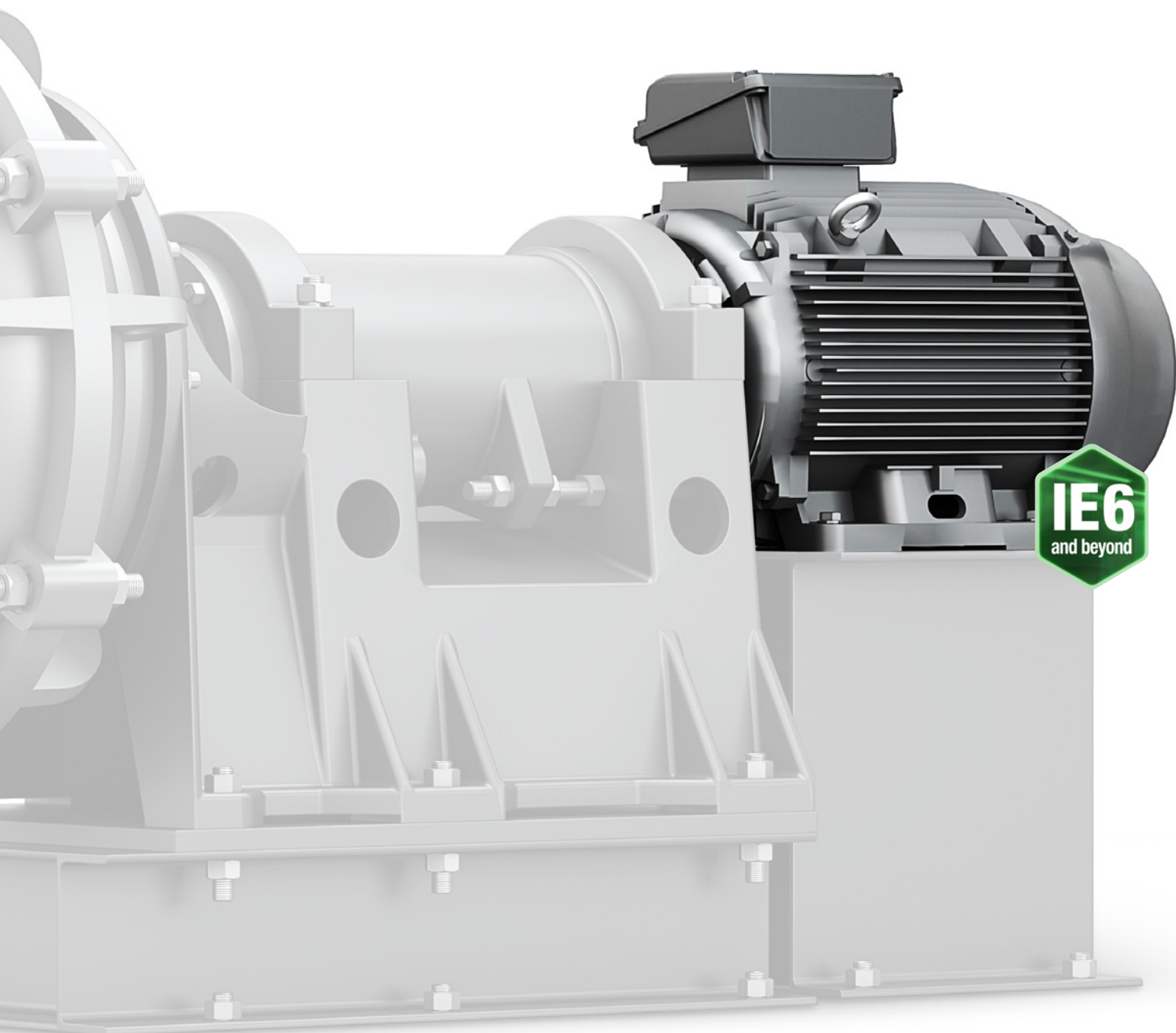


Exceeding boundaries

Exploring technological advancements on motor efficiency and redefining existing standards.



IE6
and beyond

Empowering climate goals

In the Paris Agreement (2015), nations from around the world were united in a pledge to limit the rise in global temperature to well below 2°C, with an even more ambitious aim of capping it at 1.5°C. This commitment was made with the understanding that it would significantly mitigate the risks and consequences of climate change. To realize this formidable objective, emissions must be slashed by 45% before 2030 and hit net zero by 2050.

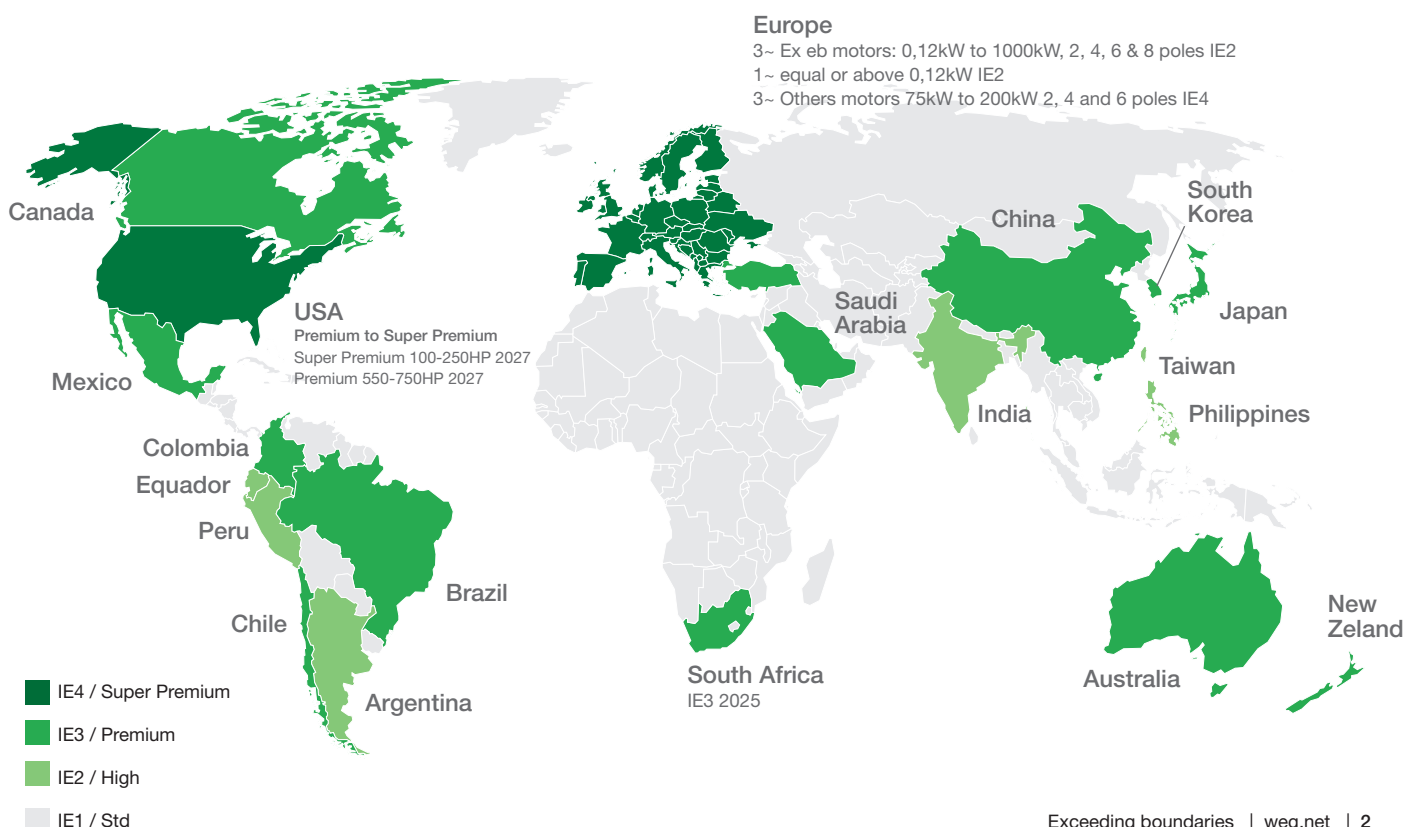
One pivotal avenue toward this end lies in the swift adoption of energy-efficient technologies. Notably, electric motor systems, responsible for 53% of global electricity consumption according

to the IEA, stand out as crucial role in the battle against CO₂ emissions.

Highlighting the significance of electric motors, the IEA's 2021 World Energy Outlook delineated 40 pivotal milestones. Without them, final energy consumption would skyrocket by around 30% by 2030. Among these milestones is the imperative that all motor sales meet best-in-class standards by 2035.

Although MEPS (Minimum Energy Performance Standards) have been fixed by many countries to contribute on the climate agenda, the technologies already available on electric motor market becomes possible to evolve faster.

EFFICIENCY REGULATION MAP


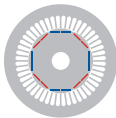

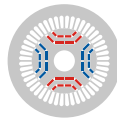


Motor technologies

Induction motors have long been the go-to choice for industrial applications, prized for their affordability and reliability. However, their dominance faces challenges from emerging technologies driven by stricter efficiency regulations, heightened awareness of energy efficiency's importance. While induction motors can achieve efficiencies surpassing IE4 standards, permanent magnet (PM) and

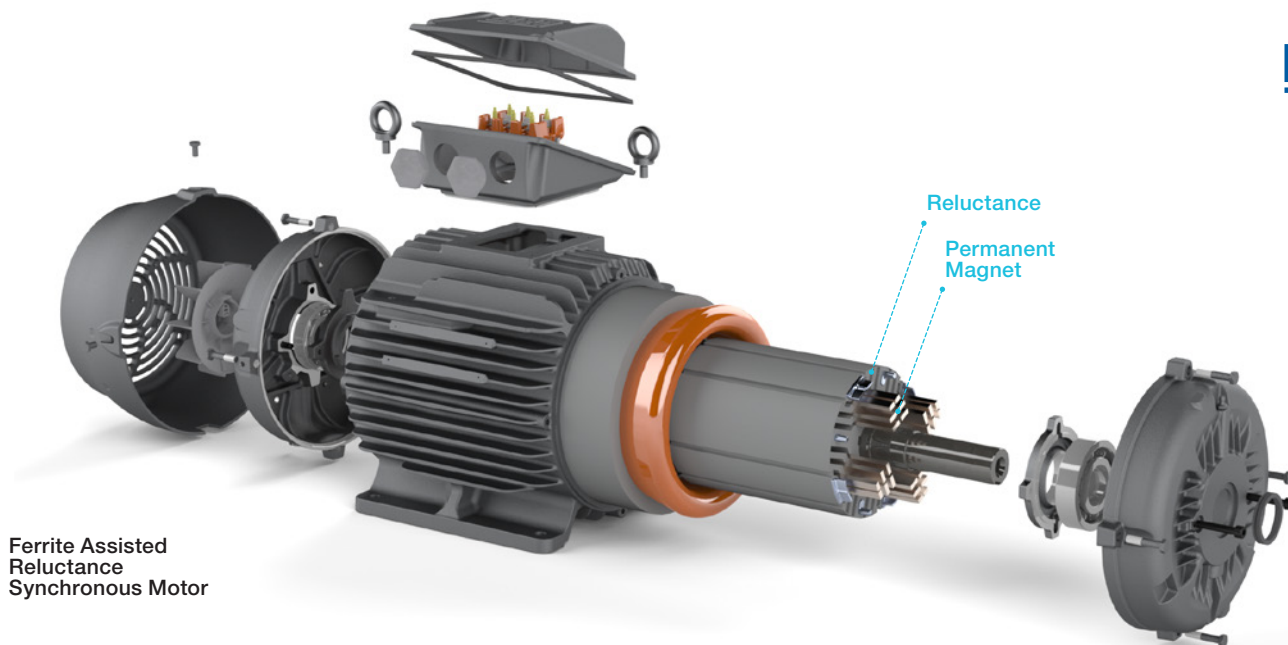
synchronous reluctance (SynRM) motors have pushed boundaries, achieving efficiencies surpassing IE5 levels.

In a climate increasingly focused on energy efficiency and environmental stewardship, WEG has introduced a groundbreaking hybrid innovation that merges PM and SynRM motor technologies, achieving IE6 and beyond efficiency levels.

Feature	Squirrel Cage Induction Motor	Permanent Magnet Synchronous Motor	Pure Reluctance Synchronous Motor	Ferrite Assisted Reluctance Synchronous Motor
				
Line-start without VSD	Yes	No	No	No
Require VSD	No	Yes	Yes	Yes
Motor Cost	\$	\$\$\$	\$	\$\$
VSD Cost	\$	\$	\$\$	\$
Efficiency class range	IE3 – IE5	IE4 – IE6	IE3 – IE5	IE4 – IE6
Rated power factor	●●●	●●●●	●	●●●
Efficiency drop at partial load	●●●	●●●●	●●●●	●●●●
Power density (kW/kg)	●●	●●●●●	●●●	●●●●

SOURCE: de Almeida, A.T.; Ferreira, F.J.T.E.; Fong, J. Perspectives on Electric Motor Market Transformation for a Net Zero Carbon Economy. *Energies* 2023, 16, 1248. <https://doi.org/10.3390/en16031248>

NOTE: The fewer points assigned, the poorer the system's capability.

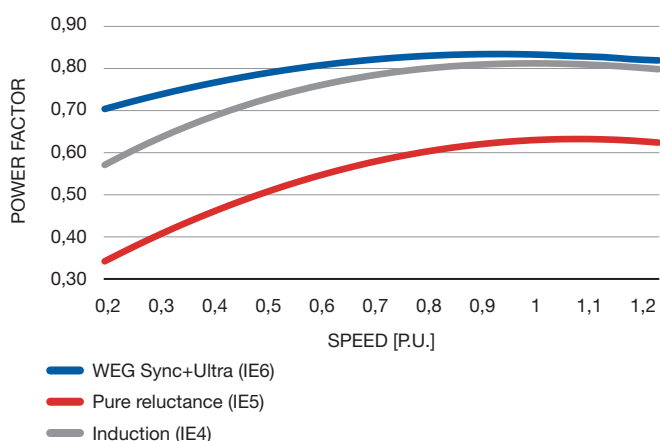
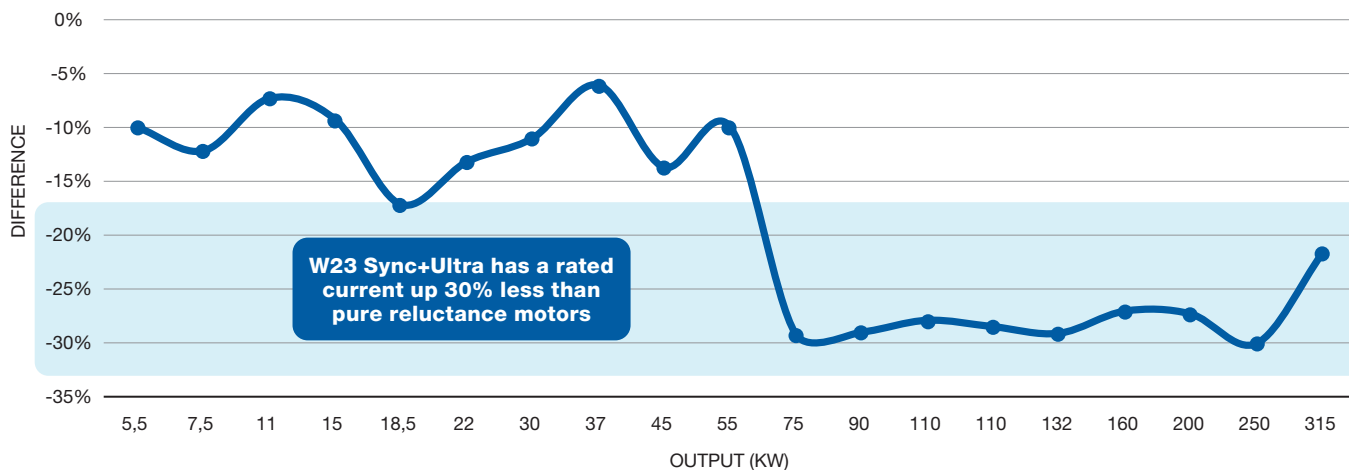


Ferrite Assisted
Reluctance
Synchronous Motor

As traditional induction motor technology nears its efficiency ceiling, this technology also often necessitates substantially higher inrush current levels, requiring new starters and protection systems when replacing existing motors.

While Pure reluctance motors offer a potential solution to meet IE5 level, they also come with drawbacks such as a low power factor, implying on increased costs. Lower power factor means a higher rated current and sometimes a frequency inverter with a higher current is needed.

RATED CURRENT DIFFERENCE W23 SYNC+ULTRA (IE6) X PURE RELUCTANCE (IE5) 400V 1500RPM



Given that there is always a frequency converter between the motor and the grid, any reduction in power factor is not directly observable from the grid's perspective, and thus does not affect the grid supply. However, a lower power factor might necessitate a frequency converter with a higher current rating.

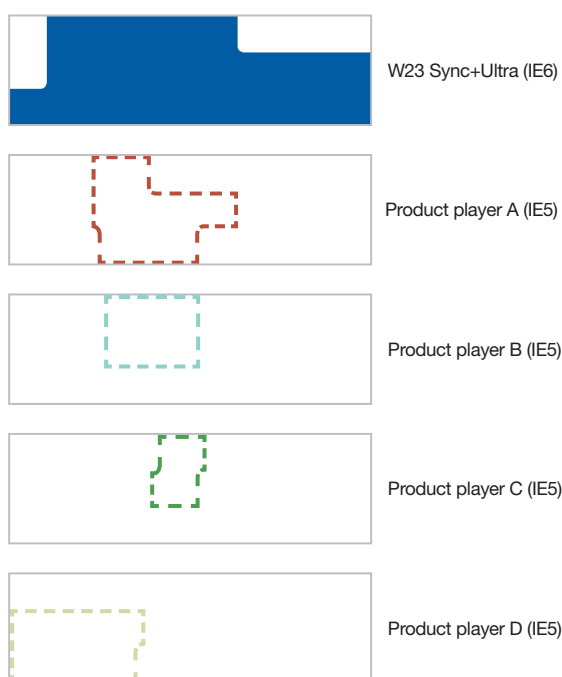
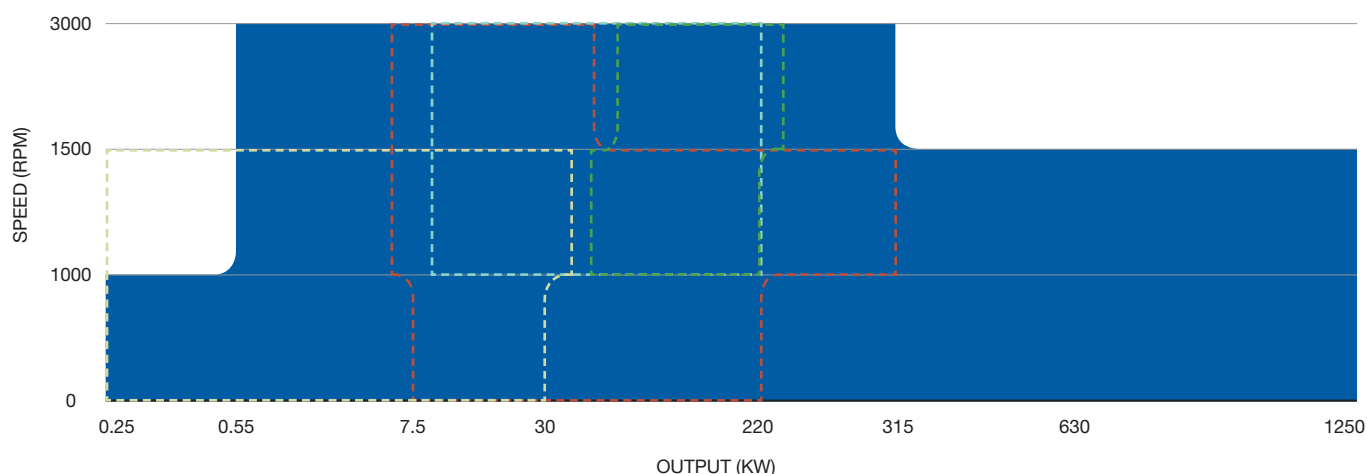
The W23 Sync+Ultra features a hybrid design configuration, employing Ferrite Assisted Reluctance Synchronous motor technology within the IEC 80 to 250 frame sizes.

Ferrite magnets, composed of iron and oxygen, are commonly referred to as ceramic magnets due to their manufacturing process similarity with traditional ceramics. Their magnetic field

is activated during rotor assembly and with low magnetism, maintaining an easy process of maintenance, similar to a conventional induction motor.

From the IEC 280 to 450 frame sizes, the W23 Sync+Ultra project uses Permanent Magnet technology with rare-earth magnets, ensuring lower levels of rated current even at higher powers.

POWER RANGE AVAILABILITY



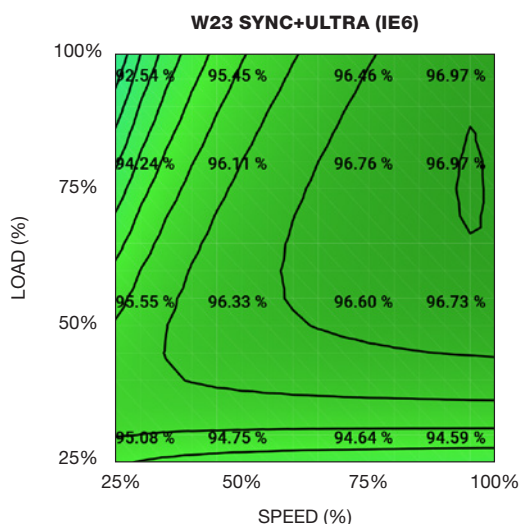
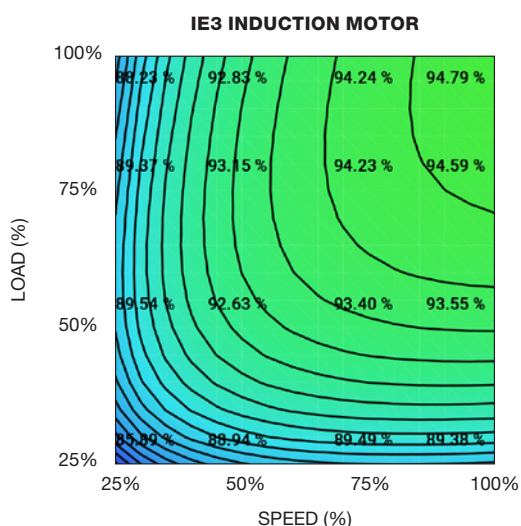
This solution provides a higher power factor, allowing optimization of resources in the installation infrastructure as frequency inverters with lower current ratings and smaller cable gauges.

A project that covers the widest power range available on the market with IE6 efficiency level.

Efficiency advantages

For instance, while an induction motor loses over 20% efficiency across different speed and load ranges, the W23 Sync+Ultra motor maintains its superior efficiency, decreasing by less than two percent when the load and speed vary. This versatility extends to the applications, serving various industries, in which there are scenarios with fluctuating loads.

EFFICIENCY MAP 90kW 1200RPM



Higher efficiency for all map range

AVOIDING CARBON EMISSION

HIGHEST EFFICIENCY OF THE MARKET

LOWER COST OF OWNERSHIP

WIDEST RANGE UP TO 1,250 KW



Nevertheless, efficiency isn't solely about energy consumption; it also impacts the motor's operational lifespan. Lower losses mean less heat, resulting in an extended lifespan, fewer replacements and reduced maintenance needs.

Most motor applications do not require the motor to run at rated speed for their entire operation time. On the contrary, industrial processes often operate at different load requirements (depending on required flow, throughput, etc). Induction Squirrel Cage motors are most efficient at between 80% to 100% of rated output, with efficiency dropping sharply below 50% of rated output. W23 Sync+Ultra presents improved operating characteristics in partial load condition. The partial load efficiency of W23 Sync+Ultra is much higher when compared to induction squirrel cage motors.

Besides that, energy costs count for about 97% of the total cost of ownership during its lifetime. That said, the payback (ROI) of a replacement of an IE3 or even lower efficient motor by an IE5 or even higher efficient one, usually results in less than 2 years.

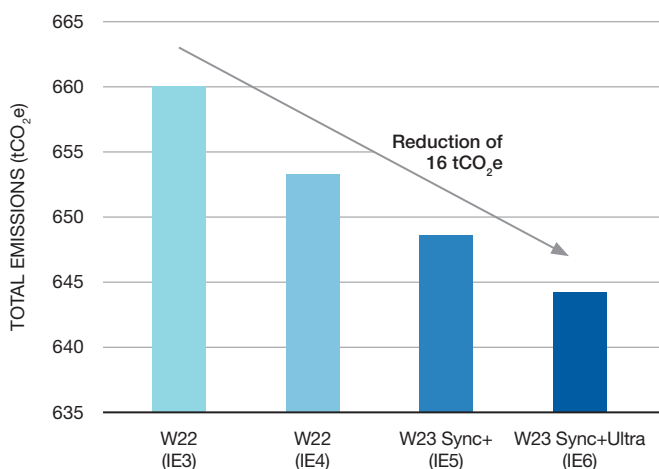
Environmental concerns

The increase in energy efficiency is crucial to a more sustainable future. By using more efficient motors, we also increase the reduction of CO₂e emissions. Replacing a 75 kW, 4-pole IE3 induction motor with an IE6 motor could potentially reduce emissions by 16 tons of CO₂e.

TOTAL EMISSIONS - USE PHASE*

75kW 1500RPM

* Calculation of avoided emissions based on the IEA usage regime.
 ** Calculation under 100% load condition.



DOWNSTREAM PHASE REPRESENTS 98% OF MOTOR CARBON FOOTPRINT

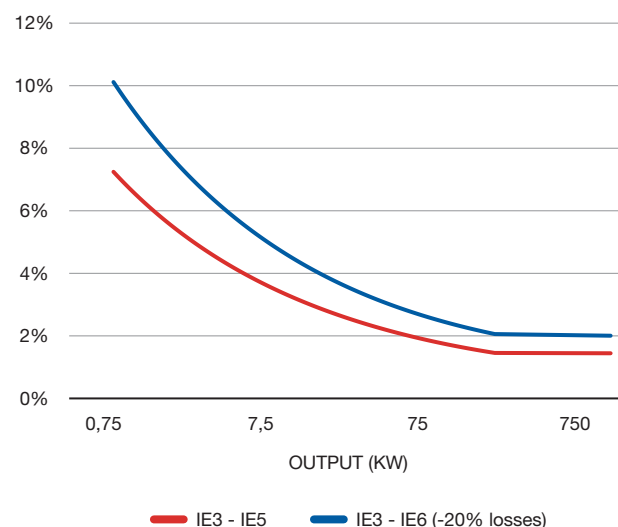
The role of advanced motor technologies

W23 Sync+Ultra operates at synchronous speed, eliminating almost all the electrical and magnetic losses in the rotor, being more efficient and offering a significantly reduced energy consumption.

W23 Sync+Ultra can be used in variable speed applications leading to large energy savings.

ENERGY SAVINGS

Percent of input power



higher
PARTIAL LOAD EFFICIENCY

LESS THAN **2**
years
PAYBACK (ROI)

versatility
SERVE SCENARIOS WITH FLUCTUATING LOADS

16
tons
REDUCTION OF CO₂ EMISSIONS BASED ON THE IEA USAGE REGIME

W23 Sync+Ultra (IE6* and beyond)

The urgency to transition to more sustainable energy sources is increasingly evident, and the industry plays a crucial role in this process. WEG, a global leader in electrical technologies and automation, takes the forefront of this movement with the launch of the most efficient industrial motor ever created. Facing the challenge of balancing economic growth with environmental responsibility, the company presents a forward-looking solution that redefines standards of efficiency and sustainability.

The highest established efficiency level, IE5, is an evolution with 20% lower losses than its predecessor, IE4. With the W23 Sync+Ultra, WEG has broken through the current level barrier and set new standards: IE6 and beyond, meeting 20% lower losses than IE5. And higher levels following the percentage of fewer losses compared to the previous level. In addition to setting a new performance standard for the industry, this line represents a significant step towards a more sustainable industrial operation.

Added to its unparalleled energy efficiency, the W23 Sync+Ultra contributes significantly to avoiding carbon emissions and driving the energy transition. By raising the efficiency standard and minimizing energy waste, this solution represents a decisive step towards a more conscious and sustainable

operation. With this initiative, WEG reaffirms its commitment to environmental protection and building a positive legacy for future generations.

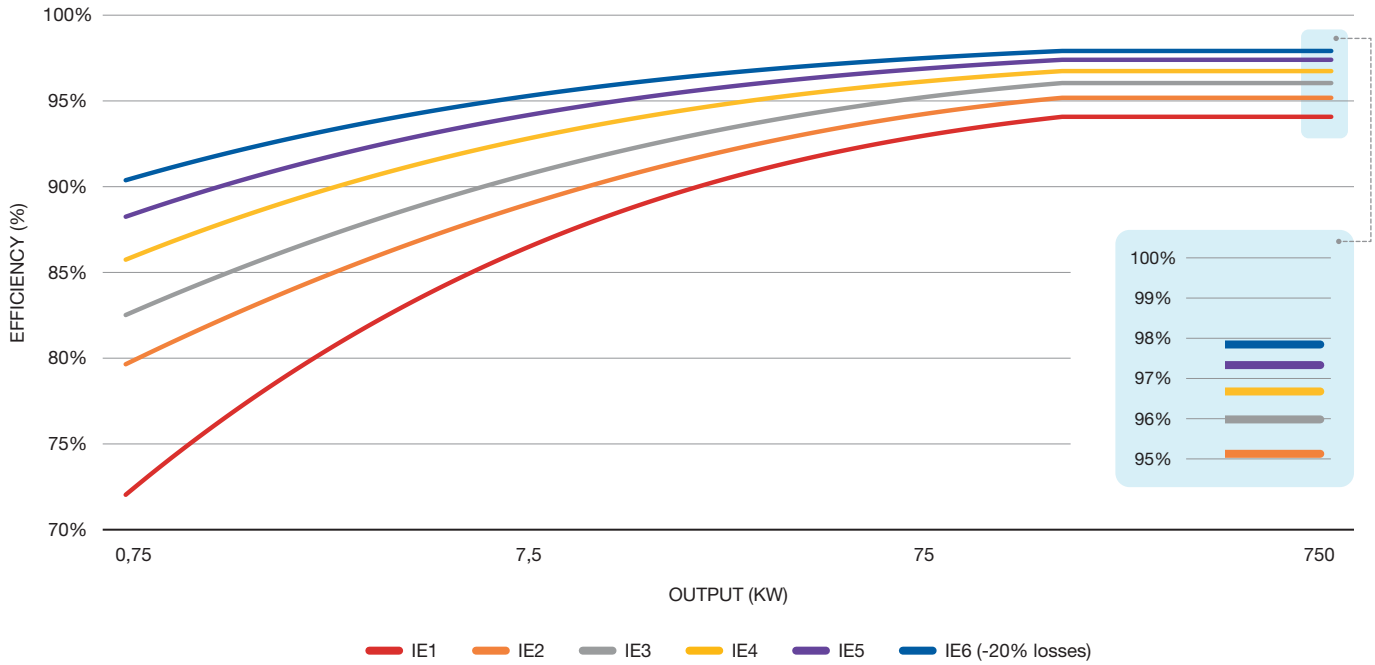
As the demand for clean and sustainable energy continues to grow, WEG stands out as a visionary leader in the search for innovative and conscious solutions. With the launch of the W23 Sync+Ultra, not only are set new efficiency standards in the industry, but it also inspires other organizations to follow its example and commit to building a more sustainable and prosperous future for all. Join us on this journey towards a better world, where caring for the planet is top priority.



* IE6 efficiency level is not established by the IEC 60034-30-2. It is referred by WEG as per the 20% lower losses reached by W23 Sync+Ultra when comparing to IE5.

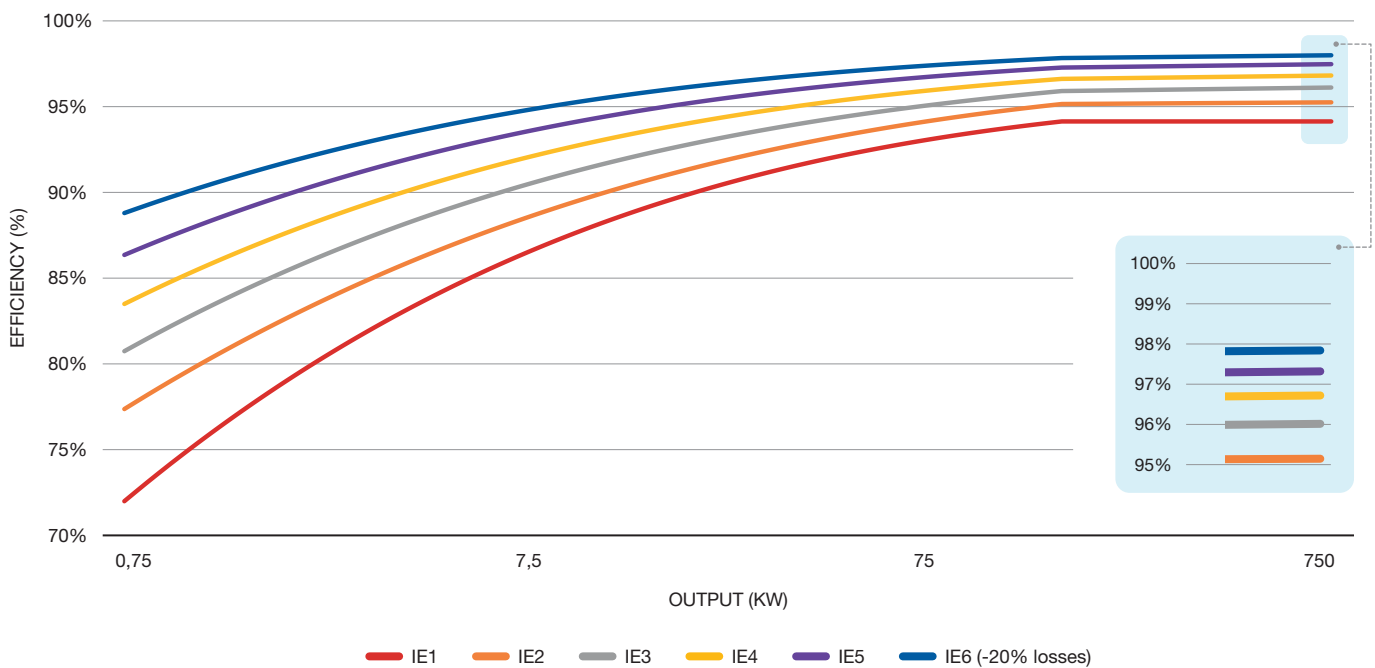
EFFICIENCY CLASSES

IEC TS 60034-30-2 - 1201 - 1800RPM



EFFICIENCY CLASSES

IEC TS 60034-30-2 - 1801 - 6000RPM



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