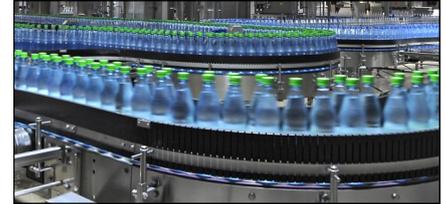


# ROTRONIC APPLICATION NOTE

Application note: N° F048

May 2014

## CO<sub>2</sub> Monitoring in the Beverage Industry



### Facts & figures:

- A large bottling line can fill up to 30.000 bottles or cans an hour

- Coca Cola operates 60 bottling plants in India only.

- Ireland is the second largest per capita consumer of soft drinks with 126l behind the US with 216l per year.

- You can reduce the risk of cardiovascular diseases by drinking plain sparkling water according to a scientific study.



Industrial carbonating system with a CO<sub>2</sub> tank

### Discussed in this edition:

The carbonating process	1
Why the need to monitor CO <sub>2</sub> in a beverage plant?	1
What solution can Rotronic offer?	2
Rotronic products	2
Customer benefits	2
Contact us	3

## The carbonating process

Everybody loves a refreshing sparkling drink during the summer heat.

CO<sub>2</sub> does not only bring the bracing sparkling effect into your drink but even helps to conserve the beverage. A chemical reaction of CO<sub>2</sub> and water forms carbon acid which has an antibacterial effect.

All well known soft drinks come with the right fizz.

The beverages are treated with a carbonating process just before the final bottling or canning.

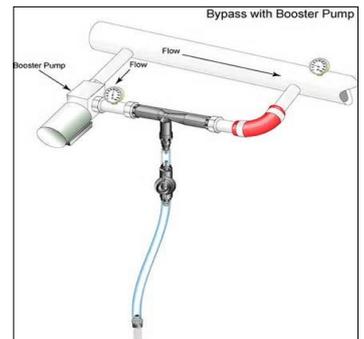
Carbonating systems mainly consist of a booster pump, a CO<sub>2</sub> saturator, a carbonating

tank and an optional CO<sub>2</sub> analyser to check the carbon acid content of the final product.

With the aid of a booster pump the beverage mixture is conveyed to the saturator which works according to the Venturi principle. An optimizing control keeps the flow velocity through the saturator within a constant working range. This generates a partial vacuum at the smallest cross section of the saturator which causes a reduction of the pressure level. This suction effect then mixes the CO<sub>2</sub> with the beverage liquid. The short-time increase of the flow velocity guarantees a fine distribution of the gas and homogenous mixing.

The process essentially depends on the tank pressure which has to be set slightly higher than the saturating pressure of a specific product.

Right after that, the drink is ready to be bottled automatically to preserve its texture.



CO<sub>2</sub> saturator in a carbonating stage of a bottling line

## Why the need to monitor CO<sub>2</sub> in a beverage plant?

Carbonating processes use most of the CO<sub>2</sub> in the beverage industry. But beside that the gas also occurs during fermentation or it is used for refrigeration - so CO<sub>2</sub> is omnipresent in such facilities.

High concentrations of CO<sub>2</sub> in closed areas where workers attend to their jobs can become a lethal risk. Extensive CO<sub>2</sub> levels can lead to bad headaches, drowsiness, unconsciousness and even sudden death. A CO<sub>2</sub> level above 5000ppm is considered as alarming.

The gas can neither be recognized by its odour nor by its visual appearance. Soft-drink factories or breweries there-

fore require an accurate CO<sub>2</sub> control and alarm system to maintain their high standard of operational safety.

To assure hygienic conditions and to reduce the risks of CO<sub>2</sub> incidents, bottling lines which fill carbonated drinks are often operated in separated areas of a factory.

There is a controlled loss of CO<sub>2</sub> during the bottling or canning process of sparkling drinks which is minimal, but the amount adds up considering that industrial lines are able to fill up to 30.000 bottles an hour. With each filling a tiny amount of CO<sub>2</sub> gets exposed to the surrounding atmosphere.

Factories require big amounts of CO<sub>2</sub> which is delivered and stored in gas cylinders. During transport or storage there is always the risk of a thin crack occurring and that gas escapes unnoticed.

Drinks which are not meant to be carbonized such as beer or wine also emit CO<sub>2</sub> during the fermentation process. The gas needs to be release controlled. Also here leakage can be a danger and CO<sub>2</sub> sensors help to keep control of the atmosphere.

The small insight shows how beverage manufacturers depend on reliable CO<sub>2</sub> monitoring systems.

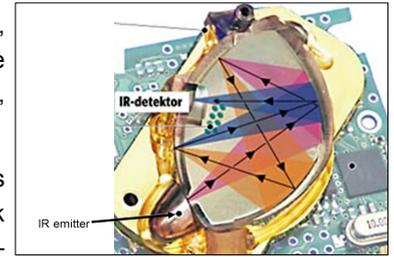
## What solution can Rotronic offer?

Rotronic offers a wide range of fix-mounted CO<sub>2</sub> only and CO<sub>2</sub> temperature transmitters. All of them are based on the principle of NDIR technology. They are pre-calibrated and have a lifetime of over 15 years under

normal conditions. Multiple analogue outputs like current loop, voltage and relay contact allow for the easy adaptation to every application. A major advantage of the current sensor is the stability of the measurement over the

entire temperature range, whereas some sensors are temperature dependant, Rotronic remains stable.

Transmitters provide various kinds of signals to keep track of the CO<sub>2</sub> level and to trigger alarms to protect people.



**Rotronic CO<sub>2</sub> sensor with an extra long IR-beam of 15cm to assure most accurate measurements**

## Rotronic products:

### Transmitter:

- **CF3 series**  
0...2000ppm or 0...5000ppm, ±30ppm, ±3% of reading  
Optional display, IP54.
- **CF8 series**  
0...2000ppm or 0...40000ppm, ±30ppm, ±3% of reading or ±300ppm, ±3% of reading  
Optional display, IP54,  
Optional visual alarm,  
Optional relay,  
Optional CO measurement,  
Optional temperature measurement.

### Hand held device:

- **CP11**  
Measurement of CO<sub>2</sub>, temperature and relative humidity, -20...60°C, ±0.3°K, 0.1...99.9%rh, ±2.5%rh, 0...5000ppm, ±30ppm, ±5% of measured value,  
Data logging function (18000 values) with time stamp.

0...5000ppm, ±30ppm, ±5% of measured value,  
Data logging function (18000 values) with time stamp.

### Calibration:

- **CO<sub>2</sub> calibrator**  
Neutralises CO<sub>2</sub> from the air, Cleanliness: 20-25ppm CO<sub>2</sub> gas flow out,  
Reaction time: 90 seconds to neutralise CO<sub>2</sub>  
Operating range: 0...45°C,  
Delivered with 10 soda lime cartridges.

### Wall mount display

- **CO<sub>2</sub> Display**  
Measurement of CO<sub>2</sub>, temperature and relative humidity, adjustable, visual CO<sub>2</sub> indicator 0...50°C, ±0.3°K, 0...100%rh, ±2.5%rh,



**CF3 duct mount transmitter in industrial housing, IP65**



**CF8-W-Disp-GH transmitter, IP65**

## Customer benefits:

### Accuracy and long term stability

Choosing Rotronic gives you the best accuracy on the market.

The Rotronic CO<sub>2</sub> sensors can easily be calibrated, to guarantee highest possible precision of the measured concentration.

### Calibration

The ABC function autonomously avoids baseline drift. A calibration and adjustment is carried out within a user defined time where the low-

est value is automatically calibrated at 400ppm. Optionally a 0ppm calibration unit is available from Rotronic.

### Connectivity:

Rotronic CO<sub>2</sub> devices can be connected to control systems via analogue signals such as current or voltage. Relays energize alarm sirens or flashing signals. Log data can be transferred via USB from the CP11 or the CO<sub>2</sub> display to any PC for further evaluation.



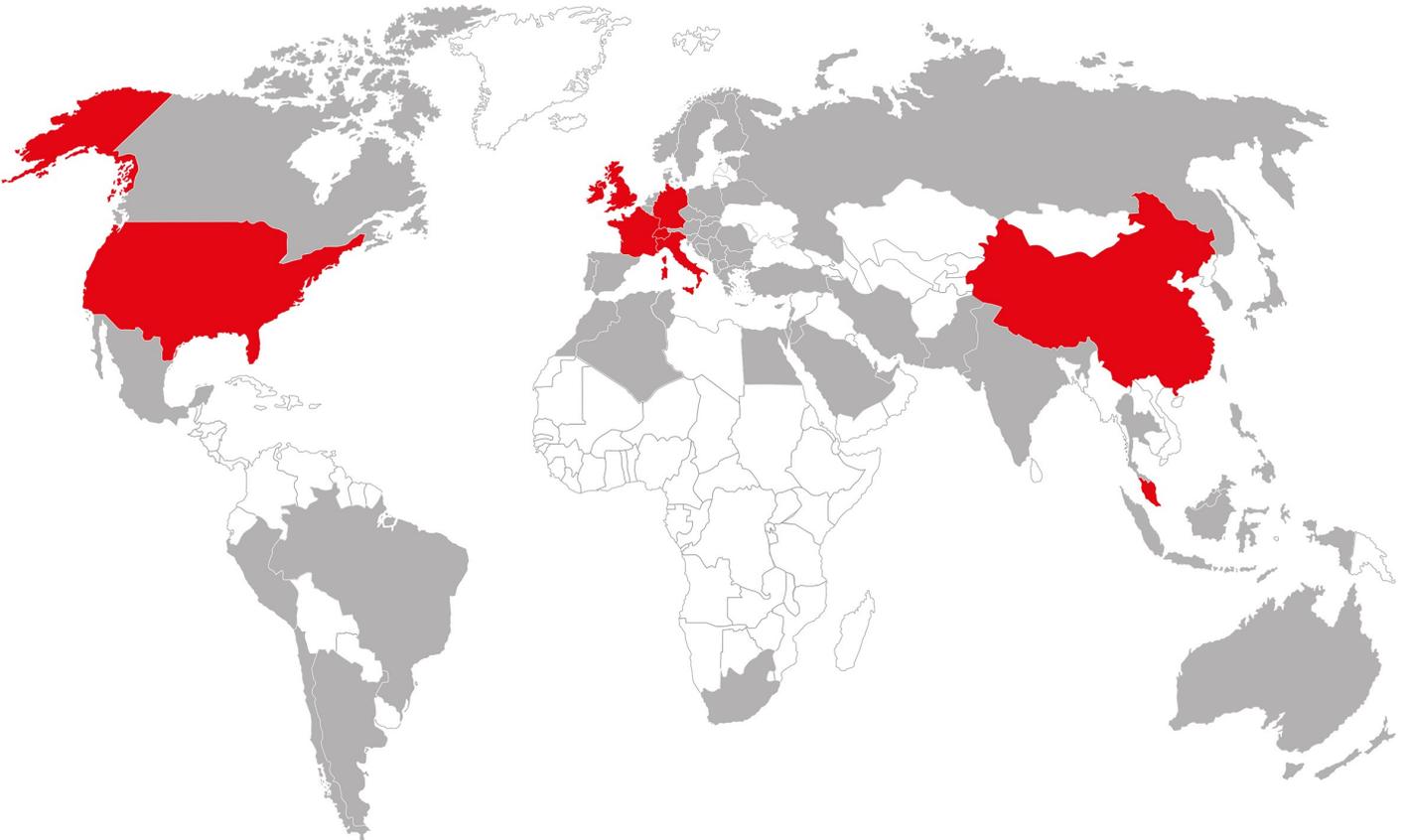
**CP11 CO<sub>2</sub>, rh & temperature handheld**



**CO<sub>2</sub> Display to measure & log CO<sub>2</sub>, relative humidity & temperature**

## Contact us:

Rotronic is represented in more than 40 countries around the world. An up to date list of all our partners is available at [www.rotronic.com/international](http://www.rotronic.com/international)



### SWITZERLAND

#### **ROTRONIC AG**

Grindelstrasse 6,  
CH-8303 Bassersdorf  
Phone: +41 44 838 11 44  
Fax: +41 44 838 14 87  
[www.rotronic.com](http://www.rotronic.com)

### FRANCE

#### **ROTRONIC Sarl**

56, Bld. De Courcerin,  
F-77183 Croissy-Beaubourg.  
Phone: +33 1 60 95 07 10  
Fax: +33 1 60 17 12 56  
[www.rotronic.fr](http://www.rotronic.fr)

### SINGAPORE

#### **ROTRONIC Instruments PTE LTD**

1003 Bukit Merah Central,  
#06-31, Inno Centre,  
Singapore 159836  
Phone: +65 6376 2107  
Fax: +65 6376 4439  
[www.rotronic.sg](http://www.rotronic.sg)

### GERMANY

#### **ROTRONIC Messgeräte GmbH**

Einsteinstrasse 17-23  
DE-76275 Ettlingen  
Phone: +49 7243 383 250  
Fax: +49 7243 383 260  
[www.rotronic.de](http://www.rotronic.de)

### UK

#### **ROTRONIC Instruments UK Ltd.**

Crompton Fields, Crompton Way  
Crawley, West Sussex, RH10 9EE  
Phone: +44 1293 57 10 00  
Fax: +44 1293 57 10 08  
[www.rotronic.co.uk](http://www.rotronic.co.uk)

### ITALY

#### **ROTRONIC Italia srl**

Via Repubblica di San Marino, 1  
I-20157 Milano (MI)  
Phone: +39 02 39 00 71 90  
Fax: +39 02 33 27 62 99  
[www.rotronic.it](http://www.rotronic.it)

### USA

#### **ROTRONIC Instrument Corp.**

Suite 150, 135 Engineers Road,  
Hauppauge, NY 11788  
Phone: +1 631 427 38 98  
Fax: +1 631 427 39 02  
[www.rotronic-usa.com](http://www.rotronic-usa.com)

### CHINA

#### **ROTRONIC Shanghai Rep. Office**

2B, Zao Fong Universe Building, No. 1800  
Zhing  
Shan West Road, Shanghai 200233  
China  
Phone: +86 21 644 03 55  
Fax: +86 21 644 03 77  
[www.rotronic.cn](http://www.rotronic.cn)