WHITE PAPER

New opportunities for machine builders

Full range of machinery motors optimized for high power density



ABB offers machine-building OEMs an extensive range of High Dynamic Performance (HDP) motors.

With frame sizes between 80 and 400, and with high-speed and water-cooled design alternatives, ABB can provide high-performance drive solutions comprising matching HDP motor and variable speed drive (VSD) for a wide variety of machine types, sizes and applications – whether for new designs or for retrofitting.

Benefits for machine builders

High-quality HDP motors



Motor series
- M3FT (IP23)
- M3ET (IP55)
- M3LT (IP55, water cooled)

Frame diameters
from 80 to 400

Torque-dense and compact

Power range
Extensive range, from 2 kW to 2,000 kW

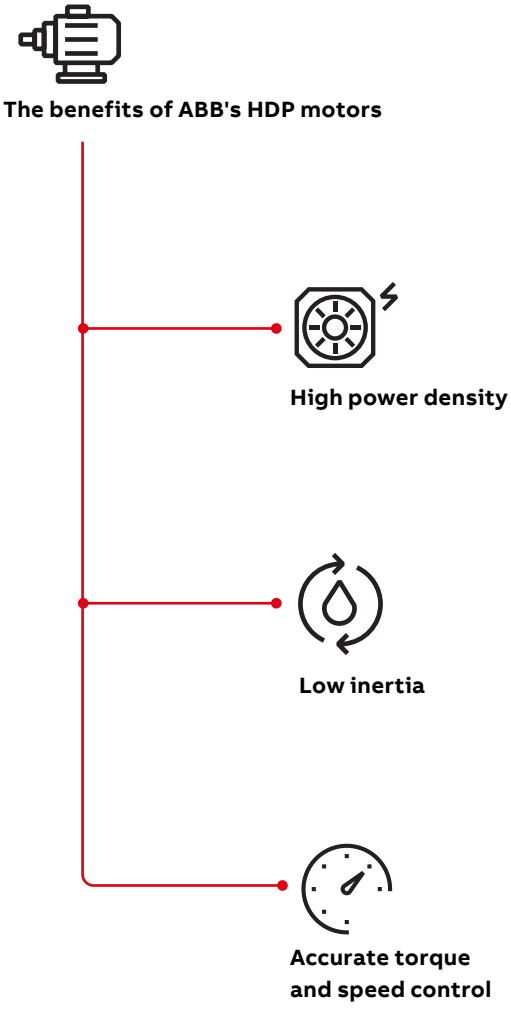
Cooling options
- Forced ventilation
- Open-circuit ventilation
- Water cooling

130 years of motor leadership
Now also available to machine builders

Millions of motors worldwide
ABB has been a leading provider of electric motors for more than 130 years. Millions of ABB motors are currently in operation in numerous industrial applications worldwide, and appreciated for their simple, yet advanced, modular design, reliability and longevity.

Precise motor control
ABB is particularly renowned for its optimized motor and variable-speed drive (VSD) packages, providing precise motor control and maneuvering capabilities in a wide variety of variable-speed applications throughout general industry including pumps, fans and compressors.

High-torque applications
Excellent control and maneuvering capabilities are, of course, also attractive to machine builders and their customers in high-torque applications such as extruders, wire drawing machines, test benches and cranes – and well-provided by packages combining ABB's High Dynamic Performance (HDP) motors and VSDs into complete solutions.



A history from DC to AC

Historically, industrial machinery was driven by DC motors on account of their superb speed control. However, with the emergence of variable speed drives (VSD) in the 1980s, it became possible to control the speed of AC motors, making them a viable alternative technology.

Ever since, specialized AC motors with square cross-section frame design, such as ABB's HDP motors, have been gradually replacing DC motors. The square frame design and a high overload capacity give HDP motors an excellent dynamic response due to the low moment of inertia.

Based on simple induction technology, specialized AC motors have proven more cost effective and service friendly than the previous DC motors – and today dominate the market both for retrofitting and for new machine designs.

Frame-size and technology range
Machine builders' first selection criterion

A replacement for every machine
The first OEM requirement that any motor provider must be able to meet is an extensive product range. Frame sizes for machine motors are relatively fixed and "standardized," and replacement motor providers must be able to respond with a model that fits the machine type in question. ABB provides drop-in replacement HDP motors for every commonly requested frame size.

Technology variants for special needs
With its upgraded HDP motor range, ABB can offer machine builders frame sizes between 80 and 400, and output capacities up to two megawatts – as well as alternative designs variants such as high-speed and water-cooled motors. All motors are designed for use with a VSD, and ABB can provide matching motor and VSD packages across the frame-size range – along with professional support and services on a global basis.

Extending your offering
ABB's HDP motor and VSD solutions create new opportunities for machine builders to improve and extend their customer offering. Thanks to ABB motors very high power density, machine builders are offered a dual benefit: designing more compact new machines while boosting the performance of existing machine types using more powerful replacement motors.

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Frame sizes range from 80 to 400 with outputs from 2 kW to 2,000 kW. Different cooling options are available, including water cooling, depending on frame size.

Motor series	80	90	100	112	132	160	180	200	225	250	280	315	355	400
M3ET (IP55)	●		●		●	●	●	●	●	●	●	●	●	
M3FT (IP23)			●		●	●	●	●	●	●	●	●	●	●
M3LT (IP55, water-cooled)	●		●		●	●	●							

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Three variants of ABB's HDP motor in frame size 160 with different cooling arrangements.



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01 Air cooled (ET - IP55, axial fan)

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02 Air cooled (FT - IP23, radial blower)

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03 Water cooled (LT - IP55)

Performance and compactness
The ABB dual power-density benefit

ABB has long been pushing the motor power density frontline through repeated technology innovation and cooling breakthroughs. Our motors are universally acknowledged as the most compact in general industry. With our re-engineered HDP motor range, we also invite machine builders to benefit from our high power density.

Machine builders can capitalize on ABB's uniquely high power density in two ways: retrofitting an existing machine with a stronger drop-in replacement motor, or selecting a more compact, yet equally strong, HDP motor when designing a new machine type to reduce its footprint.

Benefit 1: Retrofitting opportunities
In retrofitting, i.e. in motor replacement projects, it's important to match the frame size of the existing motor with a minimum of additional engineering work. ABB's full range of drop-in replacement motors add value through their superior power density. With the same speed and torque as the old motor higher power density, an ABB HDP motor will boost machine performance and offer machine builders a strong new competitive edge.

Benefit 2: New machine-design opportunities
Due to floor-space constraints, machine compactness is an increasingly important product differentiator requested by machine builders and their customers. The compactness of the motor can have a significant impact on the compactness of the machine itself, depending on machine type and category. A high power density means OEMs can design more compact machines by selecting a motor of a smaller frame size than compared to previous generation for a given output.

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ABB's HDP motors are developed and tested as a system solution together with a matching VSD to ensure optimum motor control and machine maneuvering.

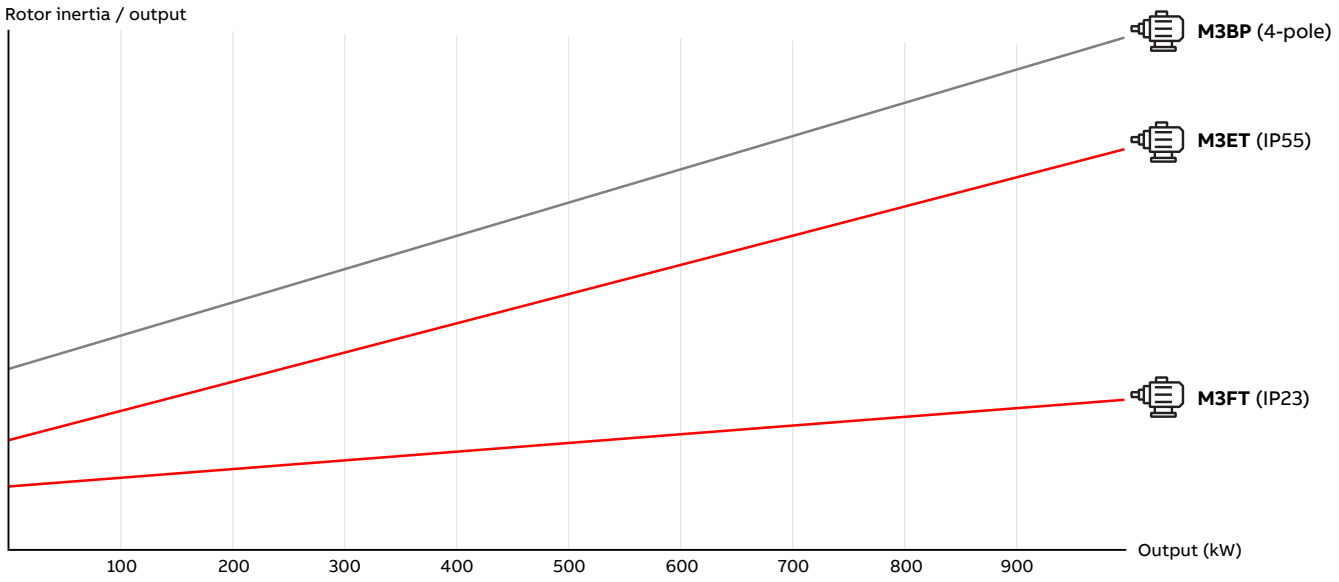


Superb control and maneuvering
Optimized motor and drive operation

ABB's packaged solutions, containing motor and matching VSD, are optimized as complete drive systems. They excel in motor control and enable precise maneuvering of any type or size of machinery.

Lab tested performance
Machine builder must be able to expect the drive system to provide excellent motor control and maneuvering, reliably and consistently. ABB's HDP motors draw heavily on a long tradition of developing, testing and optimizing motor and VSD together as complete drive system solutions. The matching of motor and drive is inherent in every variable-speed application motor from ABB. Optimized on system level, these solutions are also highly energy efficient.

Making full use of VSD capabilities
To make full use of ABB's VSDs – including flexibility to optimize processes and control, reliability to reduce downtime, and efficiency to reduce energy use and carbon emissions – the motor's technology solution must be up to the challenge. ABB's HDP motors are designed to enable fast motion control and high maneuvering precision due to their low inertia and high overload capacity. Low-inertia motors can more successfully shift rotational direction to enable, for example, faster back-and-forth machine motion.



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Low rotor inertia is key to providing fast and precise machine maneuvering. The chart shows a comparison between the inertia of two ABB HDP-motor variants and a comparable ABB process performance motor (M3BP) at different outputs (at 1,500 rpms).

Flexible motor solutions
Adapted to customer needs

Even a complete motor range, including technology variants such as water-cooled and high-speed motors, may not be sufficient to meet all the specific needs of thousands of machine types and sizes in the market. ABB therefore offers customization of its HDP motors.

Modular platform
ABB keeps a limited, yet sufficiently large, number of standardized components in stock to enable design flexibility. This allows us to meet most machine-building requirements without extending delivery times. When developing our HDP motor range, we made sure to include all the commonly requested frame sizes and technology variants such as water-cooled, high-speed and megawatt-class alternatives.

Customization
Further design flexibility is achieved by developing adjustable key components. Examples include flexible mounting of the terminal box, which makes it easy to connect cables regardless of machine-specific space constraints, and programmable encoders which allow OEMs and end-users to adapt to changing needs instead of keeping a set of encoders in stock.

Easy installation
Installation friendliness is another prioritized part of ABB's manufacturing philosophy. It must be easy to install, for example, a replacement motor into an existing machine without excessive engineering work. ABB has considered installation simplicity in everything from making connection points easily accessible to simple installation of accessories, such as cooling fans, encoders and brakes, whether of ABB or third-party make.

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Space constraints in the end user application may be cause to customize the motor, e.g. re-positioning the terminal box.



Availability and delivery precision
Across the globe

Delivery time is of the essence and any replacement motor must be readily available and for fast retrofitting, regardless of the machine's geographical location.

Fast delivery
Fast delivery of replacement motors is instrumental to minimize costly downtime for OEMs end users. ABB can deliver HDP motors within 4–5 weeks, even extensively customized versions, thanks to its modular design and manufacturing philosophy, which allows for rapid manufacturing using a limited set of components.

Unrestricted global use
ABB HDP motors are compliant with the IEC 60034 standard and hence prepared for unrestricted global use. All frame sizes, technology variants and customizations are available to machine builders worldwide, and support is provided to OEMs and end users through ABB's global services organization.

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ABB has an extensive portfolio of global services to meet OEM and end-customer needs.



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9AAU000000000010 EN 11-2021