



Brochure

# High voltage cast iron motors Up to 2250 kW, 3000 HP

We provide motors and generators, services and expertise to save energy and improve customers' processes over the total lifecycle of our products, and beyond.





# High performance cast iron motors designed to meet all requirements of the specific application

HXR cast iron motors are custom designed for an ideal match with the individual customer's specific application. Innovative, TEFC (totally enclosed fan cooled) HXR motors are the right choice for applications with requirements for dependable, high efficiency motor power that cannot be met by standard products.

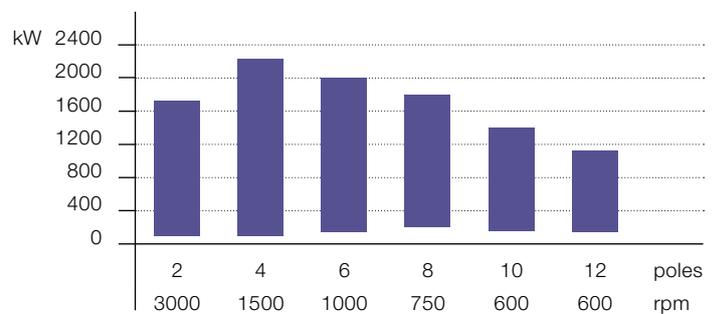
HXR motors are available up to 2250 kW at 50 Hz (up to 3000 HP at 60 Hz)

## Basic specification

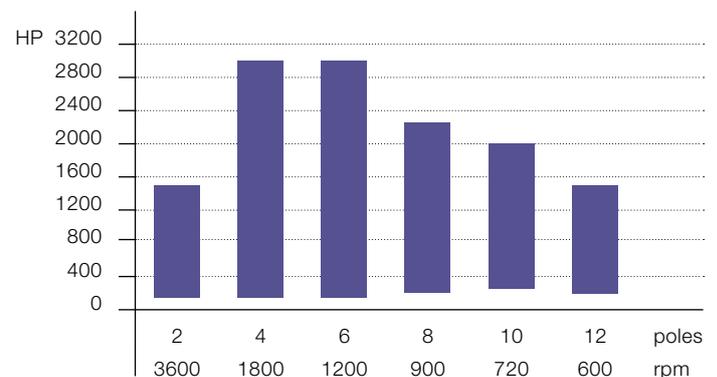
- Totally enclosed fan cooled cast iron construction
- 100 to 2250 kW at 50 Hz
- 150 to 3000 HP at 60 Hz
- Shaft heights: 355-560 mm  
14.5-22.0 inches
- Voltages from 380 V to 11 500 V
- Horizontal or vertical
- IP55 / IP56, IC411 / IC416
- TEFC / TEAO
- Standards IEC, NEMA, CSA...
- Motors for marine applications (LRS, DNV, BV, GL, ABS...)
- Motors for classified areas
- Motors for VSD

Wide range of other features available on request.

HXR output at 3000 V 50 Hz



HXR output at 4000 V 60 Hz



# HXR cast iron motors: High efficiency reduces environmental impacts and operating costs

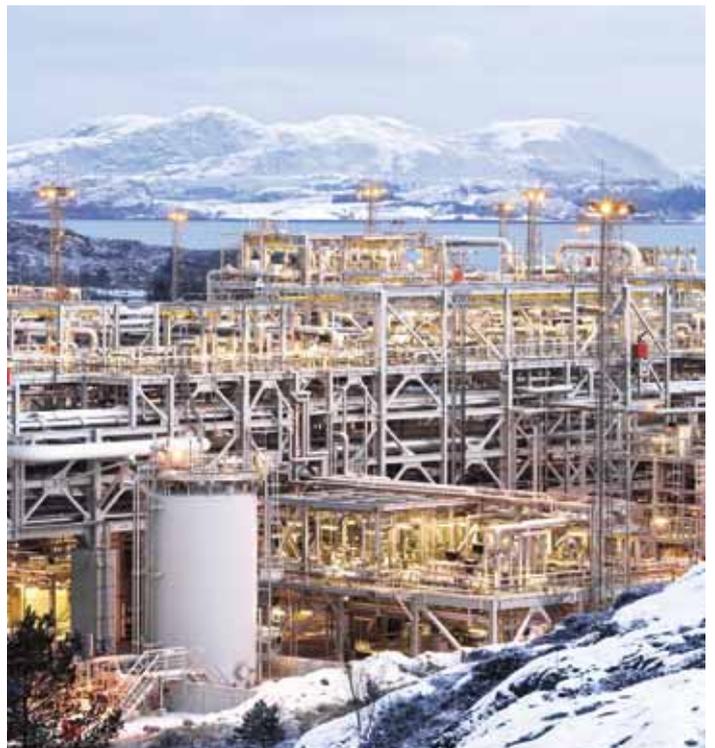


ABB is constantly working to further improve the environmental characteristics of its products. The HXR range of engineered motors – featuring high efficiency, long service life and low noise level – are not only environmentally friendly but also cost less to run.

Losses have been minimized by the effective use of material and optimized fan designs. Reduced core and fan losses mean that there is no sharp drop in the efficiency curve at partial load.

At the same time ABB has strengthened the mechanical structure of the motor and optimized the electrical dimensioning in order to increase the permissible starting time and, correspondingly, the permissible load inertia.

HXR motors also feature low noise levels, and are among the most silent high efficiency TEFC motors available. Most ratings produce less than 80 dB(A) when measured at one meter.

**Typical efficiency levels for 4-pole HXR motors**

Output kW	Efficiency %	
	4/4 load	3/4 load
500	96.7	96.7
630	97.0	97.0
710	97.1	97.1
800	97.2	97.2
900	97.3	97.3
1000	97.2	97.3
1250	97.4	97.5
1400	97.6	97.6
2000	97.9	97.9

**Constructed to run cool**

HXR motors are totally enclosed (IP55 to IEC) and provided with an external fan and cooling ribs (IC411 to IEC). Special attention is focused on the design of the rigid cast iron frame, as this plays an important part in determining the motor’s overall cooling efficiency.



The ribs are designed to present a large cooling area. The shape of the ribs is optimized to keep the air flow close to the motor surface along its entire length for efficient cooling and effective self-cleaning. The air gaps between the rib ends and the fan cover also facilitate the self-cleaning capability.

The inner surface of the frame and outer stator core surface are precision machined for a shrink fit. This minimizes thermal resistance between the stator core and frame, and thus improves cooling.

Unidirectional fans are standard on 2- and 4-pole designs in order to reduce the noise level and windage losses. Bidirectional fans are used on lower speed motors. The fans are normally made of welded steel plate.

**R&D and manufacturing closely integrated**

ABB’s R&D program seeks to ensure that all ABB products are based on the latest technology for optimum performance and reliability. Improvements resulting from innovation, new materials or new manufacturing methods are introduced as quickly as possible so that the benefits are passed on to customers. This process is facilitated by the close proximity of ABB’s research, design and manufacturing facilities.

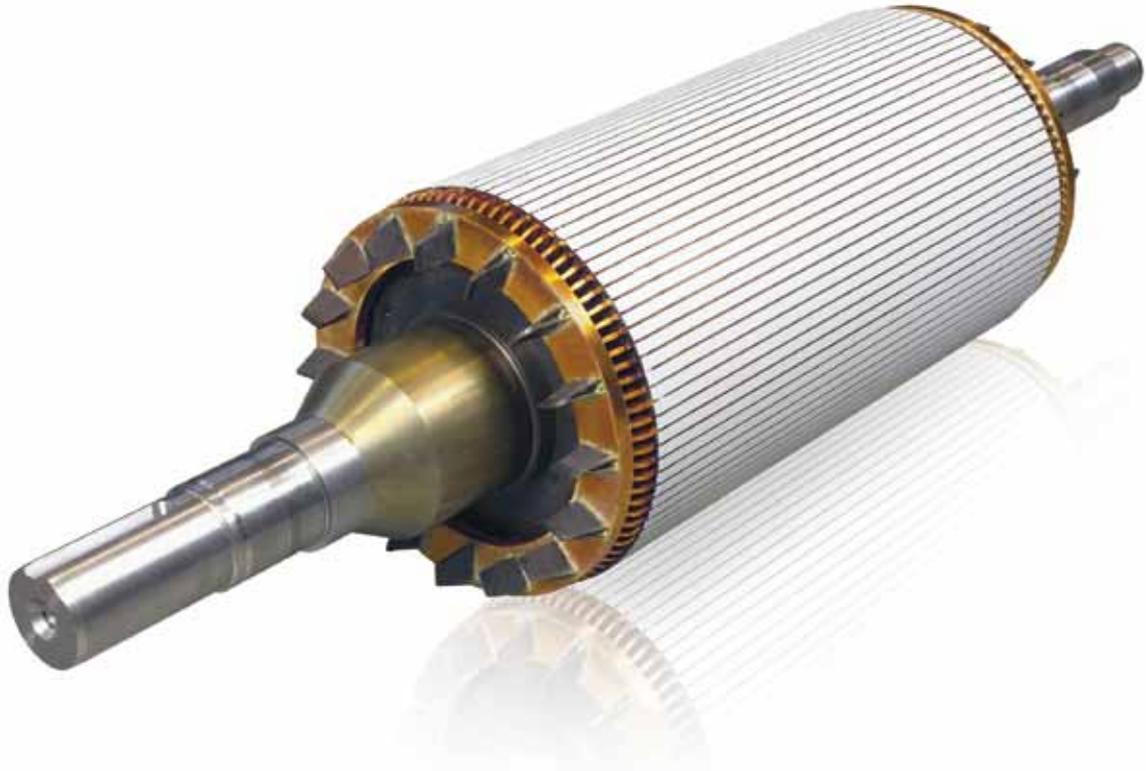
# High quality stator windings



The quality of the winding is a key factor in overall motor reliability. HXR motors feature a combination of the class F insulation system and vacuum pressure impregnation (VPI). This approach was first used in the late 1970s and has been providing excellent reliability since then.

To ensure the motors have a good overload margin – which promotes a long lifetime – they are normally rated to class B even though the insulation meets thermal class F requirements (temperature limit 155°C). The basic impulse level exceeds IEC requirements, and the windings are designed to cope with the highest mechanical stresses – including the effects of rapid autoreclosure in phase opposition.

# Rigid rotor construction



The rotor cage is constructed using deep bars of either copper, copper alloy or very conductive aluminum alloy. Copper bars are silver brazed to copper short circuit end rings, while aluminum bars are made of extruded rod and are continuous welded by machine to cast end rings.

For optimum performance and maximum rotor life, most rotors are built using copper bars and end rings (aluminum rotor standard for 2-pole motors). Great care is taken during manufacture to minimize stress buildup, and the rotor bars are swaged to provide a very robust construction able to withstand heavy duties.

## Low vibration

HXR custom engineered motors feature ABB's patented rotor construction for exceptionally low vibration levels. Even for 2-pole motors the typical vibration values are less than 0.8 mm/s at 3000 rpm, or the peak-to-peak displacement is less than 0.3 mils at 3600 rpm.

These low vibration levels are also unaffected by changes in the motor temperature, i.e. the vibration level remains stable from cold start to normal operating temperature. Vibration measurements are taken on fully assembled motors to verify compliance with the applicable standards.

# Reliable bearings



## Antifriction bearings

Horizontally mounted motors with shaft height 355-500 mm have deep groove ball bearings at both ends as a standard solution. This bearing construction has been tested for IP55 protection, and IP56 protection can be offered as an option. Motors with shaft height 560 mm have two bearings (deep groove ball bearing and cylindrical roller bearing, type NU) at the D-end and a cylindrical roller bearing at the N-end.

Vertical motors with shaft height 355-500 mm have a single row angular contact ball bearing at the N-end. Motors with shaft height 560 mm have two angular contact ball bearings in a tandem arrangement at the N-end. The axially free bearing is spring loaded to allow thermal expansion and reduce noise and vibration.

When a greater radial load capacity is required, for example in a belt drive, an optional cylindrical roller bearing (NU) can be used at the D-end.

The bearings are relubricated with grease while the motor is running. Excess and waste grease is removed from the bearing construction through a valve and an opening in the outer bearing cover.

Labyrinth type bearing seals prevent contamination of the bearings by airborne particles. Joint surfaces are sealed with sealing compound to ensure the best possible protection of the bearings.

All motors are provided with SPM (Shock Pulse Measuring) nipples as standard at both ends of the motor. The condition of the bearings can therefore be easily checked while the motor is running. Provision for resistance temperature detectors (RTD) is provided as standard.



### Sleeve bearings

Oil lubricated sleeve bearings can be supplied for horizontal motors as an option. The standard design is a side flange split type bearing. The normal rotor float range is  $\pm 8$  mm from the mechanical center.

The oil level can be checked using a sight glass from either side of the motor. Oil filling and drainage are easily carried out. Protection against contamination is provided by floating type labyrinth seals.

# Terminal boxes designed for maximum flexibility

Cable connection is a straightforward task as there is plenty of space in the terminal box, which can even be changed from side to side after installation. The standard location of the main terminal box is at the D-end on horizontal motors and at the N-end on vertical motors. The box is supported by rigid fixing beams on the motor frame.

Terminal boxes are welded from sheet steel for a robust construction. A variety of different HV terminal boxes – including star point, phase segregated and phase separated – are available. There are also several options for cable sealing. Optional accessories, such as current transformers and surge capacitors, are available to ensure HXR motors are a perfect match for their operating environment.



- 1 Low voltage terminal boxes allow convenient cable entry from either the left or right side.
- 2 High voltage terminal boxes can be rotated, even after the initial cable connection. These boxes are equipped with a pressure relief valve.
- 3 All auxiliaries are wired to a separate connection box. The connection diagram is attached inside the cover.





## Comprehensive range of accessories

ABB supplies a wide range of proven accessories for HXR motors – customers can select the accessories they need to customize their motors for an exact match with their requirements.

**The following accessories are included as standard:**

- 6 Pt 100 resistance temperature detectors (RTD) in stator winding, wired to separate terminal box
- SPM and grease nipples on both antifriction bearings
- labyrinth seals on bearings
- grounding bolts on frame and inside and outside of terminal boxes
- stainless steel rating plate
- jacking screws
- lifting lugs
- provision for dowel pins

Please contact ABB for further information about optional accessories.

# Extensive testing



ABB's design and manufacturing experience, combined with state-of-the-art facilities, ensure that each HXR motor meets the strictest quality requirements.

Extensive testing during manufacturing and final assembly verifies the high quality of the motors. Following type testing of a new motor to prove its electrical characteristics, all subsequent motors of the same type undergo an extensive routine test program.

# Custom engineered for your application

ABB's high voltage HXR motors are used in a wide variety of processes across many different industries. Typical applications include pumps, fans, blowers, compressors, conveyors, pulverizers, and even ship thrusters and AC generators. Versions classified for hazardous areas are available for use in the chemical, oil, gas and similar sectors.

Totally enclosed fan cooled (TEFC) motors are suitable for almost all environmental conditions. Their good starting characteristics make these motors especially suited to driving energy efficient blowers and fans. In addition, high efficiency at both full and partial loads produces major cost benefits in continuous operation. As a result these motors are an excellent choice for driving pumps in power plants and process industries, as well as many other continuous duty applications.

ABB works with customers to ensure that they select the optimum motor for their application and process. ABB's unmatched experience in supplying power equipment, automation and control systems for all branches of industry give it unrivalled insight into the needs of different processes and businesses – enabling ABB to act as an innovative and reliable partner. ABB is committed to ensuring that customers get technically outstanding solutions optimized for their particular needs.



# Ideal for use with variable speed drives

A cage induction motor is the most versatile, reliable and economical prime mover available to industry, and there are countless applications where variable speed control of these motors is required.

HXR motors that are specified for use with frequency converters can be smoothly controlled down to zero speed. Non-fluctuating torque can be achieved for constant torque applications, and HXR motors feature rapid torque response and high dynamic speed control accuracy as standard.

Windings are form-wound as standard in HXR motors. This construction results in very moderate voltage stresses between the winding elements, even when supplied with the most efficient inverter types and steepest voltage pulses. Chokes and filters are therefore not needed, making installation simpler, reducing losses and enhancing the performance of the entire drive system.

## Optimized performance

HXR motors can be custom dimensioned to optimize their performance with specific drives. Electrical dimensioning ensures the best possible performance of the drive and guarantees that the frequency converter is fully utilized. In many cases the power demand can be met with a smaller inverter unit.



ABB works with its customers around the world to offer flexible solutions that meet their requirements. In large projects, for example, ABB's engineers can work with the customer to reduce the number of different types of motor used in order to minimize the requirement for spare motors.

# A sound investment



## ABB's HXR motors represent a sound investment:

- established supplier with over 100 years' experience
- short delivery times
- state-of-the-art design
- high efficiency for lower operating costs
- high reliability and long lifetime
- low noise and vibration levels
- VPI insulation system
- comprehensive range of accessories
- compliance with many international standards
- global service network
- ISO 9001 quality and ISO 14001 environmental certificates

# Worldwide support and service

With over 10,000 committed professionals in more than 50 countries, ABB can provide customers with comprehensive support no matter where they are located. All services are provided by ABB trained personnel, and are supported directly by the manufacturing plant. ABB's reputation for service is based on quality, flexibility and local presence on a global scale.

ABB's commitment to support extends from the first contact, through product selection, specification, design, manufacture, and delivery, to maintenance and servicing. ABB seeks to build long-term working relationships with its customers, supplying power equipment, automation and control systems that will deliver reliability, lower operating costs and minimized life cycle costs, and thus help customers to boost their competitiveness.



ABB supplies comprehensive product and service information on its website, and also provides support online.

## Reliable and efficient motors and generators for any application

ABB produces one of the world's most comprehensive ranges of motors and generators. We supply the manufacturers of series built machines and the operators of highly specialized and demanding industrial processes.

Our range runs from 0.06 kW standard motors to 70 MVA generators. It encompasses high and low voltage motors and generators, induction and synchronous, AC and DC.

These motors and generators are designed for all industrial applications and a complete range of options and auxiliary equipment is available.

ABB motors and generators meet all widely used standards and are approved for use in hazardous areas. Protection classes include flameproof, non-sparking, increased safety, dust ignition protection and pressurized.



# Contact us

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

ABB ([www.abb.com](http://www.abb.com)) is a leader in power and automation technologies that enable utility and industry customers to improve performance while lowering environmental impact. The ABB Group of companies operates in around 100 countries and employs about 120,000 people.

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