INNOMOTICS

Discover

Ready for IE4... and beyond

Upgrade to Super Premium Efficient motors

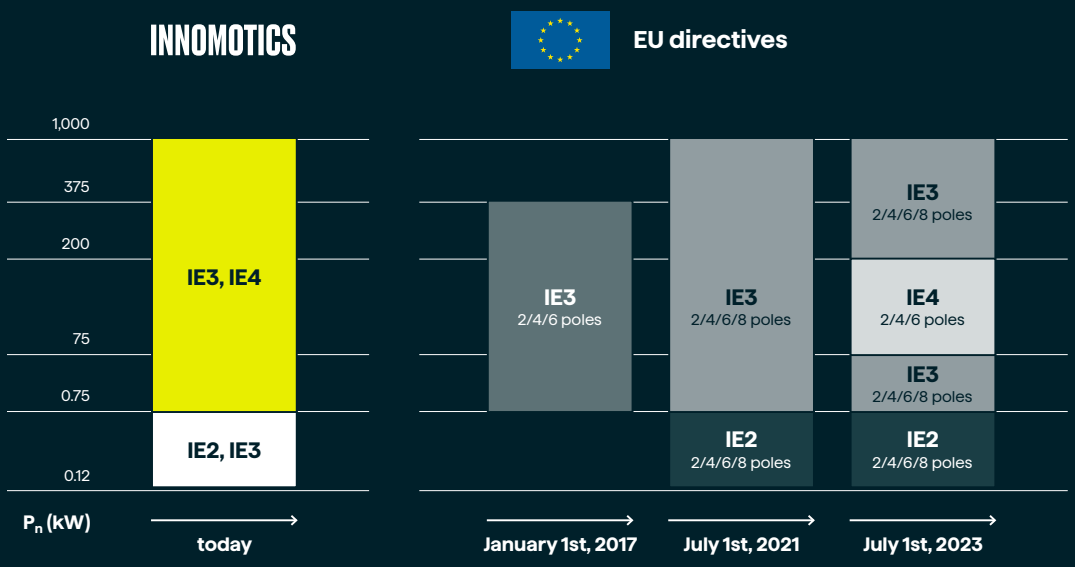
IE4

IE4 energy efficiency class

Today the highest one for direct-on-line motors

On July 1st 2023, the second step of the Ecodesign regulation (EU) 2019/1781 came into force in the countries of the European Economic Area. This includes the requirement that safe area motors that are 2–6 pole and with rated power between 75-200 kW fulfill the IE4 energy efficiency class, as defined by the IEC 60034-30-1 standard. This involves also converter-operated motors with a direct-on-line rating plate.

Let's make an overview of the impacts and benefits of the migration to IE4, both within this mandatory power range and beyond it.

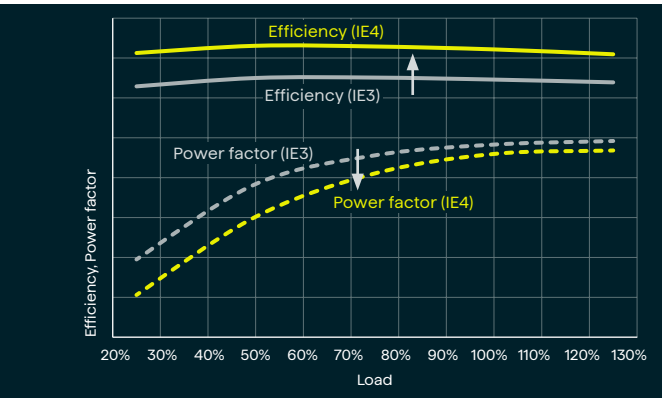


Migrate to IE4 in the mandatory range easily with Innomotics low voltage motors

Upgrading from IE3 to IE4 motors has several impacts.

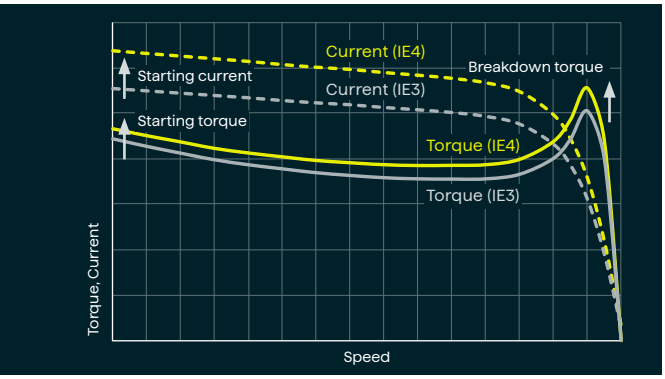
The **Innomotics SD Severe Duty** motor portfolio has always been well prepared for any upcoming energy efficiency regulations. With the available power range from 2.2 kW to 1,000 kW in IE4, as well as by offering also 8-pole motors in IE4, it is exceeding the today's Ecodesign requirements.

Let's now deal with **2-, 4- and 6-pole** motors with power rating 75-200 kW. The following comparison has been made by taking the technical data of the respective motor types from the standard Innomotics offering.



Impact on the motor operation

- Thanks to the higher IE class, the motor **efficiency** is improved especially in partial loads. The new efficiency value can be around 1 % higher, which decreases significantly the energy losses.
- On the contrary, the **power factor** is typically lower, by 0.8 % on average, for 2 & 4 pole motors. This will have an impact on the nominal motor current. Many of our 6 pole motors actually have an increased power factor.
- The **nominal speed** of the motor usually increases by one or several rpm. This is slightly shifting the operating point of the application.
- The migration to IE4 has a positive effect on the **sound pressure level**. The motor noise usually decreases, in average by 2 dB.

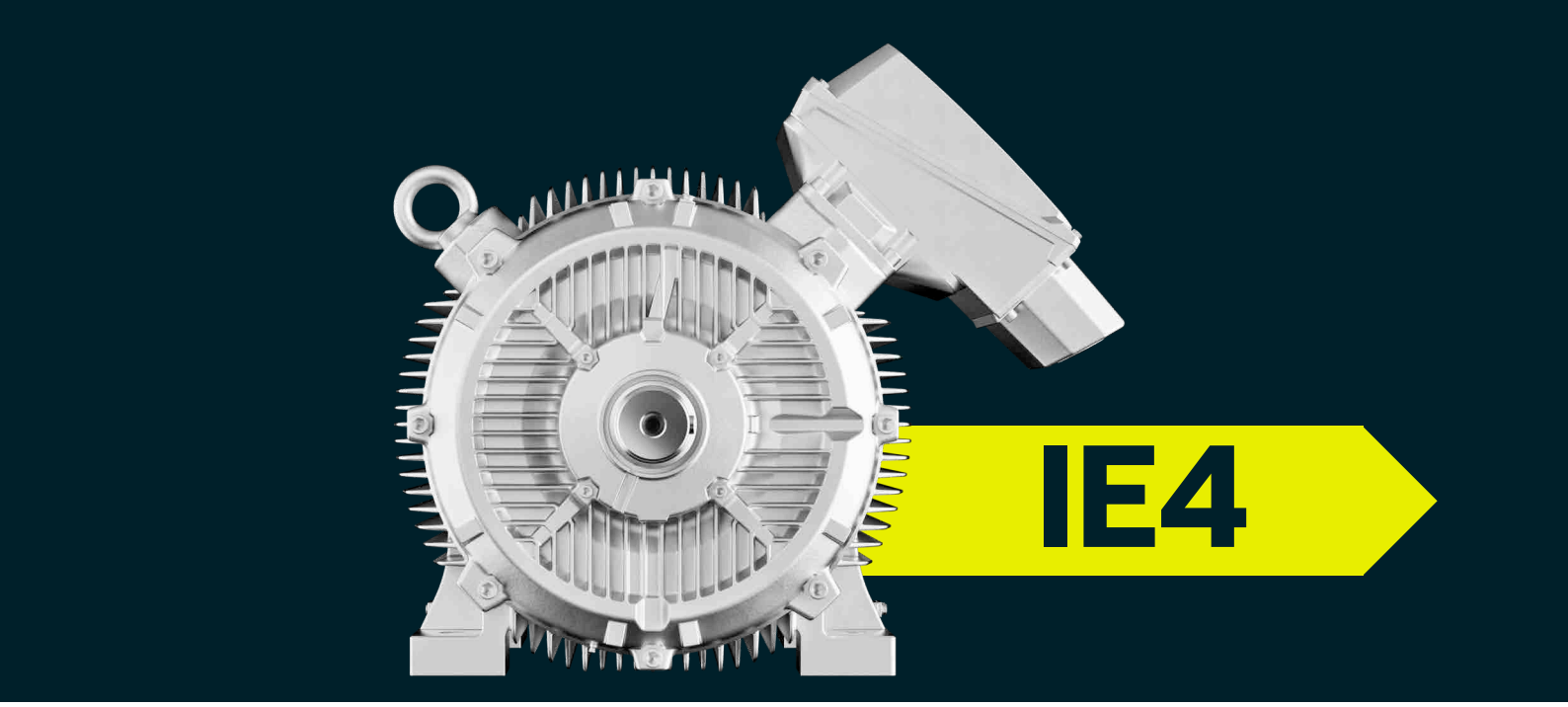


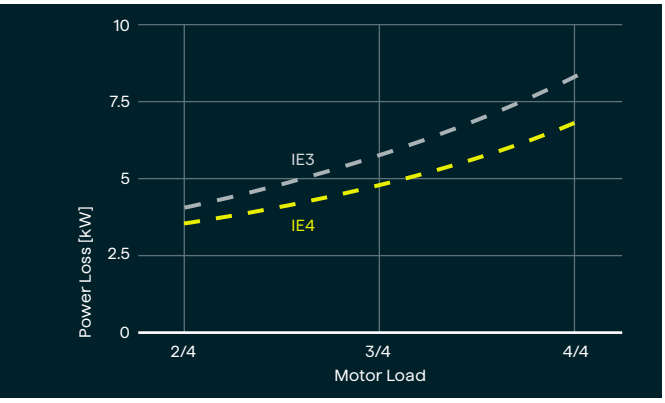
Impact on the motor starting

- The **starting current** is increased by 15 % on average, but might be higher, especially with 2-pole motors. This might have an effect on the selection or setting of the appropriate motor starter and short circuit breaker.
- The **starting torque** is increased by 5 % on average, sometimes much more, however by 6-pole motors it might even decrease.
- The **breakdown torque** (maximum torque) is increased on average by 10 %, the largest differences occur with 2-pole motors. The impact on the motor torque curve is beneficial, the motor is able to overcome better the load torque and is more resistant to short-time overloading.

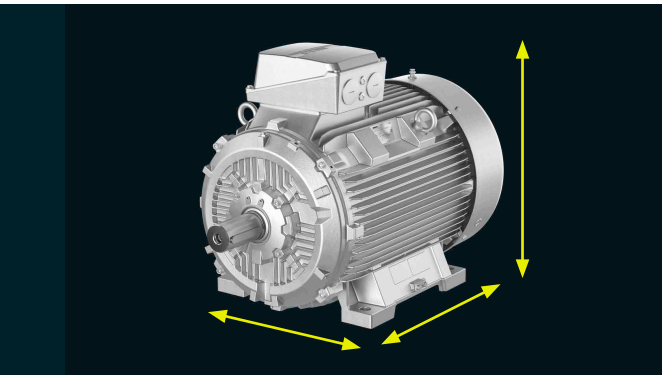
Tip:
Always check the motor starter or the motor protection when changing to a more efficient motor.
Make sure it is IE4 ready. The motor rated current shall be in the first 1/3 of the setting range of the motor protecting device.

Looking for a low starting current in IE4? Select Innomotics SD Add!
For the larger motors, where the starting current is really important, the catalog variant Innomotics SD Add (1LE5_3_) is available. It is designed for a reduced starting current, the ratio I_S/I_N is typically around 7 times. This is often even better than what the usual IE3 motors have.





Power losses comparison of 200 kW 4-pole motors in IE3 and IE4, created by Innomotics Evaluate tool.



Impact on the environment

– The use of an IE4 motor brings a significant **reduction of energy consumption and CO_2 footprint.** Taking a motor from the mandatory range 75 – 200 kW, we speak about Megawatt hours of energy and tons of CO_2, which will be saved by one single motor annually.

Impact on the energy cost saving

– The **commercial benefit** is worth thousands of Euros annually saved with one single motor after migration to IE4.

– Depending on the operation mode, the **return on investment** of installing a new IE4 motor instead of repairing an old IE3 motor is normally really short – low units of years.
You can evaluate the best fitting solution using the Innomotics Evaluate tool (formerly known as SinaSave, see page 7).

Impact on the mechanical parameters

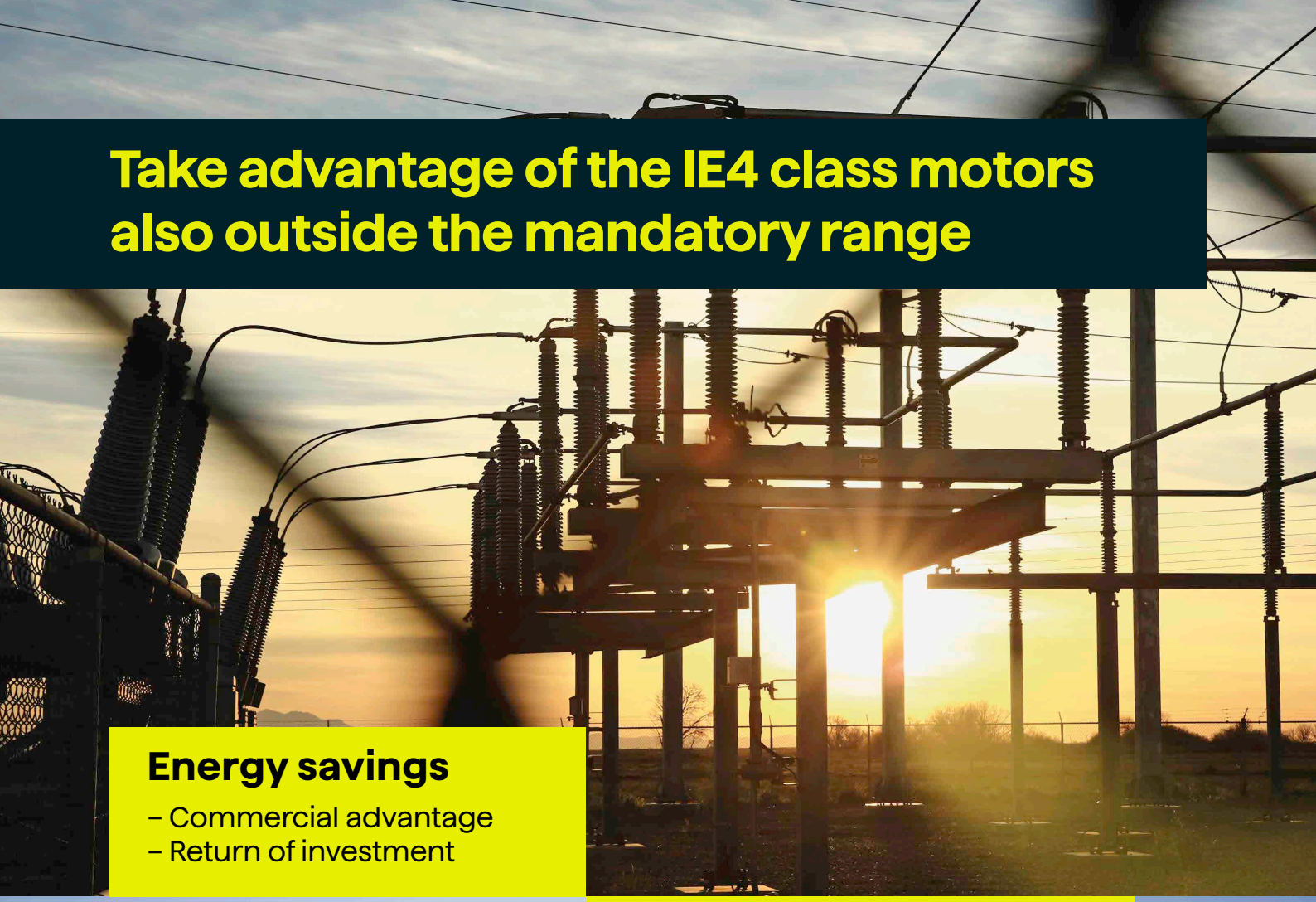
– The **mounting dimensions** (feet, flange, shaft end) are always a direct match between the respective IE3 and IE4 motor, so you can easily make a simple drop-in replacement.

– The difference in the cable entry **height** and total motor height is max. 25 mm between the IE3 and IE4 motor.

– The motor **weight** is greater on average by 7 % and the rotor **inertia** by 15 %, because the motor has to contain more active material.

– The motor **length** is varying +/– 10 % depending on motor type, but more often it is smaller. That shows how compact the new Innomotics SD next generation (1LE5) design is.

Take advantage of the IE4 class motors also outside the mandatory range

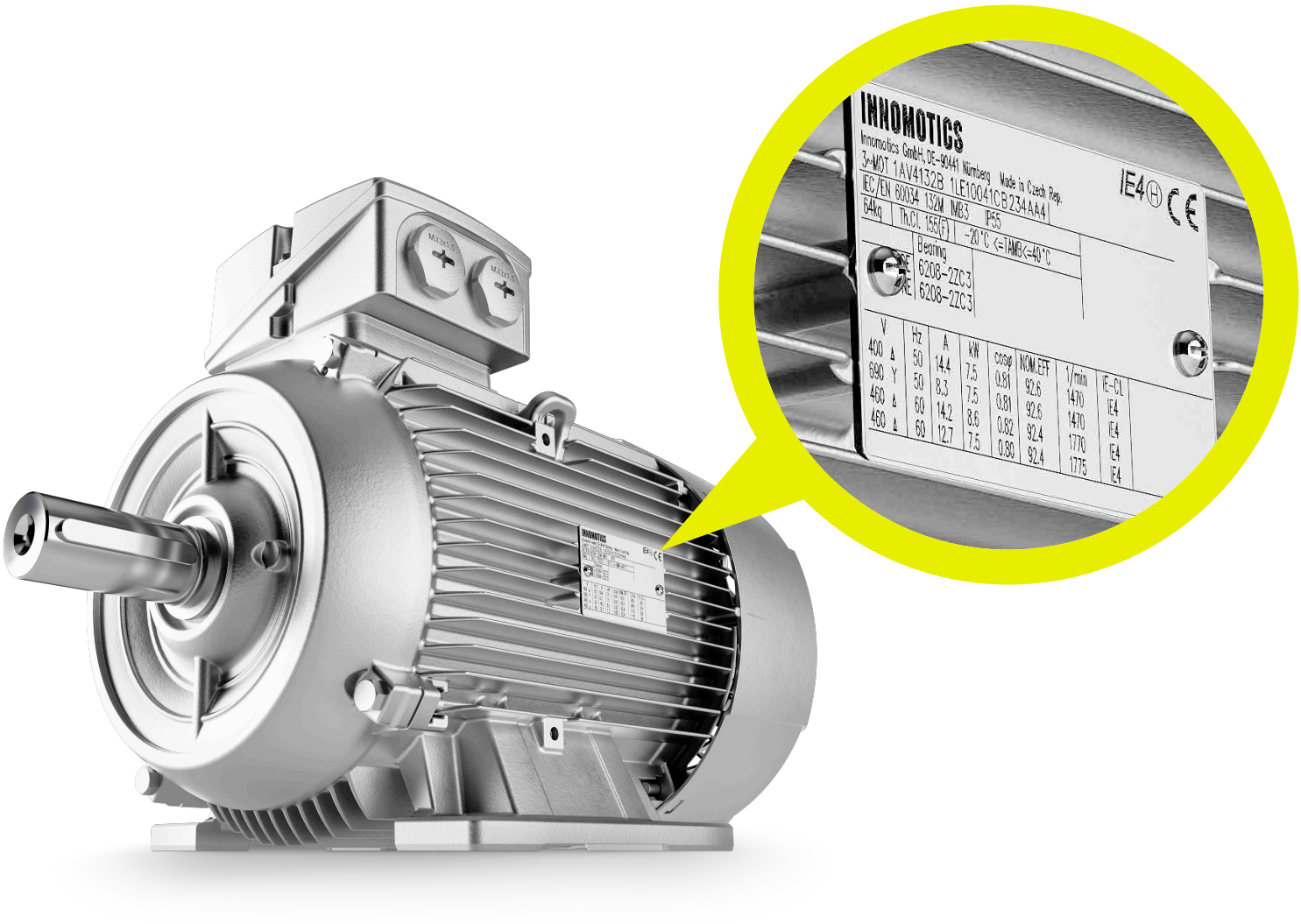


Energy savings

– Commercial advantage
– Return of investment

Environmental impact

– Reduced CO_2 footprint
– Reaching carbon neutrality

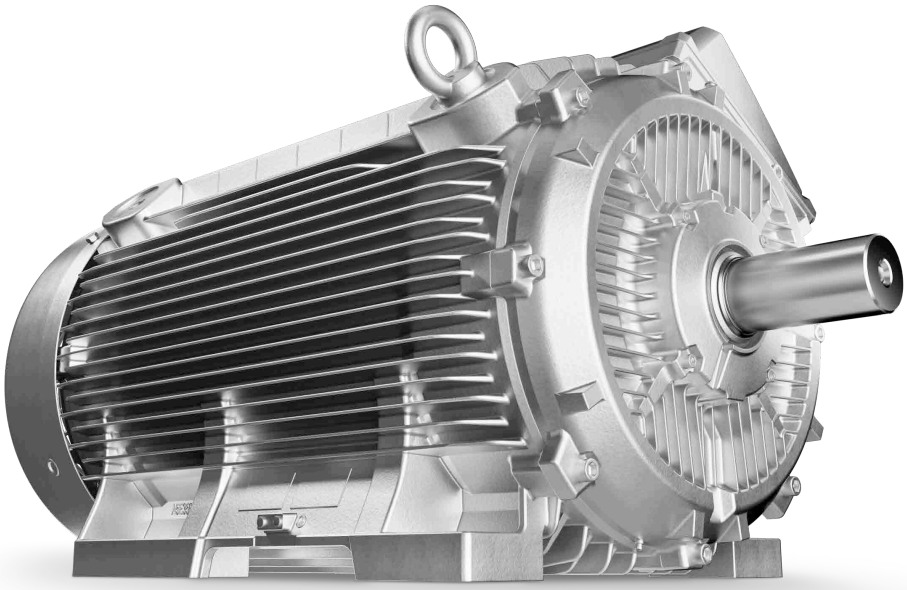


Using IE4 motors will enable:

- **Lifetime extension** – stator and bearings temperature of IE4 motors at nominal load is usually lower.
- **Managing short-time overloads** – the IE4 motors usually have a higher thermal overloadability.
- **Easier acceleration of the load** – the IE4 motors usually have a higher starting and breakdown torque.
- **Energy savings** – short return of investment, being the best option for direct-on-line applications.
- **Reduction of plant cooling demands** – machine hall cooling system benefits from the lower thermal losses.
- **Taking advantage from the latest 1LE5 design** – switching to the motor series optimized for IE4.
- **Alignment to project specifications** – especially in oil and gas, metals or paper projects, the IE4 class is often required generally.
- **Utilization of govermental subsidies** – several governments support projects where high efficient motors are used or a reduction of CO_2 emissions is declared.
- **Readiness for the future energy efficiency regulations** – especially the OEMs can adapt their machines for the moment when an extended IE4 mandatory range comes into force.

Considering the motor installed base, application types and their operation modes, **the upgrade to IE4 motors has the potential of the highest energy savings worldwide.**

Innomotics SD next generation (1LE5) is the product series to bring you to IE4 class



Efficient

- New product optimized for IE4 class
- Wide IE4 portfolio from 2.2 to 1000 kW (frame sizes 132–450, 2–8 poles) [1]
- Compact design with a great power/size ratio, eg.
  - 315 kW in frame size 315
  - 500 kW in frame size 355
- Increased Power Line types (higher than IEC rating) available also in IE4 to fit into a limited space [2]
- Easy configuration, document generation and ordering of all design variants

Versatile

- Design variants selectable in catalog and online configurators
- Extensive offer of options and accessories, eg. 40 possible terminal box locations [2], various temperature sensors, encoders and brakes
- Flange mounting IM B5 up to frame size 355 without support device
- Comprehensive offer of certificates for IE4 motors, such as CE, UL-S, CSA-S, UKCA, CC-no., CSA EEV, CEL, VIK, Marine certficates [2]
- Optional design for increased speed up to 4500 rpm with catalog option L37 [2]
- Mounting dimensions identical to 1LE1 motors for an easy drop-in replacement
- Same platform and options structure as 1LE1 motors

Reliable

- Suitable also for harsh environments
  - ambient temperature up to -50 ... +60 °C
  - protection class up to IP66 [2] paint system up to CX offshore [2]
  - salt air resistant
  - CHEMSTAR option packages for chemical and oil&gas industries [2]
- Reinforced bearings to withstand high cantilever forces
- Premium insulation system for VSD supply from 690 V network without output filter, available also in IE4 [2]
- Short delivery times, starting on 20 working days even with various options [2]

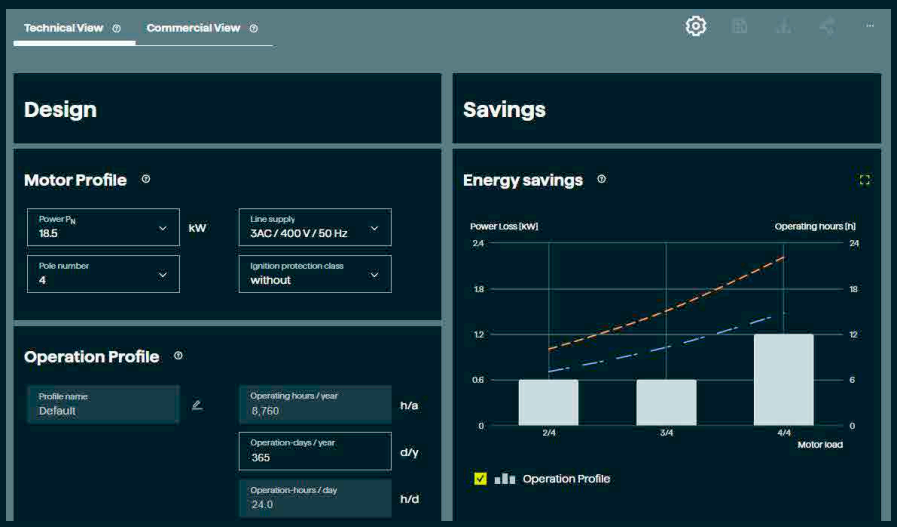
1) status as of October 2024,
2) depending on exact frame size

Determine your energy saving potential and payback time when upgrading to IE4 motors using the Innomotics Evaluate tool

Highlights of the Innomotics Evaluate tool

(formerly known as SinaSave):

- Easy and free access without login, additional benefits for registered users
- Comparison of existing and current motors – greenfield and brownfield use cases
- Drive systems for pump and fan applications also included
- Individual settings enabled – energy prices, load profiles, project view
- Motor list upload from XLS table supported – analysing an entire plant or its section
- Responsive design adapted for mobile devices – accessible anywhere
- Linked to other tools – user can continue to motor configuration and order



Innomotics Evaluate tool can demonstrate that the **return of investment** is short when installing an IE4 motor instead of an old IE1/IE2 motor, also for smaller power ratings. It can be even **20 % shorter** than when purchasing a new IE3 motor.

evaluate.innomotics.com

Configure your Innomotics IE4 motor online!

configurator.innomotics.com

Meeting decarbonization targets thanks to IE4 motors

Governments worldwide are setting targets for reduction of carbon emissions. In the EU, there is currently a package „**Fit for 55**“ under negotiation, to be implemented into legal frameworks of the member countries. The name refers to the target of reducing net greenhouse gas emissions in the EU by at least 55% until 2030.

Furthermore the EU regions are aiming to reach carbon neutrality until 2050.

The package **Fit for 55**, as part of the European Green Deal, contains for example:

- Member states' emission reduction targets (40 % in 2030 compared to 2005)
- Increased speed of energy saving to 1,9 % annually
- Introduction of emission permits also for buildings
- Carbon neutrality requested for new buildings (from 2030) and for transformation of old buildings (until 2050)

Energy efficient electric motors are a measure to meet the carbon neutrality targets.

What is Innomotics doing in order to decarbonize its low voltage motor manufacturing plants?

- Purchasing green electricity and installing own photovoltaic plants, used eg. for paint shop heating
- Using process waste heat
- Improving building insulation and utilizing skylight
- Operating electric cars and forklifts

You can upgrade to IE4 class ... and beyond! Learn about the IE5 Permanent Magnet motors!

innomotics.com/pm-motors

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Orders received as of **August 1, 2024,** will be confirmed exclusively with the product mark **"Innomotics"** regarding the concerned products and services. Independent of the order date, all ordered products or services with **delivery** dates from **April 1, 2025**, will be delivered with the product mark "Innomotics".

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