

PRESS RELEASE

KONVEKTA AG

Topic: Heating, ventilation and air conditioning for e-buses

Creating the mobility of tomorrow:

Climate comfort for the future of mobility

- **CO₂ heat pump - thermal management for electric double-decker buses**
- **Expansion of the product portfolio: UL 700 CO₂ heat pump system**
- **Higher overall efficiency in heating operation thanks to “refrigerant charge balancing“ as the latest module of the CO₂ heat pump system**
- **Battery temperature control**
- **AES mode control module for e-buses**

Welcome to the future of vehicle comfort: Konvekta AG presents the latest innovations in the field of air conditioning, heating systems, and heat pumps for electric buses. In an era where comfort, efficiency, and sustainability are increasingly vital, the standards for mobile air conditioning and heating solutions need redefinition. The aim of Konvekta AG is not only to provide passengers with a feel-good climate but also to assist fleet operators in equipping their vehicle fleets with forward-looking technologies.

The future of local public transport is accelerating toward electrification! As many local public transport companies just received their first electric solo and articulated buses, and others already transitioned entirely to electric mobility, the demand for additional bus variants is also on the rise. Konvekta AG is expanding its product portfolio to include a system for electric double-decker buses, another variant for solo buses, and three new modules for the CO₂ heat pump, all aimed at enhancing overall efficiency.

CO₂ heat pump - thermal management for electric double-decker buses

Air conditioning and heating of electric or hybrid double-decker buses presents a unique challenge. These vehicles do not only have a larger interior volume, but also extend over two decks. In addition, the boarding and alighting areas are usually wider to allow passenger flow. All of this makes it difficult to distribute cold or warm air evenly. Due to the vehicle’s overall height, it is not possible to position the system on the roof.

The optimal solution for sustainable mobility

The new CO₂ heat pump air conditioning and heating system of Konvekta AG was developed especially for electric double-decker buses. It is another milestone in the mobility industry and sets new standards in efficiency, performance and environmental protection. Integral part of this technology is a compact CO₂ heat pump mounted in the rear of the vehicle. This system regulates the temperature of the bus with pinpoint accuracy in hot summer and but also cold winter months. A pleasant climate for drivers and passengers without the use of environmentally harmful refrigerants, fossil fuels or an additional electric heater.

A CO₂ heat pump is the smartest and most efficient heating technology in the field of e-mobility. It obtains heat not from fuel or through pure electricity, but from the ambient air. As a result, it yields a multiple of the input energy and achieves a high level of climate comfort. To generate 100% heat, the Konvekta double-decker CO₂ heat pump requires only 1/3 operating power from the battery. Thus, by using natural resources, compared to electric heating, 2/3 of the energy is saved. This significantly reduces operating costs and increases the range.

With a strong focus on sustainability and environmental responsibility, Konvekta AG does not use any chemical refrigerants for this system either, but the natural refrigerant CO₂ (R744, carbon dioxide).



The first electric double-decker bus with a CO₂ heat pump thermal management system

Extension of the product portfolio: UL 700 CO₂ heat pump system

As part of Busworld Europe 2023, Konvekta is also exhibiting **the most powerful of the Konvekta CO₂ heat pump thermal management variants**, the "UL 700 EM CO₂ heat pump" for temperature control in electric and hybrid buses.

The system is composed of various components that not only ensure temperature control of the vehicle and the batteries, but also offer a wide range of options for energy recovery and efficient energy use.

The currently most powerful thermal management is the "UL 700 EM CO₂ heat pump", which covers a temperature range from -20°C to + 47°C and offers optimal comfort for driver and passengers and maximum energy efficiency for the vehicle. With zero emissions, the annual energy consumption for

cooling and heating is reduced by over 50%. The system obtains up to 75% (COP up to 4) of the required heat or cold from nature, not from fossil fuels or electricity - from the ambient air or through energy recovery and is therefore highly efficient.

The efficiency of the system is significantly influenced by the optimal interaction of the individual components. The Konvekta control systems are characterized by complete customization to the wishes of vehicle manufacturers and operators. The software monitors and analyzes various operating parameters of the bus in real time and adjusts the air conditioning, heating and ventilation as required. This tailor-made control unit minimizes unnecessary energy losses and thus contributes to sustainable energy efficiency.



Solaris Hydrogen with UL 700 CO₂ heat pump thermal management

Patented refrigerant charge balancing technology

Konvekta AG presents another innovation in heating technology for electric buses: „refrigerant charge balancing“ as the latest module of the CO₂ heat pump.

Throughout the year, CO₂ heat pump systems provide both efficient cooling in summer and reliable heating in winter. This is a major challenge because of the optimal refrigerant charge, which can vary according to heat demand, outdoor temperature, or operating mode, and thus has a direct impact on the system performance.

With the new „refrigerant charge balancing“ module, the refrigerant charge level is precisely controlled, ensuring that the optimal quantity of refrigerant is always available to the system.

This results in a 10% increase in system performance in heating mode while reducing energy consumption. This approach saves costs and preserves environmental resources. Another advantage of the refrigerant displacement is that the system always works in an optimal range through the targeted control of the filling level and the load on the components in the overall system is reduced. This extends the life of the system and reduces maintenance.

Module for battery temperature control

Battery temperature significantly influences the service life and performance of electric buses. Extreme outside temperatures and temperature spikes during the charging process can stress battery packs.

Konvekta's CO₂ heat pumps, equipped with the battery-temperature-control module, effectively and precisely regulate battery temperatures. Energy storage devices operate within an optimal temperature range, minimizing the risk of excessive heat buildup during operation or overly low temperatures in winter.

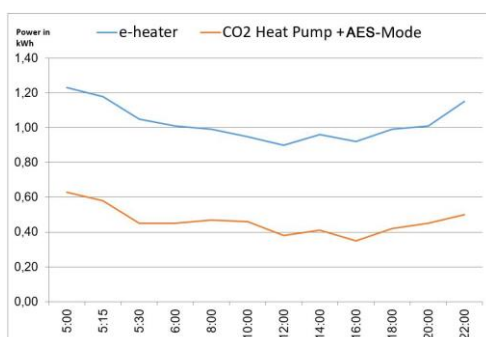
Without reliable and constant temperature control, this can lead to accelerated battery degradation, long-term loss of capacity and lower performance, which directly affects the lifespan, range and operation of an electric bus.

Controlled temperature control minimizes these risks, increases battery life and helps to optimize the total cost of ownership. Battery temperature control therefore has a direct impact on reliability, efficiency and cost-effectiveness of electric buses.

AES - mode control module for e-buses

CO₂ heat pump systems draw a large part of the required energy from the air and not from the battery. This system operates more than 50% more efficiently than an electric system. The new software add-on module, the AES mode (Additional Energy Storage), eliminates the need for an additional heater. Currently, every heat pump vehicle also has an additional electric heater to cover special temperature peaks during winter seasons and for the pre-heating process before starting in the morning.

With the new AES (Additional Energy Storage) mode module, the Konvekta CO₂ heat pump system can distribute 100% of the generated energy as needed. For example, using 100% of the available heat for hot water treatment. Another advantage of the system is that it can independently take over the entire preconditioning process, even at low temperatures. **Vehicles with AES therefore do not need an electric auxiliary heater.**



Power consumption: Electric auxiliary heater versus Konvekta CO₂ heat pump with AES mode

Sustainable air conditioning for the future: Konvekta AG relies on the natural refrigerant CO₂

With a strong focus on sustainability and environmental responsibility, Konvekta AG does not use chemical refrigerants for all new developments in the field of electromobility, but the natural refrigerant CO₂ (R744, carbon dioxide). CO₂ is an ideal refrigerant for the use in heat pumps. Compared to conventional chemical refrigerants e.g. R134a, CO₂ has a significantly higher efficiency. This means that during summer time a system using CO₂ needs about 25% less energy for the same cooling capacity compared to a system using chemical refrigerants because the desired temperature is reached more quickly. CO₂ damages the climate 1,430 times less in comparison to the chemical refrigerant R134a and it does not produce any environmentally harmful decomposition products. It is a naturally occurring substance and available in unlimited quantities. Compared to other naturally occurring refrigerants, carbon dioxide is neither toxic nor flammable.

About Konvekta AG:

Konvekta AG is a leading manufacturer of innovative solutions in the field of heating and air conditioning technology for electric buses. The company attaches great importance to energy efficiency, comfort and sustainability and is continuously developing new technologies to meet the requirements of modern bus vehicle construction.

Kontakt Konvekta AG general contact:

Tel. +49 (0) 66 91-76-0

info@konvekta.com

Press contact:

Claudia Mittelstaedt

Corporate and Technical Communications

Tel. +49 (0) 66 91-76-219

claudiamittelstaedt@konvekta.com

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