

## Garages & Tunnels

### Facts & figures:

The longest tunnel in Switzerland will be the Gotthard Base Tunnel (under construction) that will be 57km long. The tunnel is a railway tunnel.

The longest car tunnel in the world is located in Norway, the Laerdal tunnel, 24km.

The LEP tunnel in Cern, Switzerland/France is a 26km circular ring.

### Garages & Tunnels in general

The modern range of vehicle engines emit many harmful substances, these include carbon monoxide (CO), carbon dioxide (CO<sub>2</sub>), nitrogen oxides (NOx), hydrocarbons and some 20 other gases. It is known that

all engines produce CO particularly at cold start. To protect ourselves from this toxic gas, vehicles are installed with catalytic converters. Therefore, a warm running modern engine with catalyst generates 140 times more CO<sub>2</sub> than CO.



### Why the need to measure CO<sub>2</sub>?

Old vehicles (pre-catalyst) generate most of the carbon monoxide pollution, to solve this, modern vehicles were installed with catalytic converters. Catalytic converters are not very efficient during cold start up but once warm they convert CO to CO<sub>2</sub> very effectively. This means modern engines emit much higher quantities of CO<sub>2</sub> than CO. It is well-known that CO is extremely toxic but CO<sub>2</sub> in high levels is also hazardous to health. To ensure healthy air quality it is important to provide excellent ventilation, however running a ventilation system constant is inefficient especially when few cars are running at a time.

In garages and tunnels vehicles can be operating in both warm and cold conditions, therefore it is important to measure both gases to ensure a safe breathing environment. Today there are laws about measuring CO and the maximum allowed value is 35 ppm. There are currently no rules on measuring CO<sub>2</sub> but this is equally as important.

#### How does it work?

A meter can both control and alarm locally and be part of a larger complete system. This application has the same principal as

required ventilation in classrooms for example.

The ventilation need depends on the number of cars running in a garage or tunnel instead of the number of students in a classroom. The sensors usually used to measure CO<sub>2</sub> and CO in public garages and tunnels are capable of covering an area of around 250 m<sup>2</sup>.

#### Reduced costs

A study was made in a garage containing 77 parking places and covering an area of 1,445 m<sup>2</sup>. The study showed that using sensors to control the ventilation reduced the fan operating time by 90% compared to constant running. The electricity cost was about 0.09 € per kW/h (including energy tax and VAT) and the fan used 1.5 kW/h in operation. This meant that the demand-control solution produced an energy saving of 970 kW/h, and a resulting reduction in running-costs of ca 85.32 €/month. If all residential garages were equipped this way the sum of energy saved would make for a considerable benefit to society and the environment. [1] A larger garage would have saved even more money thanks to the controlled ventilation system.

Another benefit is fewer people suffering from CO or CO<sub>2</sub> poisoning being admitted to hospitals. This helps reduce the costs of health care to the government.

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## 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 life-

time 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 cur-

rent sensor is the stability of the measurement over the entire temperature range, whereas some sensors are temperature dependant, Rotronic remains stable.



CF3 duct mount transmitter

## Rotronic products:

### Transmitter:

- **CF3 series**  
0...2000ppm or 0...5000ppm,  
±30ppm, ±3% of reading  
Optional display,  
IP54
- **CF8 series**  
0...2000ppm or 0...4000ppm,  
±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,  
±0.3K,  
0.1...99.9%rh,  
±2.5%rh,  
0...5000ppm,  
±30ppm, ±5% of measured value,  
Data logging function (18000 values) with time stamp.

### Data logger:

- **CL11**  
Measurement of CO<sub>2</sub>, temperature and relative humidity,  
-20...60°C,  
±0.3K,  
0.1...99.9%rh,  
±2.5%rh,  
0...5000ppm,  
±30ppm, ±5% of measured value,  
Data logging function (18000 values) with time stamp.



CF8-W-Disp-GH transmitter

## 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 automatically avoids baseline drift. A calibration and adjustment is carried within a user defined time where the lowest value is automatically calibrated at 400ppm. Optionally

a 0ppm calibration unit is available from Rotronic.

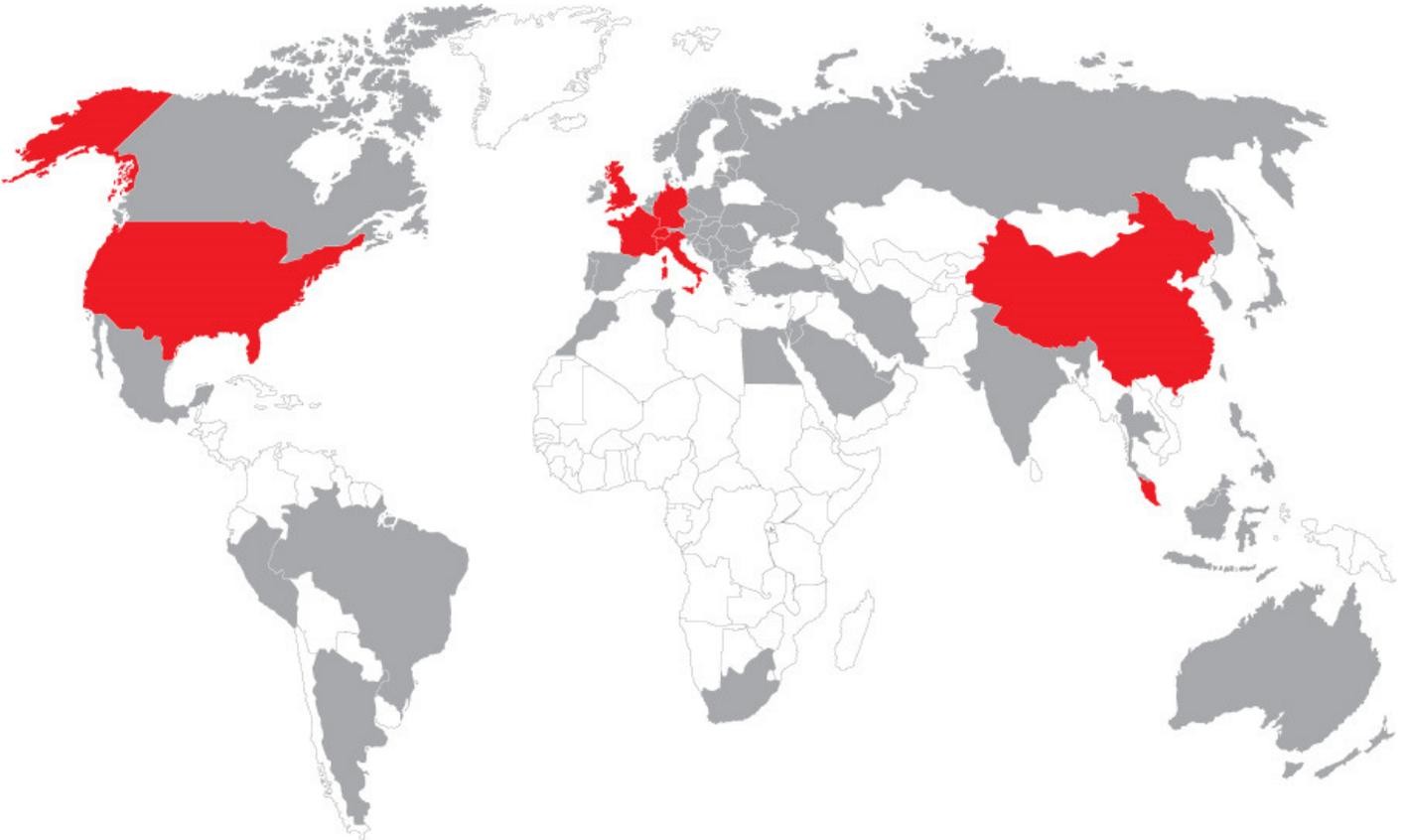


CP11 & CL11 handheld device with the 0-calibration unit



## 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](http://www.rotronic.com)



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