JLC International
Phone: 215-340-2650
Fax: 215-340-3670
948 Lenape Drive Town Center, New Britain, PA 18901
email: jlcusa@jlcinternational.com
www.jlcinstrumentation.com & www.jlcinternational.com

Theory CO_2 - Measurement

Basics CO_2

Carbon dioxide (CO_2) is a gaseous component of the earth's atmosphere. The concentration of CO_2 in natural ambient air is about 0.04% or 400ppm. With each breath, humans convert oxygen (O_2) into carbon dioxide.
Although carbon dioxide is invisible and odorless, an increased CO_2-content makes is apparent because humans will notice increased fatigue and reduced concentration. In rooms with high occupancy such as conference rooms and theatres, negative effects become all the more evident.
Modern climate control can assure optimal air quality by adjusting the supply of fresh air based on the measurement of CO_2 concentration in the indoor air. The CO_2-concentration is regarded as an important measure of indoor air quality.

Guide values for CO_2-concentration:

• ~ 40,000ppm	Proportion in exhaled human breath (20l CO_2/h)
• 5,000ppm	Limit of CO_2-concentration at the workplace
• > 1,000ppm	Fatigue and reduced concentration
• 1,000ppm	Recommended CO_2 level of indoor air
• 400ppm	Fresh, natural ambient air

Measuring methods

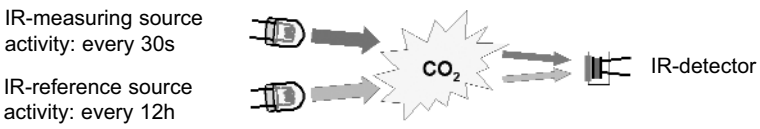
CO_2 measurements in HVAC applications are based exclusively on the Infrared (IR) absorption principle.

There are two methods to measure CO_2 concentration with the IR absorption method:
- Non-Dispersive InfraRed (NDIR) absorption sensor
- Photo-acoustic sensor

E+E Elektronik has decided for the NDIR absorption sensor principle. Compared with the photo-acoustic sensors, NDIR sensors offer the following advantages:
- less sensitive to pressure variations
- less sensitive to vibrations and acoustic interference
- compact design

The E+E NDIR system uses a two-source two-beam procedure to detect a certain wavelength of the infrared light.

A patented auto-calibration procedure uses two IR-sources with distinct operation cycles:
One IR-source operates to measure the CO_2 concentration and generates an IR signal every 30 seconds.
The second IR-source, the reference source, is used for the auto-calibration only. This source is activated twice every 24h, which leads to virtually no aging and therefore to negligible drift. The quasi drift-free signal of the reference source is used to offset eventual drifts of the measuring source.



The advantages if the E+E NDIR CO_2 sensing are:
- easy drift compensation with stable IR-reference source
- use of simple IR-filter. Other methods use two IR-filters or complicated switchable IR-filters
- only one IR-detector required
- simple and reliable design