

Press News

Silent, dynamic and powerful:

The new motor series ECI 42.40 Compact by ebm-papst

All-inclusive: The turn-key drive solutions

The electronically commutated ECI 42.40 Compact, with a nominal torque of over 100 mNm has convincing dynamics over the entire speed range as well as a high overload-protected starting torque. An ideal combination of motor and gear, it is highly robust, reliable and extremely quiet. Furthermore, the internal rotor motor is an all-inclusive drive with space-saving, integrated commutation electronics and a highly compact, digital 4-quadrant speed controller.

For users this means minimum actuation and maximum flexibility in operation, so that a wide variety of applications can be operated without high development costs. The digital speed controller provides excellent features for this purpose. Flash technology enables the motor software to be varied as required during production with a special programming process. Cost-favourable and intelligent fine tuning according to the customer-specific requirement profiles, functionality and parameterization, e.g. speed range, overload capability or control dynamics is therefore quick and easy to realise.

The microprocessor-controlled electronics are responsible for the manifold assignments of motor management. Three Hall sensors generate precise rotor position signals to the microcontroller for the exact commutation of the motor current. The 4-quadrant controller integrates a power output stage that is resistant to overcurrent and functions such as protection against blocking and overload. A service life of over 20.000 hours and high operational reliability make this 3-phase motor an industry standard. Users thus, possess a high class technological drive system for a variety of application areas that is not only fully tested and qualified but also offers high process reliability.

Thanks to the high piece numbers that ebm-papst can produce by automation, high-quality and efficient production is guaranteed at prices in line with market requirements.

The inner values are impressive:

That's what counts

Thanks to innovative solutions, the ECI 42.40 Compact has the high axial shock loads that occur with worm or helical gears well under control. The rotor shaft is fixed using a clamping plate and screws with the fixed bearing in the end shield on the A side. Contrary to gluing, that many competitors use with EC motors, this technology also provides higher reliability during the production process. The result is a lower susceptibility of the motor to failure so that it can perform its job reliably.

The innovative rotor concept

In order to achieve maximum cost efficiency and to offer the ECI 42.40 Compact at attractive prices in line with the market, ebm-papst has developed a new construction principle that enables fully automatic, process-monitored motor production. The magnets are inserted as rectangular segments in pockets as that are specially provided for this purpose and fixed with plates and no longer glued in a ring to the rotor. When compared with a glued rotor with „round “ magnetic ring, the manufacturer of which is cost-intensive, considerable costs can be saved using an electrically insulated rotor lamination with integrated magnets. Armouring is no longer necessary, the rectangular rare earth bar magnets are of higher quality and can be procured more cost-favourably than magnetic rings on the world market.

Couldn't be better: Complex production from one casting

Fully automated production guarantees high precision and low residual unbalance of the stamped laminated rotor with notched shaft that requires no subsequent balancing. The special challenge confronting the motor developers was to comply with the lowest torque pulsations in either an energised or de-energised state as well as an extremely low running noise level, high dynamics and high performance. The ebm-papst solution can be described as a synthesis of electromechanical and thermal motor development. Appropriate optimisation algorithms were used together with analytical and numerical calculation programs. Due to calculations according to the Finite Element methods, the torque pulsations were optimised to a minimum. Maximum torque quality was assured by the original rotor topology and the use of high-quality magnetic materials. Furthermore, lubrica-

1006 11/03

tion specially adapted to the ball bearing system and the application in question render the ECI 42.40 Compact extremely quiet: Regardless of the load, the noise development of the motor (without gear) always remains under 48 dB(A).

Stator and connection PCB

The six-slot stator is single-tooth wound with an extremely high bulk factor (needle winding) and all lead ends are contacted fully automatically via cut-clamp technology. In order to guarantee highly efficient production and freedom from errors, the winding ends are connected using a PCB. Basically, all types of connection, e.g. star winding configuration or delta connection are possible with an extremely wide voltage and power range. The three phases are routed with push-on pins onto the electronic PCB and through the end shield on the B-side. In the next process, the magnetic pick-up is pressed onto the end of the rotor shaft.

C-flange and electronics

The ebm-papst product philosophy deliberately separates the motor and electronics. This is due to the fact that the modular structure of the drives enables automated large-volume production despite the most varied customer requirements and applications. The PCB with the special flash operating software is fixed to the special bracket in the C-flange. The bracket also serves as a centring aid and insulation for the flat pins. The motor is connected electrically via a plug, that is located concentric to the motor cap.

The helically toothed planetary gears

Originally the ebm-papst compact motor is available with integrated, optimised one or multiple stage planetary gears, although the wide control range of the ECI 42.40 Compact usually demands fewer gear versions. Possible reduction ratios are 3, 18:1, 5:1, 21, 25:1, 30:1 and 150:1. The planetary gears themselves are extremely quiet and of modular structure. In comparison to other current solutions, these gears have a convincingly high efficiency coefficient despite the fact that they are shorter: Where other competitors have to configure two-stage gears, a one-step gear suffices here. For special applications a total of 20 different reductions can be realised with one-step gears and as many as 240 with two-stage gears.

Gear input stage

The gearing is optimally adapted to the high speed in the first stage. To reduce noise, both the planetary gears and the ring gears are of plastic although the ring gear is encased in a zinc diecast housing. Thanks to their excellent noise damping characteristics, these materials ideally minimise running noises. Furthermore, better engagement and thus higher transmittable loads can be realised by the helical gearing in the first stage. The helical gearing also enables more even and flowing engagement.

The gear output stage

Lower speeds are usually more predominant in the output stage with high torques. As this gear stage is not so critical as regards noise, the transmittable torque is decisive. Gears and planetary gears therefore, are made of case-hardened steel, the planetary gears are anti-friction mounted on the hardened needles of the planet carrier.

EPS_05-006_image1.jpg



Image 1: Quiet, dynamic and powerful: The new ECI 42.40 compact motor

EPS_05-006_image2.jpg



Image 2: The all-inclusive solution: Motor plus gear plus control electronics

1006 11/03

EPS_05-006_image3.jpg



Image 3: The new motor series ECI 42.40 Compact

Text and photos/grahpics are filed on the enclosed CD-ROM.

Hard copies are available from ebm-papst St. Georgen on request.

Editing contact:

ebm-papst St. Georgen GmbH & Co. KG

Hubert Goetjes

Telephone: +49(0)7724/81-1208

Telefax: +49(0)7724/81-1459

E-mail: h.goetjes@de.ebmpapst.com

1006 11/03