

► Our technology. Your success.

Pumps • Valves • Service



KSB SuPremE® in IE5: the world's most efficient magnet-less pump motor



Energy diet

FluidFuture®: the energy-saving concept for your system

With FluidFuture® we optimise your system's energy efficiency in four steps. We achieve top savings by always looking at the entire hydraulic system. Our KSB SuPremE®, the world's most efficient magnet-less pump motor, helps implement these savings.

Systematic approach to highest efficiency

We optimise your system using a systematic and targeted approach for a maximum in savings at minimum costs. Based on comprehensive expertise and experience we have defined an energy-saving process in four steps. By combining our expert knowledge with smart products and services, we make use of all the potential savings to lower your operating costs.

A perfect match for maximum savings

In order to achieve top efficiencies, all the components of your system need to be perfectly matched to each other. For pump sets with a variable load profile, this means combining the world's most efficient magnet-less pump motor KSB SuPremE® with PumpDrive and PumpMeter. The intelligent PumpMeter monitoring unit continuously records the operating point and offers complete transparency. With this information, the PumpDrive variable speed system autonomously optimises the operating mode: The flow rate is continuously matched to actual demand in the system. In combination with the high-efficiency KSB SuPremE® IE5 motor*, savings of up to 60 % can be made. More about FluidFuture®: www.ksb.com/fluidfuture



System analysis

- Creating transparency
- Determining the load profile

Selection

- Defining the system structure
- Selecting components

Commissioning

- Expert installation
- Professional commissioning

Highly efficient operation

- Intelligent pump technology
- Continuous monitoring

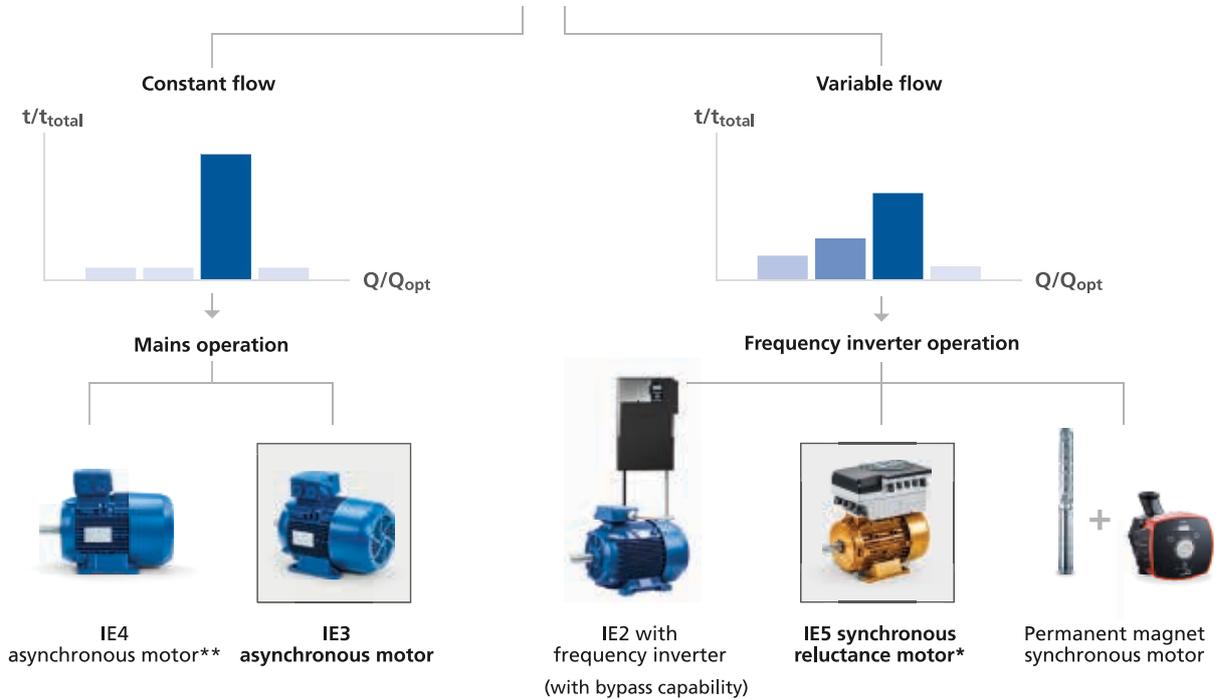
ENERGY-EFFICIENT PRODUCTS AND SERVICES



System Analysis According to FluidFuture®



Assessing the load profile



Energy-efficient drives for every need

High-efficiency drives form an integral part of the system and are therefore a prime target when it comes to ensuring energy-efficient operation. This is why it is essential that the right motor is selected for the job. To this end, a load profile is established by correlating the data from SES System Efficiency Service, or operating data is recorded by PumpMeter. Together with the

requirements of the field of application, legal guideline requirements, annual operating hours and the energy price, this profile establishes the basis for realising the optimal drive solution – which comes from KSB, the only provider to offer an end-to-end range of products and equipment that covers every requirement and demand.

KSB SuPremE®

The world's most efficient magnet-less IE5 pump motor* is on an "energy diet".

- **Energy savings of 70 percent and more:** The efficiency gain of up to 60 % due to speed control is increased even further by an energy saving of up to 15 % in the motor alone.
- **Far ahead of its time:** The IE5 motor (as per IEC /TS 60034-30-2) already exceeds the requirements of the European ErP 2017 regulations.
- **Sustainable:** Unlike permanent-magnet synchronous motors and asynchronous motors, the KSB SuPremE®
- IE5 motor* does not incorporate magnetic materials or increased levels of copper.
- **Robust:** Non-critical, durable materials as well as the fully matured reluctance principle and the high service life of the bearings ensure reliable operation.
- **Compatible:** Wherever there is room for an IE2 asynchronous motor, a KSB SuPremE® IE5 motor* can also be installed to get the work done efficiently.

The products illustrated as examples are partly fitted with options and accessories incurring a surcharge.

* IE5 in accordance with IEC/TS 60034-30-2 up to 15/18.5 kW (only for 1500 rpm types rated 0.55 kW, 0.75 kW, 2.2 kW, 3 kW, 4 kW; IE5 in preparation)

** IEC 60034-30-1

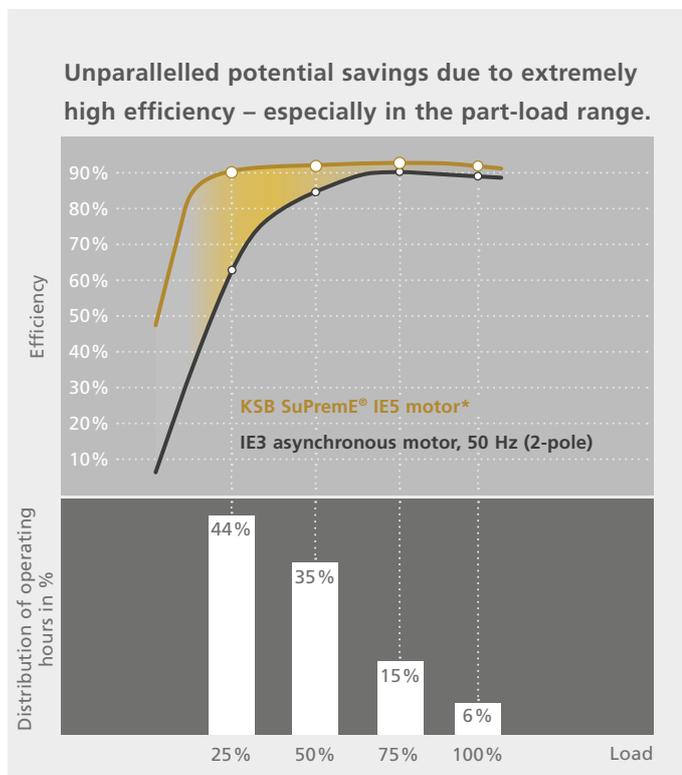
Energy efficiency: experience the future today

The energy diet of the world's most efficient magnet-less pump motor KSB SuPremE® immediately shows on your energy bills. The synchronous reluctance motor is operated at variable speed and achieves uniquely stable and high efficiency gains in all load ranges.

Analyses of existing pump systems have shown that most electric motors are not run at their rated load point, but mainly at part load. In Europe, motors are normally operated at no more than 60 % of their rated load. The efficiency regulations for electric motors initiated by legislators all focus on operation at the rated load point. With its super premium efficiency at full load – but above all with its high efficiency across the entire part-load range – the KSB SuPremE® IE5 motor* stands out as the lean alternative drive for the future.



The diagram shows the efficiency curve plotted over the load of a 7.5 kW, 1500 rpm SuPremE® IE5 motor* in comparison to a 2-pole IE3 asynchronous motor. Load profile to "Blue Angel" requirements.

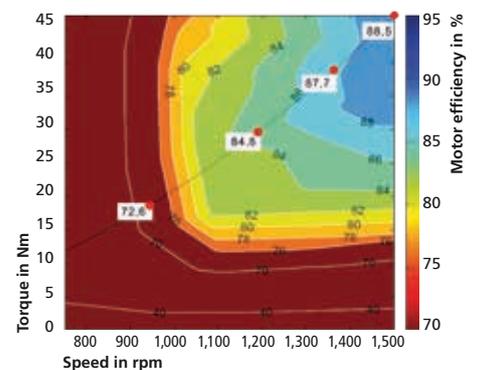


Source: Dipl.-Ing. M. Wiele, Prof. Prof. h. c. mult. Dr.-Ing. Peter F. Brosch, Hochschule Hannover, University of Applied Sciences and Arts, Faculty I, Drives and Automation Technology

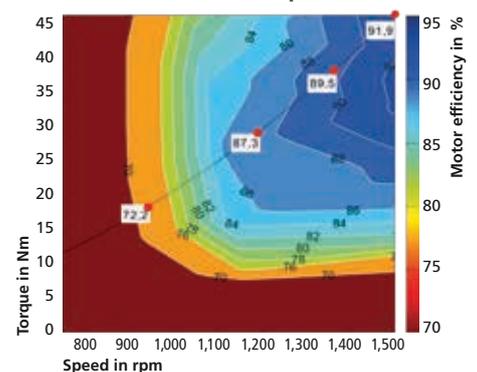
* IE5 in accordance with IEC/TS 60034-30-2 up to 15/18.5 kW (only for 1500 rpm types rated 0.55 kW, 0.75 kW, 2.2 kW, 3 kW, 4 kW: IE5 in preparation)

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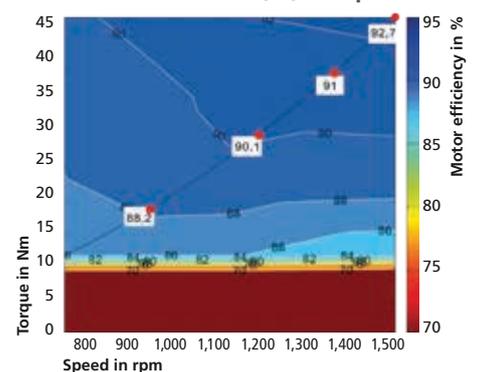
7.5 kW ASM IE2, 1,420 rpm



7.5 kW ASM IE3, 1,450 rpm



7.5 kW KSB SuPremE®, 1,500 rpm



Measured data by Prof. Edgar Stein, Kaiserslautern University of Applied Sciences, 2011





The drive solution of the **future**

The world's most efficient magnet-less pump motor KSB SuPremE® heralds in a new era for pump motors as the main benefit associated with the DOL starting routine employed by today's dominant asynchronous motors will continue to lose value and importance in the future. Just like the KSB SuPremE® IE5 motor*, these units will also be increasingly equipped with a speed control system. It is exactly in this actively controlled mode, however, that the KSB SuPremE® IE5 motor* unfolds its full potential by making every application fit for the future.

The KSB SuPremE® IE5 motor* paves the way

- No DOL starting – no unnecessary losses
- Every bit as robust as asynchronous motors
- Rotor laminations geometry for quiet operation
- Losses associated with the speed control system required are marginal
- Easy maintenance because no magnets are used

Variable load profile

Integration of a speed control system

DOL starting is not required

No unnecessary losses attributed to DOL starting

The success of the asynchronous motor largely has to do with its DOL starting capability. This benefit also presents a drawback, however, because DOL starting leads to unnecessary losses caused by rotor current as evidenced in the slip that occurs at this time. Asynchronous motors will be increasingly fitted with a speed control system in recognition of the fact that maximum flow rate conditions are not always required. In these scenarios, DOL starting is not necessary. There is a better alternative to this combination setup with a speed control system, however – the synchronous motor. Although synchronous motors cannot start up without a frequency inverter, they achieve considerably higher levels of efficiency during operation as no current is sent to the rotor.

Robust for future applications

Asynchronous motors have the reputation of being very robust. The same can also be said of the world's most efficient magnet-less IE5 pump motor*, KSB SuPremE®, whose probability of failure is reduced thanks to the omission of sensors, while the lower temperature of the rotor extends the service life of the bearings. The KSB SuPremE® IE5 motor* also incorporates only non-critical and durable materials to ensure smooth operation for many years at a time.



Low-noise operation

One of the ways in which conventional synchronous motors differ from synchronous reluctance motors such as the KSB SuPremE® IE5 motor* is the special cut of the laminated rotor core. Formally known as US patent 5.818.140, the invention refers to a rotor geometry with flux-conducting and flux-blocking segments that ensure smooth operation. This geometry provides for an extremely low level of torque ripple (1 to 2 %) that, in turn, keeps operating noise to a minimum.

KSB SuPremE®, the world's most efficient magnet-less pump motor



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One step ahead – including when it comes to **resource efficiency**

The world's most efficient magnet-less IE5 pump motors*, KSB SuPremE®, impress with their exceptional overall eco-balance by not only achieving considerable energy savings, but also contributing to a healthier environment as the motors incorporate zero magnetic materials made from rare earths.

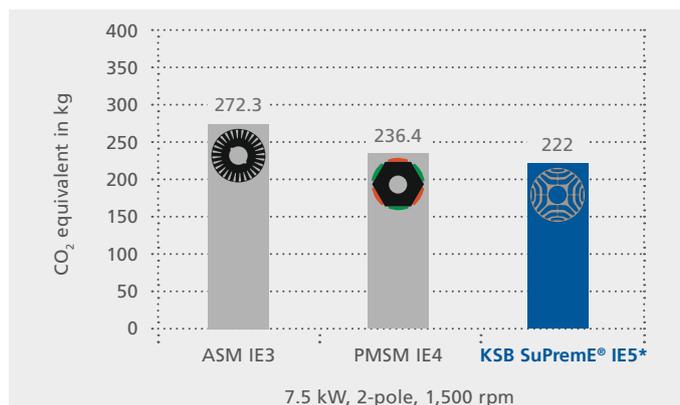
Using critical materials is a thing of the past

Many modern technologies are almost impossible to realise without using rare earths. The problem with this approach is of course the fact that mining and processing the metals required can severely impact the environment. Further adding to this is the monopoly-like situation that prevails in the global market as China has for years been the largest exporter of rare earth elements and therefore also establishes market prices.

Avoiding the use of rare earths was an absolute must when developing the world's most efficient magnet-less IE5 pump motor* KSB SuPremE®. The solution was to leverage the synchronous reluctance principle so that the highly efficient drive could also meet IE5 efficiency class requirements without the need for magnets. As a result, KSB can manufacture its SuPremE motors independently of global market events while at the same time keeping the environmental impact to a minimum. An independent PLCA study has confirmed this.

Sustainable, magnet-less design principle

KSB SuPremE® IE5 motors* use no magnetic materials or increased levels of copper, making their design much more sustainable than that of permanent-magnet synchronous motors and asynchronous motors.



In fact, the total environmental footprint of manufacturing synchronous reluctance motors is 6 percent lower than that of permanent-magnet synchronous motors, despite the higher output per size of the latter, as a result of no magnetic materials being used.

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The energy diet works

With the FluidFuture® energy efficiency concept and the world's most efficient magnet-less IE5 pump motor* KSB SuPremE®, KSB has sustainably improved the operating efficiency of numerous plants.

Heidelberger Druckmaschinen AG

90 % energy savings

Application:

Cooling lubricant circuit of grinding machines with four fixed speed pumps with motor ratings of 37 kW each

Measure taken:

Replacement of the pumps in conjunction with variable speed, high-efficiency drives

- 3 x Etanorm G065-200 PD
- 3 x PumpDrive MM variable speed system
- 3 x characteristic curve control unit (PumpMeter)
- 3 x KSB SuPremE® IE5 motor*(22 kW)

Result:

- Energy savings of approximately 90 %
- Payback period of just 1.6 years



All Etanorm pumps feature the PumpDrive variable speed system.



Each pump is designed for a flow rate of 100 m³/h.



Uwe Ricker, Heidelberger Druckmaschinen AG:

„Astounding efficiency: 90 % energy savings with our cooling lubricant pumps.“

Miele & Cie. KG

40 % less energy required

Application:

Commissioning a new system for centralised cooling water supply

Measure taken:

Use of 2 high-efficiency refrigeration units in combination with:

- 11 x Etaline GN and 7x Etanorm G pumps – each fitted with PumpMeter and PumpDrive
- 2 x high-efficiency KSB SuPremE® IE5* motors

The PumpMeters automatically identify potential savings.

Result:

- 40 % less energy required for refrigeration
- Annual reduction of CO₂ emissions: 400 tonnes



Etaline PumpDrive employed as dual-pump sets



2 Etanorm PumpDrive pumps for continuous operation with high-efficiency KSB SuPremE® IE5 motors*

Continental ContiTech Vibration Control GmbH

€ 15,700 saved each year

Application:

Closed-circuit cooling system used for air conditioning and cooling of production facilities

Measure taken:

Replacement of one of the centrifugal pumps installed in the facilities with a speed-controlled KSB system comprising

- Etabloc pump (single-stage)
- 18.5 kW synchronous motor (KSB SuPremE® with PumpDrive S MM, size C)
- PumpDrive speed control system
- Characteristic curve control unit (PumpMeter)

Result:

- Energy savings: approx. 371 kWh/d → € 15,700 p.a.
- Reduction of 1,900 tonnes of CO₂ p.a. → 74.7 percent



For more information visit
www.ksb.com/fluidfuture/references



Technology that **makes its mark**

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Your local KSB representative:



KSB SE & Co. KGaA
Johann-Klein-Straße 9
67227 Frankenthal (Germany)
www.ksb.com

You can also visit us at
www.ksb.com/socialmedia