



Low voltage synchronous motor and  
drive for low speed applications  
Packaged according to customer  
requirements

# Optimized package for low speed applications

## High performance

Our synchronous motors deliver high performance in industrial processes, the marine and offshore sectors, utilities and specialized applications all over the world.

## Reliability and efficiency

Designed for outstanding levels of reliability and efficiency, our motors not only help our customers to cut operating, maintenance and energy costs, but also to reduce their environmental impact.

## Flexibility

For maximum flexibility, ABB synchronous motors are designed for horizontal, inclined or vertical installation.

## Packaged together

The motor and drive package is optimized and engineered based on the customer's requirements. Packaging helps the customer in every phase of the project, from project creation to final commissioning.



### Industrial drive

Our industrial drives provide scalable motor control from standard to customer specific applications for a wide range of industries. A wide voltage and power range with various drive configurations and options enable one drive platform to be used for all needs.

### DTC

The heart of the drive is DTC, the direct torque control that provides high performance and significant benefits: eg, accurate static and dynamic speed and torque control, high starting torque and long motor cables.



### Centralized control, excitation and protection unit

The drive package for the synchronous motor offers a centralized automation control point and centralized supply for the integrated excitation unit. It also offers protection functionalities for the whole drive package.

### Suitability

Mine hoists conveyors, mineral mills, propulsion, shaft motor-generator sets and many other low speed and high torque applications.



# Synchronous motor for high-performance industrial processes



Horizontal motors



Vertical motor

Synchronous motors are used in high performance industrial processes, the marine and offshore sectors, utilities and specialized applications all over the world. Here are a couple of the main advantages that synchronous motors offer:

## Full torque from zero speed, and a long speed area with constant power

Synchronous motors can easily operate at low speeds, down to zero speed. Control of the speed is accurate since it operates in synchronization with the supply frequency (ie, no slip compensation is required, as in an induction motor).

Synchronous motors can operate at high speeds even if the base speed (field weakening point) is set to a low speed area. Typically, field weakening of 1:4 can easily be performed (eg, constant torque area 0 to 100 rpm, constant power area 100 to 400 rpm).

## High overloadability without oversizing the motor

Synchronous motors can be designed for very high power density at overload. Typically, overloads up to 300% are not a problem. This requirement does not have any effect on the active material volume that is needed to fulfill the rated thermal loadability of the motor. This means that there is no need to oversize the motor for the overloads.

## High efficiency leads to smaller inverter unit sizes

The high efficiency of the motor and adjustable power factor (up to 1) allow reduced cable losses, smaller inverter units and lower CO<sub>2</sub> emissions.

## High dynamic behavior

The low inertia of the salient pole design provides high dynamic behavior.

## Synchronous speed offers static speed accuracy without encoders

Synchronous motors always run at synchronous speed, there is no slip. Therefore the exact speed is known without extra encoders.

## Robust design for very demanding applications

Synchronous motors have separate excitation, which enables a bigger air gap. A bigger air gap means more robust mechanical construction. This allows much more bearing clearance in the radial direction and is therefore for applications where the mechanical stress on the bearings is high (eg, mine hoists).

## Flexible design to meet customer requirements

Flexible design to meet customer mechanical requirements (revamp, space limitations = hoists etc.).

More information on ABB's synchronous motors is available in Synchronous motor brochure (9AKK105576).

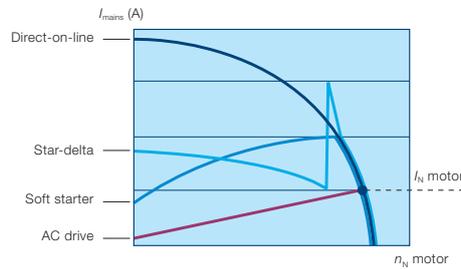
# Packaging the synchronous motor with the low voltage industrial drive

Synchronous motors can be manufactured as fixed speed motors as well as for variable speeds. There are several reasons to choose a variable speed motor with a dedicated converter.

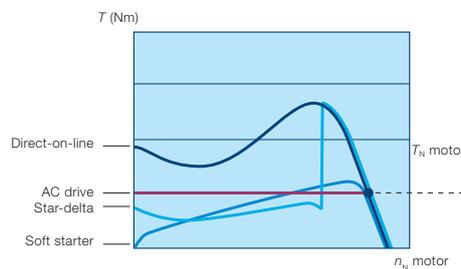
## Variable speed drives give great benefits compared to fixed speed motors

- Speed control according to process requirements
- Less mechanical stress on driven equipment. Drive control ensures smooth starting, acceleration and operation.
- Less electrical stress on the network
- Power factor compensating possibilities
- Special operation speed and functions are possible without extra accessories (eg, creeping speed)
- Better overall efficiency
- Smaller motor size. Converter driven motors can be designed with fewer poles and therefore the motor size is smaller.

## Less electrical and mechanical stress at startup



## Smooth starting, less electrical stress on the network



## Adjustable and smooth torque, less mechanical stress on driven equipment (motor, gearbox, etc.)

ABB's low voltage industrial drives offer a number of benefits that can be used together with low voltage synchronous motors as well.

## Low voltage industrial drive highlights

- Built-in redundancy through parallel connected power modules (instead of phase modules)
- Reduced power drive functionality
- Same drive type used for smaller motors in the same plant; same spare parts, tools, etc.
- The same multidrive can be used for large synchronous motors and for small auxiliary motors
- Maintenance requirements, low voltage certification is sufficient
- Low harmonic content on the network side

More information on ABB's industrial drives is available in the Product guide for ABB drives and controls (3AFE68401771) and in the Industrial driven catalogs.



# Drive packaging helps in every phase of the project

## Project creation

A complete motor and drive package is carefully designed to fulfill the technical specifications and process performance requirements of the customer in the most optimized way.

Project specific component selection is done based on:

- application requirements,
- loading conditions (motor + regenerative, etc.),
- overload requirements,
- site conditions such as environment conditions and network aspects,
- special application functionalities,
- functional safety requirements.

## Project execution and engineering

- Dedicated project manager; single point of contact
- Engineering of tailored and optimized components for customer process performance requirements

## Project specific periphery engineering

- Cable specifications
- Transformer specifications
- Network stability and design guide
- Drive package protection concept

## System integration engineering

- Single line diagrams
- Hardware and software control configuration and interfaces
- Tailored control functions
- Cable lists and connections
- Heat dissipation calculations
- Utility power consumption

## Services

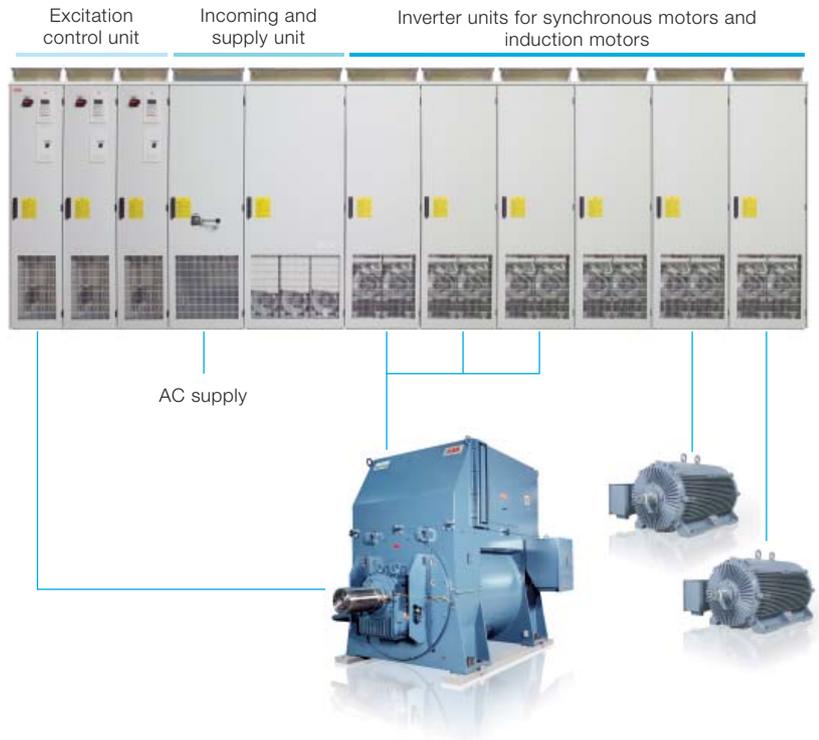
- Full package onsite services including installation supervision and commissioning
- Performance testing procedures and final testing of the drive package
- On-site and off-site training
- Network harmonic analysis
- Drive train mechanical analysis
- Validation services for non-package components
- Performance simulations
- On site electrical and mechanical measurement services



# Comprehensive range of low voltage synchronous motor and drive packages for low speed applications

## Synchronous motor as a part of a multidrive

Several synchronous and induction motors can be driven with a common multidrive, enabling savings in cabling and installation and improving application efficiency through common DC bus energy circulation.

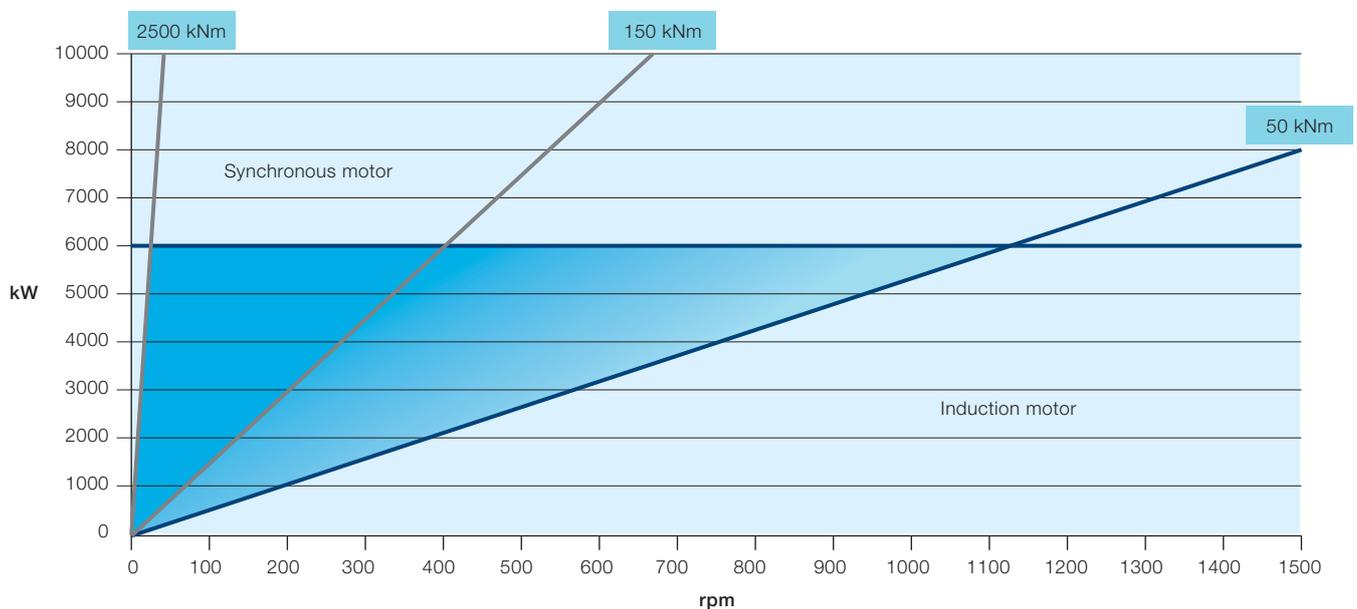


## Selection guideline

This chart represents the general guidelines for choosing a low voltage synchronous motor and drive package. A choice has to be made between an induction motor and a synchronous motor. In general, it can be said that if the required torque is higher than 150 kNm, then the best choice is a synchronous motor. In some cases even for 50 kNm it is still more advantageous to select a synchronous motor.

With low voltage converters power can be as high as 6 MW. Higher power requires medium voltage converters.

The final choice also depends on the other factors such as how long the required constant power range is, and the need for zero speed operation and overload capability.



# Contact us

For more information please contact  
your local ABB representative or visit:

[www.abb.com/drives](http://www.abb.com/drives)

[www.abb.com/motors&generators](http://www.abb.com/motors&generators)

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3AUA0000143100 REV A EN 26.4.2013 #16770