This is natural behavior of this type of motor. There is no speed sensor feedback to driver for closed loop speed control.



Performance comparison of 7.5kW 3000rpm DirectSyn motor and IE3 Asynchronous motor

	Asynchronous 7.5kW 3000rpm IE3	DirectSyn 7.5kW 3000rpm
Rated Eff [%]	90.6	94.9
Eff @%50	88.5	93.4
Eff @%25	83.8	87.6
PF	0.95	0.99
Current [A]	12.5	11.3
Stack length [mm]	150	135

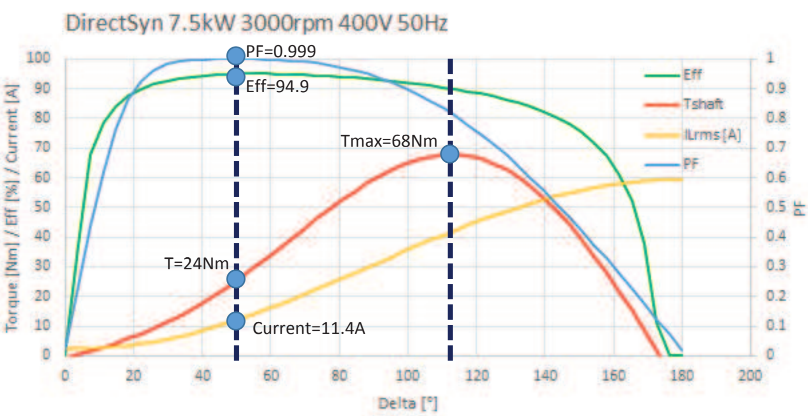


DirectSyn 7.5kW 3000rpm

7.5kW 3000rpm	
97.8	IE10
97.3	IE9
96.6	IE8
95.7	IE7
94.7	IE6
93.4	IE5
91.7	IE4
90.1	IE3
88.1	IE2

IEC 60034-30-1

7.5kW DirectSyn motor synchronous performance curves



Annual energy cost calculation for 7.5kW IE3 Asynchronous ve DirectSyn motor

Motor	Input Power [W]	Current [A]	VA
IE3 Asynchronous 7.5kW 3000rpm	8232	12.5	8660
DirectSyn 7.5kW 3000rpm	7902	11.4	7902
Difference	330	1.1	758

Annual running 6000h

0.33kWh x 6000h x 0.09$/kWh = **178.2$**