

Press release

Highly dynamic, 3-phase internal rotor motor for industrial applications Quiet-running family of products with the lowest torque pulsation

For industrial systems and devices, compact motors that provide high performance while taking up very little space are in high demand. Whether in automation, the printing industry or in packaging systems, long service life, even when running at full capacity, is always important. EC motors are particularly well suited to this area. They have excellent dynamic features and a high level of efficiency. They continue to work even under adverse conditions and are the product of choice in today's market when it comes to reliable and powerful drives with compact dimensions and an excellent price-performance ratio.

Modern plant and machine designs place a focus on decentralized intelligence and decentralized drives. When it comes to performance and service life, a localized drive provides substantial advantages over mechanical power distribution from a central drive. Powerful, maintenance-free EC motors are ideal for this task. To be able to offer users powerful, optimally stepped drives, the motor specialists at ebm-papst in St. Georgen have developed a new family of EC motors. Building on the standardized dimensions and flange measurements of brush motors already on the market, our specialists implemented an optimal drive system by taking into consideration the special requirements for flexible and especially durable industrial motors.

Technical refinement

The requirement for manufacturing the new ECI 63 motor series was a uniform system configuration that allows the drives to be produced on a fully automated production line, with 100% process monitoring during each step of the manufacturing process. The most important part of this process for the development engineers was not just the quality of the manufactured product; the performance characteristics and

system capability of the drives also held precedence (image 1). For the motors themselves, it was important to come up with a design that allows for sensitive movements almost like those of a step motor, as well as a rapid change mode to dynamic run-up. The drive should also be able to cope with continuous alternation in 4-quadrant operation without a problem. The innovative solution realized in the new motor series builds on the principle of a three-phase permanent magnet synchronous motor with an internal rotor design for electronically commutated (or, in a few cases, sine-commutated) motor operation. The active components consist of a six-slot stator and a four-pole rotor. The concentrated stator winding has low copper loss, and because it does not require coil crossover, it is not only robust, but also cost-effective to manufacture. A targeted air gap extension (image 2) in the rotor surface reduces the motor detent torque to a minimum. In addition, foregoing all types of oblique parts in the stator and rotor results in significant technological advantages.

Rod-shaped SE permanent magnets made of neodymium iron boron material are embedded in the plated rotor stack. Thanks to the pockets in the rotor plate, the magnets are permanently held in place and are suitable for high speeds without the need for additional safety measures.

An additional challenge for the motor developers was attaining the lowest possible torque pulsation, both when the motor is energized and when de-energized, and a very low running-noise level. Many years of experience in developing and manufacturing complex EC drives, and using the most modern design and simulation software, are prerequisites for effective motor optimization. Suitable analytic and numeric calculation programs, and making calculations based on the finite element method, allowed the torque pulsation to be reduced to a minimum. Endurance tests under extreme conditions and stress tests on all of the components of the motor complete the development phase.

Real-world applications

The new family of drives consists of three platform motors with an output of between 85 and 270 W at a nominal voltage of 24 V (image 3). The dimensions of the drives vary only in length. The diameter is always a uniform 63 mm. The smallest, which is 85 mm in diameter, is extremely compact. At 100 mm and 135 mm overall length, the two larger models in the family are very compact.

At the factory, we make sure our motors meet the IP 40 system of protection. The motors are designed so that they can be equipped with encoders and brakes. Digital operating electronics customized for driving these motors are available. This allows customers to choose the drive that is precisely suited for their application: either a pure drive component, meaning a motor with integrated sensors for the customer's existing control system, or the complete drive package—ready to connect and equipped with all of the necessary components.

Currently available accessories for the motors include single and double-stage planetary gears with reduction ratios of 5:1 and 30:1 and a max. nominal torque of 14.8 Nm (higher torques can be provided upon request). To provide optimum service life, the gearbox output shafts are equipped with double ball bearings, and all gearbox components are adapted for the performance potential and durability of EC motors.

Systems offered include both the optical impulse transmitter for the speed sensors and electromechanical brakes. DRIVECONTROL, the external operating electronics from ebm-papst, provide optimum activation and closed-loop speed control of these motors.

The new family of EC motors offers high performance without taking up a lot of space. Sensitive operation, similar to that of a step motor, and highly dynamic acceleration, is not a problem for this motor design. Thanks to high-performance gearboxes that have been adapted specifically for EC motors, the drives can cover a wide variety of applications, and they offer an attractive alternative to inflexible main drives. In addition, making the technological switch from brush motors to EC technology creates entirely new opportunities for more flexible and dynamic applications.

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Image 1: Fully automated manufacturing of ECI 63 series

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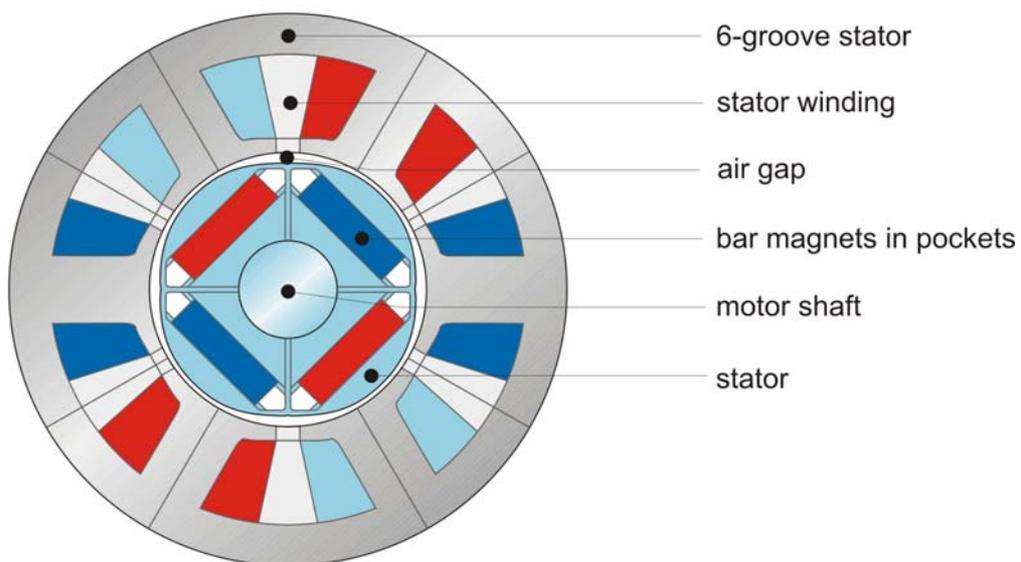


Image 2: Targeted air gap extension for optimum concentricity

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Image 3: The optimally stepped 63 series: The right motor for every type of drive

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