

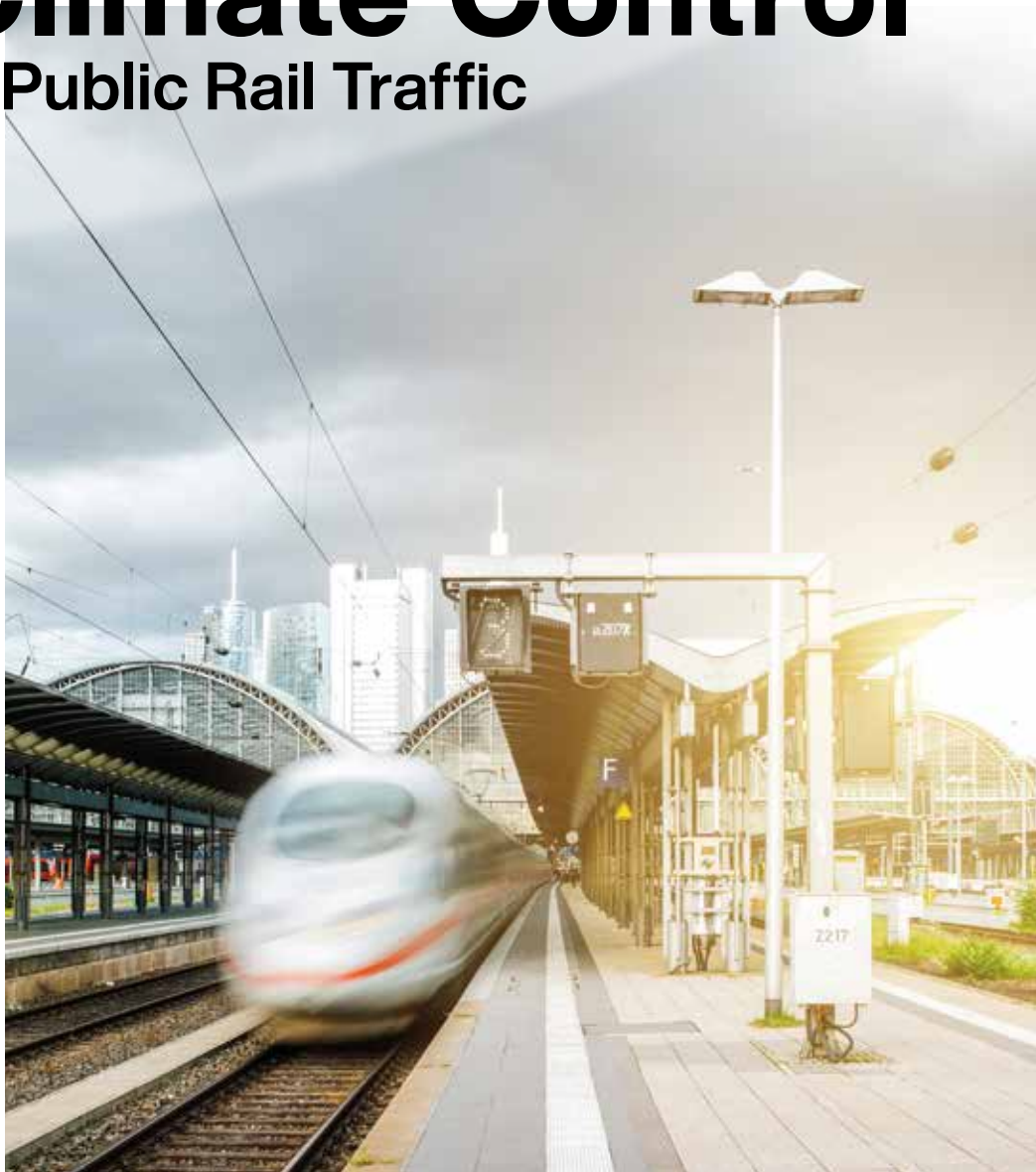
**E+E**

—  
your partner  
in sensor  
technology.



# Measuring CO<sub>2</sub> for Climate Control

in Public Rail Traffic



# + CO<sub>2</sub>-based on-demand control in the ventilation system



**In means of transport with a high passenger density, such as trains or trams, the air quality in the passenger compartments and the driver's cabin is very important in terms of comfort and safety. In particular, if the CO<sub>2</sub> content in the compartment is too high, this directly impacts the passenger's sense of well-being, and has become extremely important in the wake of the Covid pandemic. A controlled supply of fresh air reduces the contaminant load in the air due to viruses or CO<sub>2</sub>. This means that low CO<sub>2</sub> content is also indicative of low virus load and vice-versa. CO<sub>2</sub>-based on-demand control in the aeration system prevents the risk of excessive levels of CO<sub>2</sub>. In addition, up to 30% of the energy used can be saved. The EE8915, which was specially developed for rail applications, is ideally suited for use in air conditioning systems of rail vehicles.**

The target values in terms of temperature, humidity, CO<sub>2</sub> content, etc., in rail vehicles are defined in appropriate standards (specifically EN 13129) – as a function of the respective occupancy of the means of transport. Climate control is typically implemented using systems on the roofs of the railcars and driver's cabins. The functional principle of these systems follows the basic principle of popular air conditioning systems; depending on the fresh air temperature, most of the energy is deployed on heating and cooling for the air treatment system in rail applications.

Ventilation, partial and full air conditioning systems are either operated solely with exterior air, or with a component of the returned interior air in addition to the exterior air in what is known as mixed operation. In special cases – e.g., where the occupancy level is very low – these systems can also exclusively operate in recirculating air mode.

Some years ago already, DB Regio achieved energy consumption reductions by using mixed air instead of fresh air in heating operations. This offers benefits of some 835,000 Euros per year. (Cf. DB Group Sustainability Report 2009, p. 72)

## **Energy savings thanks to on-demand ventilation**

Most railcars in passenger trains are still ventilated on the basis of the seating capacity and not on the basis of actual demand by reference to the number of passengers. If you measure the CO<sub>2</sub> content in the interior return air, the required fresh air supply volume in the passenger compartment can be precisely determined. This ensures that the ideal conditions for passengers can be guaranteed at all times. In addition, precisely measuring the CO<sub>2</sub> content in the air conditioning process offers up to 30 % energy savings as less exterior air needs to be heated or cooled to match the interior temperature. For example, the installation of a CO<sub>2</sub> demand-controlled fresh air supply system for each double-decker

carriage generates savings of more than 30,000 kW/h per year, as well as ensuring rapid amortisation of the comparatively low investment costs.

### Rail traffic challenges

The use of CO<sub>2</sub> sensors in rail traffic poses particular challenges for manufactures. For one thing, the CO<sub>2</sub> content of the interior air changes very quickly due to passenger fluctuation and doors repeatedly opening (at least in trams). This means that fast response times of the sensor are key. For another, the measuring devices are exposed to exhaust gases and continually changing ambient conditions. A rugged design which reflects this ensures a long service life. Other special circumstances in rail traffic include changes in altitude during the journey, vibrations, and the limited installation space.

### Ideal solution:

#### The EE8915 rail sensor by E+E Elektronik

EE8915 reliably measures the CO<sub>2</sub> concentration in a harsh environment and meets all pertinent rail standards. The sensor is positioned in the return air feed. Active pressure and temperature compensation using built-in sensors ensures a particularly high CO<sub>2</sub> measurement accuracy irrespective of the temperature, altitude or weather conditions.

Due to the NDIR dual wavelength principle, the sensor built into the EE8915 CO<sub>2</sub> sensor is particularly insensitive to soiling. Aging effects are compensated for automatically, and excellent long-term stability is guaranteed.



EE8915, wall and duct version

Concentration-independent multi-point CO<sub>2</sub> and temperature adjustment ensures excellent CO<sub>2</sub> measurement accuracy over the entire deployment temperature range. Thanks to its innovative design, the sensor has a high IP protection class and a short response time. The CO<sub>2</sub> measured values are available as current and voltage signals at the same time. Because it meets strict rail standards, the EE8915 is the ideal measuring device for demanding process and climate control tasks in rail traffic.

## The Challenge.

- High occupancy levels with poor air quality
- High energy consumption despite a low passenger count
- Restricted space and special installation requirements
- Vibration resistance
- Pollution

## The Solution.

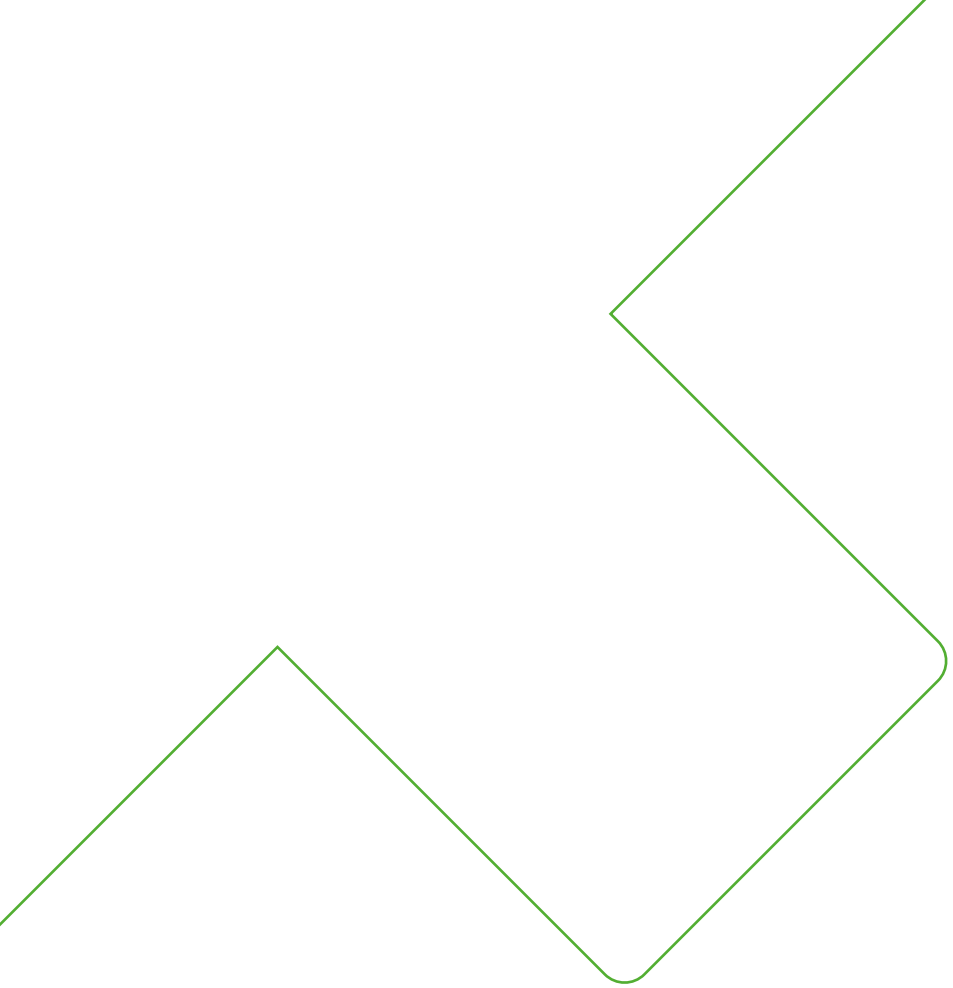
- EE8915, 5000 ppm with various installation variants: duct or wall mounting
- Complies with railway standards. EN 50155:2017, EN 50121-1:2017, EN 50121-3-2:2016, EN 61373:2010, EN 50125-1, EN 45545-2, EN 50306
- Short response time

## Product Benefits.

- Premium product with excellent long-term stability
- Benefits of the AUTOCAL method by E+E for sensor drift compensation compared to sensors using ABC logic
- Good reputation on the market
- Pressure and temperature compensation
- Rugged design with special dust filter elements
- Great cost/performance ratio
- Easy to configure and adjust for the user

## Overall Value.

- Improved comfort
- Energy savings thanks to on-demand ventilation
- Longer maintenance intervals (cleaning, calibration)
- Longer service life
- No additional enclosure required as the EE8915 comes with a rugged enclosure
- Short amortisation period



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