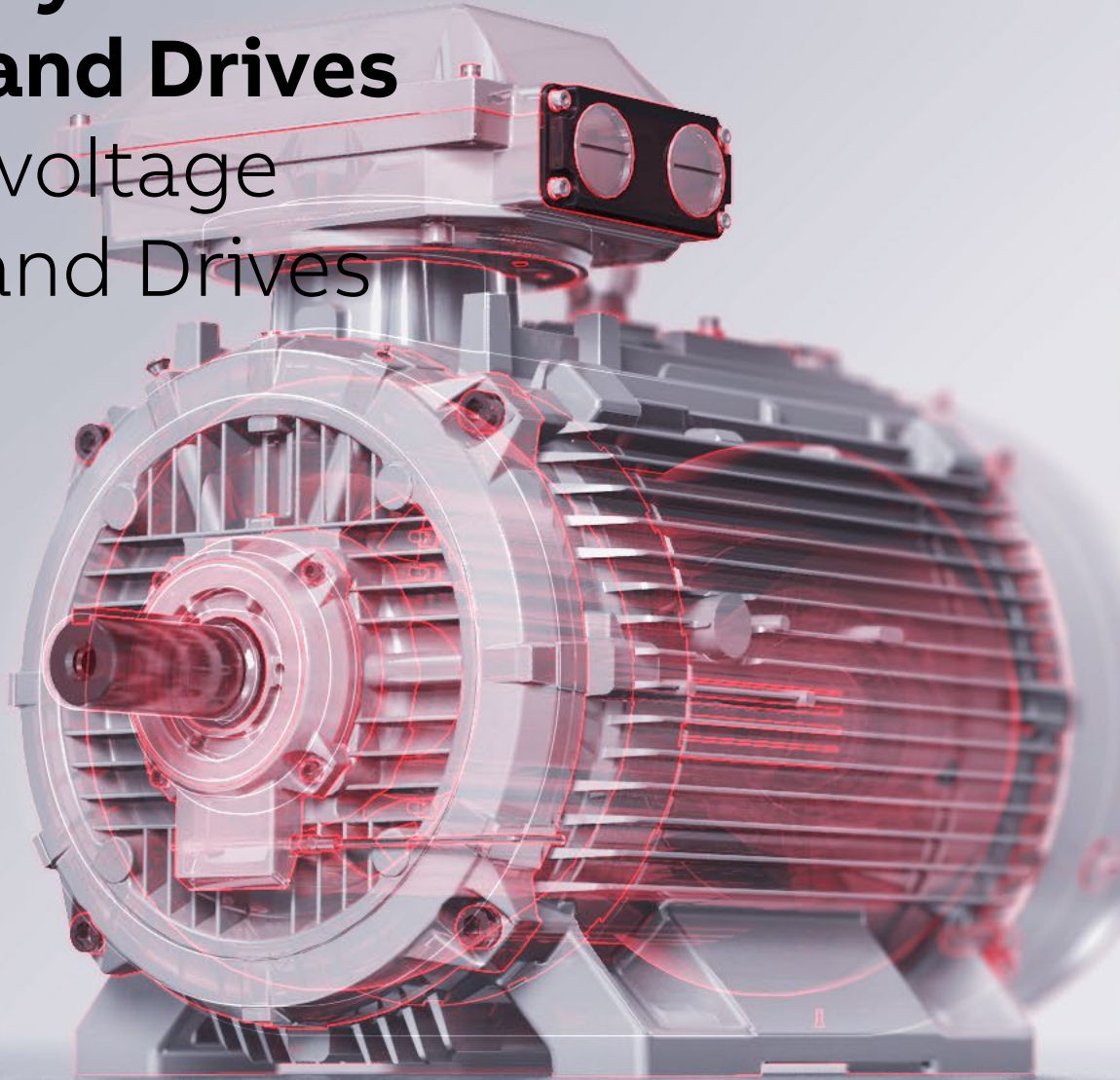


MAY 2022

# ABB IE5 Synchronous reluctance motors and Drives

IEC Low voltage motors and Drives

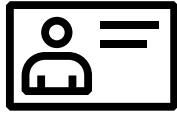


 ENGINEERS  
IRELAND

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# IE5 Synchronous reluctance motors

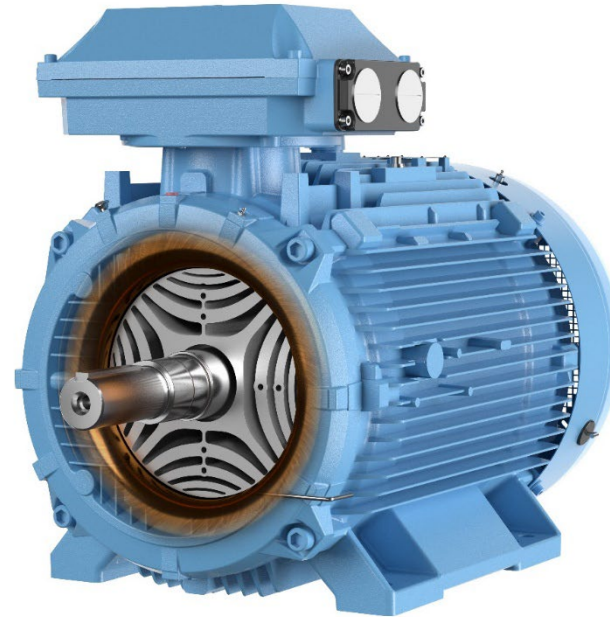


**Tero Helpiö**

Global Product Manager  
IEC LV Motors

**ABB Oy**

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00381 Helsinki, Finland  
Mobile: +358 50 33 23232  
abb.com



# Global market and trends

The world is going electric



The world is changing fast



Climate change ↑



Population ↑



Urbanization ↑



Electric motion plays a significant role in the world

Energy efficiency

Automation

Mobility



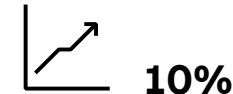
Energy efficiency is a must



Electric motors consume **over 45%** of the world's electricity



By 2040 the number of motors will **double**



Adoption of high-efficiency motor systems would cut global **electricity consumption by up to 10%**



**Changing just one motor can make a difference**

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# Making the case for energy efficiency

## The critical role of motors and drives

### Let's talk about saving energy

High efficiency motors and drives play a vital role in reducing energy consumption

### Ecodesign Regulation for motors and drives

When it comes to new regulations, it's essential to be ahead of the game to ensure that customers have future-proof products



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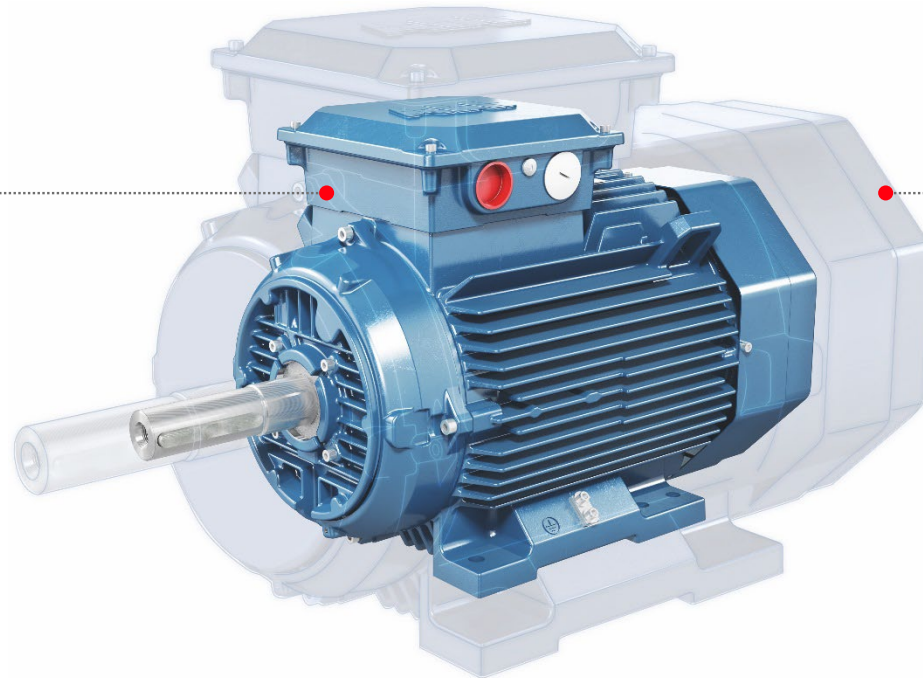
# A complete product portfolio

ABB synchronous reluctance motors

ABB offers **two ranges** of SynRM motors:

## High Output SynRM Motors

- Output: **1.1–350 kW**
- Frame sizes: **IEC 90–315**



## IE5 SynRM Motors

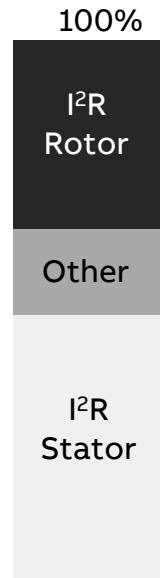
- Output: **5.5–315 kW**
- Frame sizes: **IEC 132–315**

# Key to success

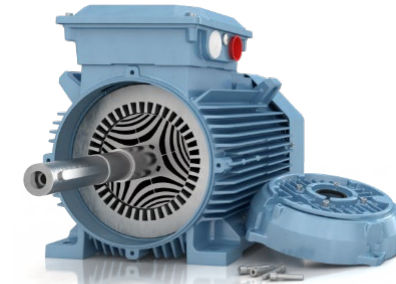
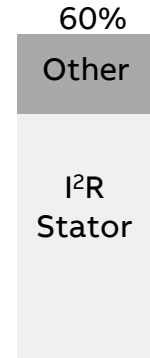
Elimination of rotor losses



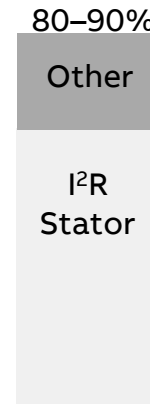
IE3 Induction motor



Losses



IE5 SynRM motor

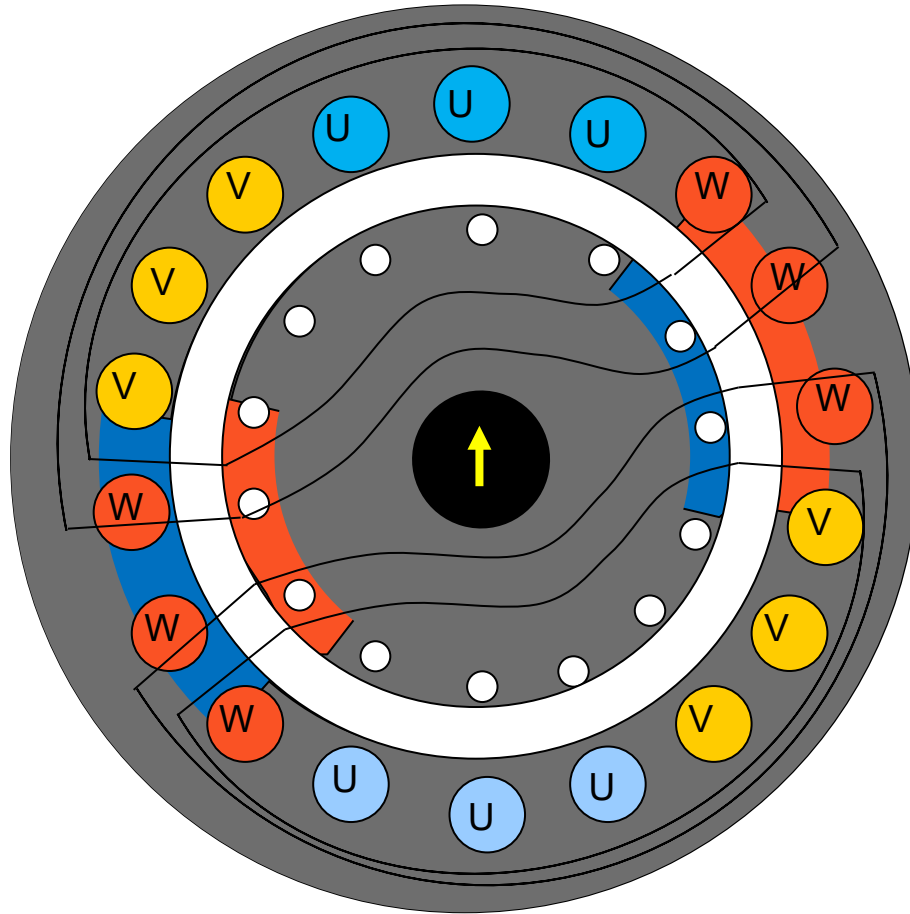


High output SynRM motor

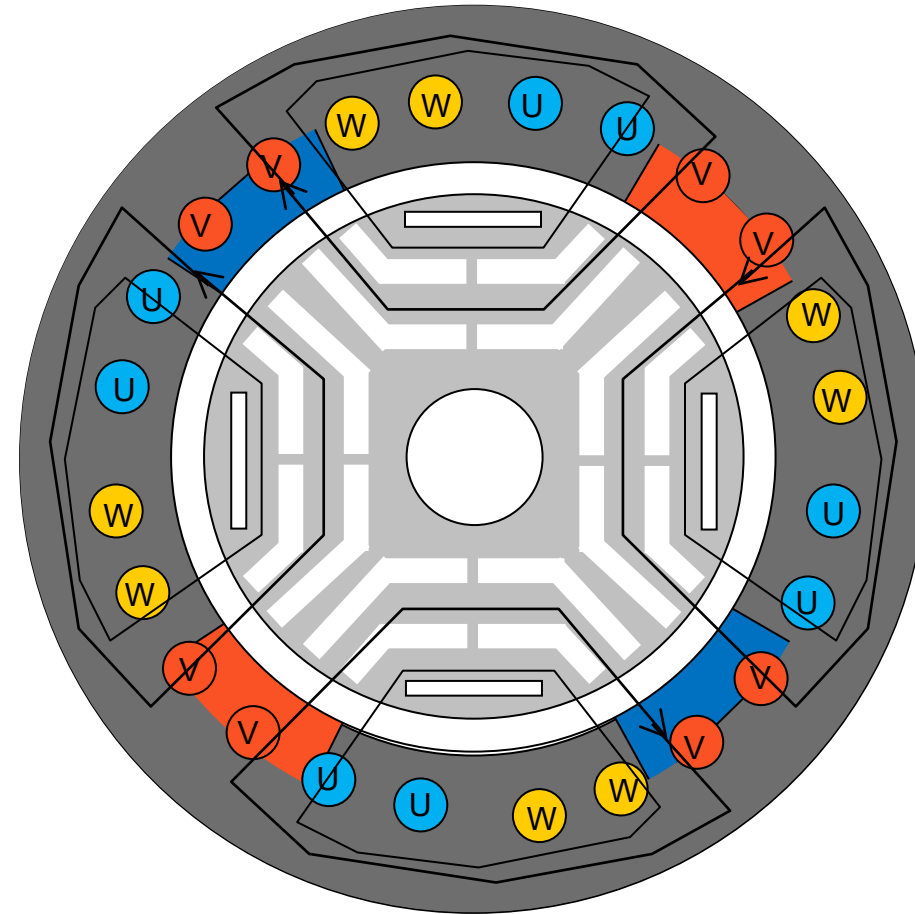
# Synchronous reluctance technology

Function compared to induction motor

Induction motor



Synchronous Reluctance motor



Elimination of resistive rotor losses

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## Brief history

### Synchronous reluctance motors

#### Proven and reliable technology

ABB Introduced SynRM motors in 2011

- IE4 efficiency class
- Firstly available for pumps and fans and now offered for all applications

Standard motor range – easy replacement of the traditional induction motors

Nowadays, more applications run with variable speed drive, helping the drive technology for SynRM become better commercialized

ABB introduced the IE5 SynRM ultra-premium efficiency motor in 2019





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# IE5 according to IEC TS 60034-30-2

## ABB IE5 Synchronous reluctance motors

IEC TS 60034-30-2 defines IE (International Efficiency) classes of variable speed AC (alternating current) motors

Familiar IEC 60034-30-1 define IE classes for DOL (direct-on-line) motors

The new standard allows motor to motor comparison in the IE class level, regardless of which standard is used for IE classification

This is the first time the IE5 class has been officially defined

- IE5 is not defined for DOL motors

In practice, the IE5 motors have 20% fewer losses compared to the IE4 motors



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# It's time to upgrade your motors

## IE5 synchronous reluctance motors

Upgrade to ultra-premium efficiency

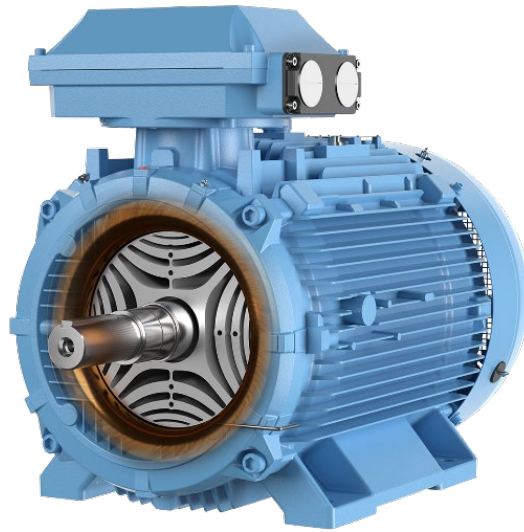
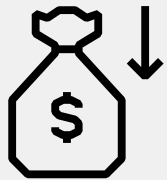
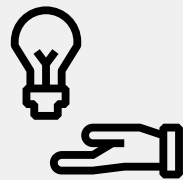


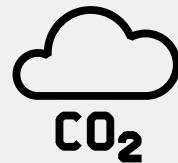
ABB IE5 SynRM motors are available and ready to order



Save money



Save energy



Reduce emissions



Improve reliability



For all applications

# The new first choice for energy efficiency

## ABB IE5 synchronous reluctance motors

ABB IE5 SynRM motors deliver a new level of efficiency: **Ultra-premium**



Significantly **more efficient** than IE3 motors



Higher efficiency **IE5**



**Energy** losses of 40% less



**Lowest** energy consumption

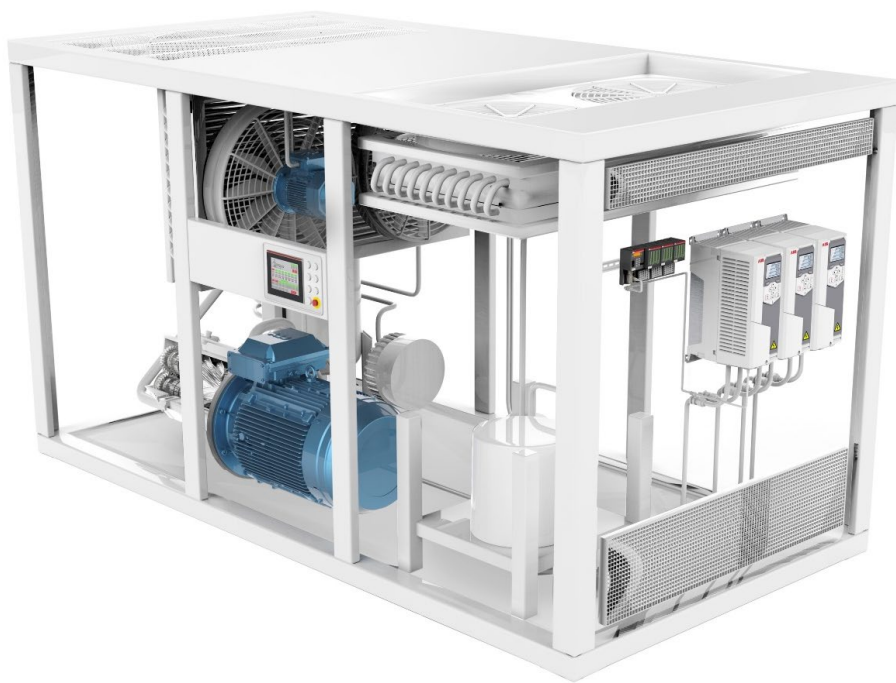


**Reduce emissions**

# The new first choice for reliability

## ABB IE5 synchronous reluctance motors

ABB IE5 SynRM motors deliver the **highest reliability and easy service**



**Minimized motor failures and downtime**, ensuring the most reliable, sustainable and long-lasting performance

**Lower** winding and bearing temperature



**Longer** lifetime  
**Extended** service intervals

**Magnet-free** rotor



**Easy** service and maintenance

**No rare earth** metals



**Environmentally** sustainable

**Less** motor noise

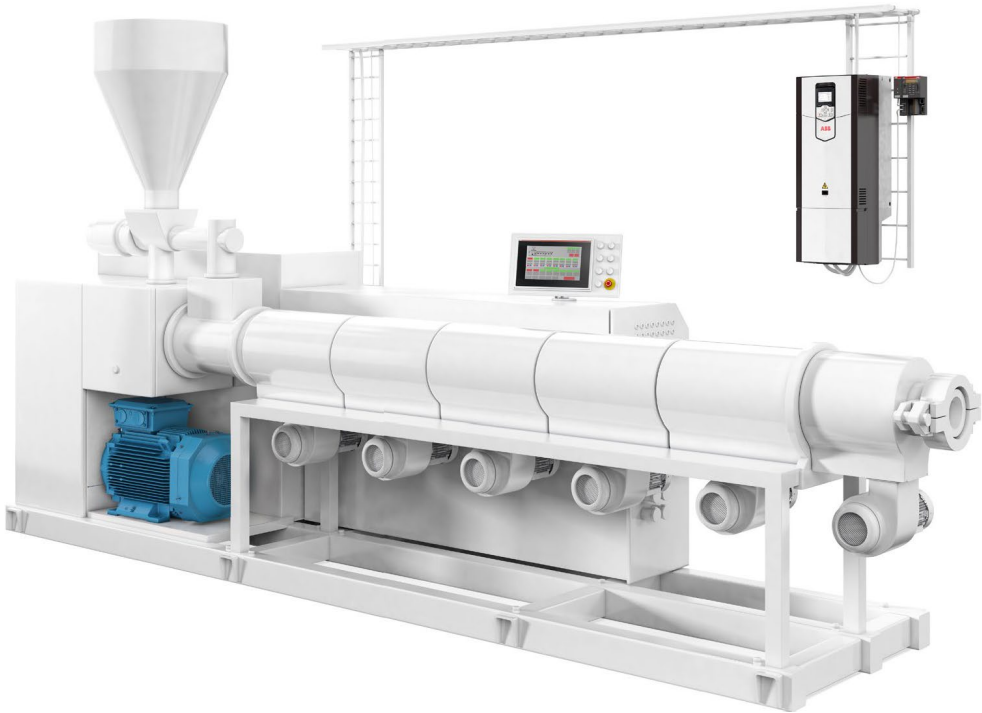


**Better** working environment

# The new first choice for controllability

## ABB IE5 synchronous reluctance motors

**Accurate torque and speed control** for demanding applications



**Accurate control and high efficiency** across the whole speed range, **even at partial loads**

**Accurate** speed and torque control



**High quality** production

**Full torque** from zero speed



**Reliable** starting

**Low** inertia



**Fast** motor control

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# It's easy to upgrade ABB IE5 synchronous reluctance motors

## Proven and reliable technology from ABB

- Long experience with SynRM motor-drive packages
- Delivering high-efficiency SynRM packages since 2011
- Numerous customer cases

## ABB IE5 SynRM motors easily replace induction motors

- The same size
- The same output power
- Significantly lower life cycle costs



# IE5 SynRM + Drive vs. IE3 motor + Drive

## Full load and part load efficiency

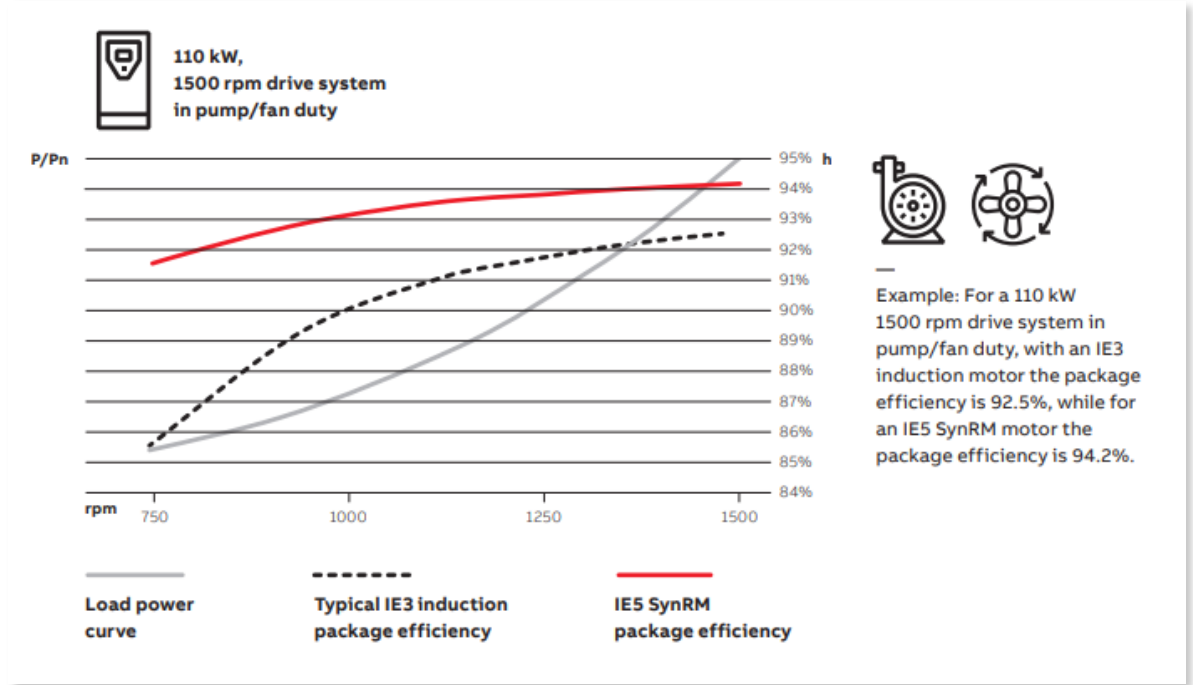
ABB measurements confirm SynRM efficiency advantage also at partial load conditions

There is about a 2-3% of benefit at full load, while at partial load the benefit can be as much as 6-7%

IE5 + VSD vs. IE3 + VSD payback calculation can be done by comparing nominal point efficiency

Partial load efficiency not critical as the power consumption is also much less

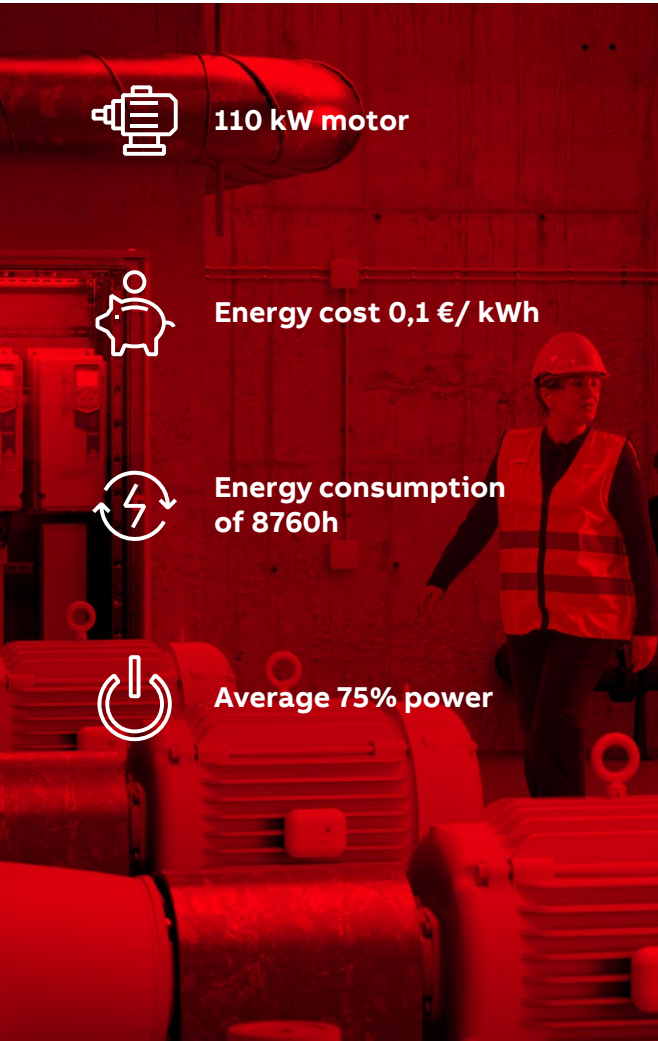
Using “average power” to assume VSD duty



! Payback calculation can be done with nominal point efficiency comparison

# IE5 SynRM motor + drive package vs IE3 package

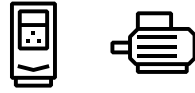
## Practical example



### IE5



13500 €



Nominal package efficiency **94,8%**



Energy consumed  
**762 MWh**  
**76234 €**

↑ ~ 17%

↑ ~ 3%

↓ ~ 3%

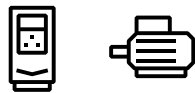
Annual saving in energy  
~2200€

↑ Incremental investment with an estimated ROI  
**~1 year**

### IE3



11500 €



Nominal package efficiency **92,1%**



Energy consumed  
**784 MWh**  
**78432 €**



# IE5 SynRM motor + drive package vs IE3 package

## Practical example



Cost savings in electricity consumption / year

**-2.200 €**



CO<sub>2</sub> savings / year

**7.651 kg (Germany)**



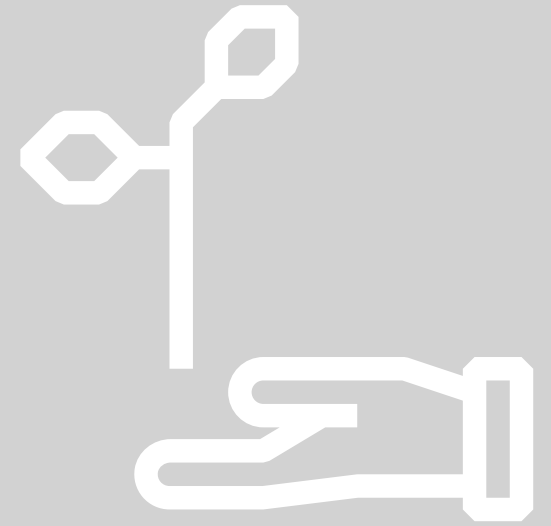
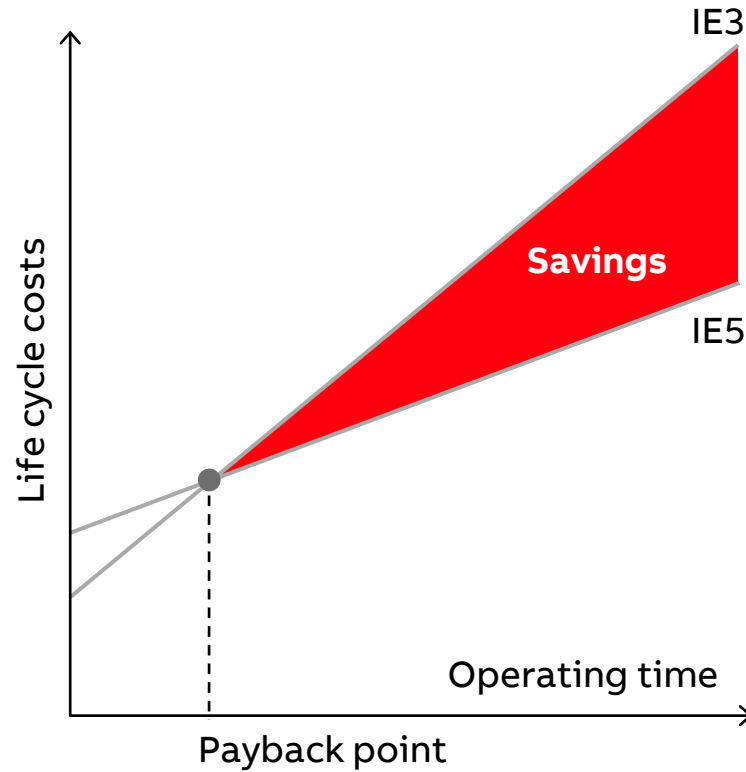
Weight reduction

**-126 kg**



ROI

**11 Months**



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# A complete drive product portfolio

Optimized package selections  
available in the catalogues

ABB offers a range of SynRM motor and drive packages  
with verified performance and efficiency!

## **ACS580/ ACH580 / ACQ580 & ACS880 variable speed drives**

- SynRM optimized drive types in the catalogue
- For all applications including water and wastewater, HVAC, food and beverage and many more
- Support various motor types including induction, permanent magnet, and synchronous reluctance motors



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## Success case – Reducing energy costs

ACH580 and SynRM package for Hobart Aquatic Centre in Tasmania, Australia

- Nineteen IE5 SynRM motor and drive packages and 25 ABB Ability™ Smart Sensors
- Estimated yearly savings of \$26,000 USD and a reduction of 77 tonnes of carbon emissions
- Advanced analytics and the scalable system will also reduce the current electrical draw demand by approximately 18%
- Return on investment in less than 3 years thanks to the savings from maintenance activities and operational costs
- Project as part of a Centre upgrade to create a more sustainable city for better communities

[Learn more](#)



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# Success case – Improving energy efficiency

ACS880 and SynRM package for a sewage treatment plant in North Rhine-Westphalia, Germany

German sewage treatment plant trusts ABB to prevent climate change and improve energy efficiency.

- Seven IE5 SynRM motor and drive packages
- Ultra-premium efficiency and good partial load efficiency of the ABB SynRM motors
- Reduced risk of disturbances in the power network and stable supply voltage with ultra-low harmonic drives
- Project support by the Federal Environment Ministry of Germany as part of the National Climate Protection Initiative

[Learn more](#)



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## Success case – Minimizing energy consumption

ACS580 and SynRM package for Campbell's refrigeration plant contributes to sustainability

Worldwide known soup manufacturer trusts ABB's motors and drives for improved process efficiency

- 14% reduction in energy consumption
- Dropping energy cost over 10,000 USD annually
- CO2 savings of 131 tonnes

[Learn more](#)



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# Learn more

## Useful resources

### ABB IE5 SynRM and Drive: The perfect match

- [Campaign website](#)
- [Success cases](#)
- [YouTube video](#)
- [Podcast](#)

### SynRM motor product website:

[Link](#)

### Drives:

[Link](#)

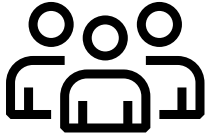
### Product catalog, 9AKK107743 EN 12-2019:

[Low voltage IE5 Synchronous reluctance motors](#)



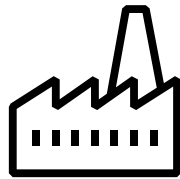
# ABB in Ireland

At a glance



**180**

People work for  
ABB in Ireland



**5**

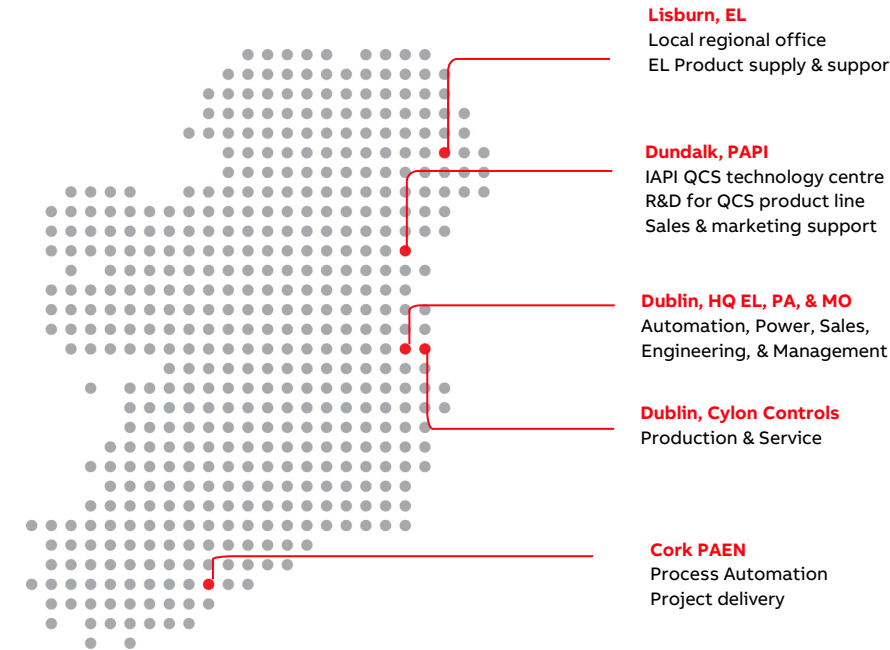
Sites where products  
are sold, serviced or  
engineered



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