

System solutions for heat pumps

New inverter electronics for efficient and low-noise compressor drives

In addition to the fans used in air-water heat pumps, the noise level and power consumption of the speed-controlled compressor drive also play an important role. This requires the use of inverter electronics that use optimum commutation to reduce operating noises and increase the energy efficiency of the heat pump.

For air-water heat pumps, ebm-papst offers efficient, quiet EC centrifugal and axial fans for indoor and outdoor installation. Based on ebm-papst's many years of experience with EC motors, their commutation electronics, and heat pump applications, the company has now developed inverter electronics that are suitable, for example, for speed-controlled permanent magnet synchronous motors (PSM), such as those used in compressors for heat pumps. The new electronics, which are available with output powers of up to 3.5 kW, 7.5 kW, and 12 kW, have many advantages in this context.

Quiet and efficient

The commutation process that ebm-papst has been optimizing for decades plays a considerable role in noise reduction, and simultaneously improves efficiency. For example, in a heat pump with a 7.5 kW compressor drive, the COP value (Coefficient of Performance) could be increased by 3.5 %. For users, this means an annual saving of 70 euros at an assumed electricity price of 35 cents per kilowatt hour. The controls also "detect" whether they are operated in one or three phases, and switch over automatically depending on the type of voltage available in the heat pump. The electronics are also flexible in terms of their cooling. Thanks to their modular design, it is possible to use water or air cooling, or use a cold plate for cooling.

Active three-phase PFC level

The active three-phase PFC level integrated into the inverter electronics (power factor correction filter) ensures good EMC properties. No additional measures are required to comply with the standards with regard to current harmonics. Given that, depending on the size of the heat pump, conventional expansion valve assemblies can easily weigh up to 20 kg, the weight saving and the reduced wiring effort required by active PFC are considerable. The low weight of the heat pump simplifies its entire handling, from production to transport and installation by the end user. As a competent partner for heat pump manufacturers, ebm-papst is already planning the next steps to become a system provider. In the future, further components will be integrated into the inverter electronics, for example commutation for the fan drive and the control of a heating rod.

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Image: New inverter electronics in output powers 3.5 kW and 12 kW for compressor drives.

Fig. 1 ebm-papst
Characters approx. 2,700, including headings and sub-headings
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About ebm-papst

The ebm-papst Group, a family-run company headquartered in Mulfingen/Germany, is the world's leading manufacturer of fans and drives. Since the technology company was founded in 1963, it has continuously set the global industry standard with its core competences in motor technology, electronics, digitization and aerodynamics. With over 20,000 products in its portfolio, ebm-papst provides the best energy-efficient, intelligent solution for virtually every ventilation or drive-engineering task.

In fiscal year 2021/22, the "hidden champion" generated revenues of € 2,288 billion. The group employs roughly 15,000 people at 29 production sites (in Germany, China and the USA, to name but a few) and in 51 sales offices worldwide. ebm-papst sets the benchmark with their fan and drive solutions which are used in almost all industries, such as ventilation, air conditioning and refrigeration, heating, information technology, mechanical engineering, household appliances, intralogistics and medical engineering.