# PRESS RELEASE

ebmpapst

engineering a better life

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### Fan specialist focuses on psychoacoustics

## Human noise perception determines acceptance of heat pumps

**Noise is produced when air vibrates. For example, air-to-water heat pumps do not operate silently. The motor and ventilation technology specialist ebm-papst has therefore developed a metric that combines physical parameters and psychoacoustics, and its examination methods, with human acceptance of noise.**

Air-to-water heat pumps extract heat from the ambient air and transfer it to the heating system. Fans ensure the necessary external air flow through the device's evaporator and generate noise as they operate according to where they are installed. The compressor noise should also be taken into account when creating a full analysis. The more built up the area is, the more people can feel disturbed by operating noises. It is by no means just the measurable sound pressure level that is crucial for acceptance of the technology, but also human noise perception.

**Individual perception of noise and sound crucial**
The values that are defined in the directives and standards and are measurable on the test stand have little to do with individual human noise perception, which differs from person to person. Until now, standards and directives have not adequately dealt with tonality, i.e. the relationships between tones. Psychoacoustics aims to define why a noise is perceived as pleasant or unpleasant. For example, trumpet music and an excavator at a construction site have approximately the same measurable sound power, but our psychoacoustic assessment of them is completely different.

**Physical and psychoacoustic parameters**
ebm-papst addressed this issue early on and set up a special psychoacoustics laboratory for test subjects. They are played the operating noises of various applications in various configurations. To achieve this, heat pumps and the fans installed in them are examined aerodynamically and acoustically in its own test facilities. Developers question the subjects afterwards to build up a scientifically founded database. Important parameters include the psychoacoustic parameters loudness [sone], sharpness [acum], tone [mel], roughness [asper] and fluctuation strength [vacil]. In addition, tonality and stimulus are also significant variables. Assessments by the test subjects are analyzed using statistical and psychological methods. The results are incorporated into in-house fan development and also provide information about the tested air-to-water heat pumps and which fans are best suited to the individual installation scenario.

**Follow-up noise assessment targets**
In future, the aim is to also use psychoacoustic parameters in addition to physical parameters when assessing noise in fans. The aim is also to work towards the introduction of an international standard based on defined psychoacoustic variables. This would then be an important prerequisite for ensuring that air-to-water heat pumps with as pleasant an operating noise as possible help to avoid any nuisance in the neighborhood due to noise pollution.

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Fig. 1: The psychoacoustics laboratory for test subjects at ebm-papst in Mulfingen.

Fig. 2: In the ebm-papst test facilities, heat pumps together with the fans installed in them are recorded aerodynamically and acoustically.


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| Photo | ebm-papst |
| Characters | approx. 3,000, including headings and sub-headings |
| Tags | heat pump, heating technology, psychoacoustics, noise |
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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.

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