

## Goals

The following goals apply when measuring industrial flue gases:

### Emissions monitoring

- Adherence to legally specified limits (e.g. TA Luft)
- Meeting ISO 14000 requirements
- Important parameters:  $\text{NO}_x$  ( $\text{NO} + \text{NO}_2$ ),  $\text{SO}_2$ ,  $\text{CO}$ ,  $\text{H}_2\text{S}$ ,  $\text{O}_2$  and in some cases  $\text{CO}_2$

### Adjustment and optimisation of systems

This refers to adherence to emission limits. Otherwise the aim is to reduce operation costs by saving energy. Important parameters:  $\text{O}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$ , excess air and efficiency.

### Process monitoring in the manufacturing industries

Monitoring combustion processes for quality assurance purposes, ISO 9000 requirements, reduction of non-spec products, reduction of costs by saving energy and minimising down periods. Important parameters:  $\text{O}_2$ ,  $\text{CO}$ ,  $\text{CO}_2$ ,  $\text{SO}_2$ .

### Portable flue gas analysers from Testo

For over 16 years Testo has been manufacturing portable flue gas analysers for special industrial applications.

These instruments fulfill demanding industrial requirements e.g.:

- High accuracy (comparable with infrared or chemiluminescence technology from stationary applications)
- Long-term measurements (semi-continuous) lasting from several hours to several weeks
- Wide range of sampling probes for every application
- Extreme measuring ranges for applications in crude gas or special burner atmospheres
- Service by the user to save on costs and reduce down times
- Not affected by dusty or moist flue gas or “tough” ambient conditions (high temperature, vibrations...)

### Measurement principles

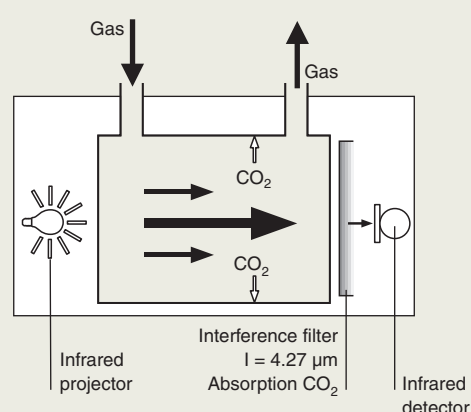
Testo uses electrochemical measuring cells for the  $\text{O}_2$ ,  $\text{CO}$ ,  $\text{NO}$ ,  $\text{NO}_2$ ,  $\text{H}_2\text{S}$  and  $\text{SO}_2$  parameters.

These sensors have major advantages for portable applications:

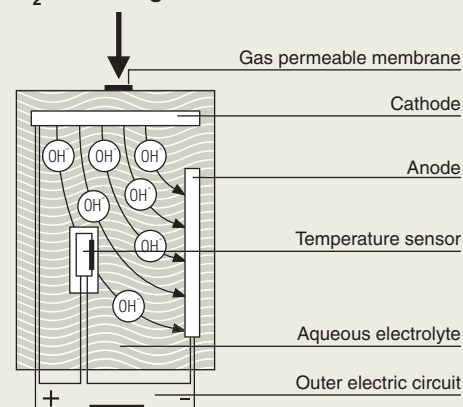
- Not affected by vibrations or changes in temperature
- Small dimensions and low weight
- Easy to change without cal gas
- Wide measuring ranges and low zero point drift for low concentrations
- Extreme linearity over the whole measuring range

An NDIR sensor is used for  $\text{CO}_2$ .

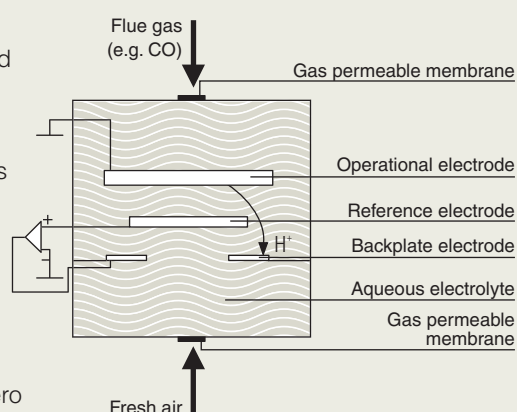
### $\text{CO}_2$ infrared sensor



### $\text{O}_2$ measuring cell



### Measuring cell e.g. for toxic gases



**Typical applications**

	testo 325-I	testo 300 M-I	testo 350 M testo 300 XL-I	testo 360 testo 350 XL
Oil/gas burner	CO: +	+	+	+
Coal furnace	CO: +; SO <sub>2</sub> : +	+	+	+
Wood combustion	CO: +	o	+	+
Block-type thermal power station	NO: o	o	+	+
Steel and nonferrous	CO: +	o	+	+
Cement production	-	-	o	+
Glass industry	CO: +; SO <sub>2</sub> : +	+	+	+
Terotechnology	o	+	+	+
Universities/Technical colleges	o	+	+	+
Burner/Boiler manufacturers	o	+	+	o
Chemical industry	+	+	+	+
Garbage incineration	-	-	o	+
Therm. post-combustion	-	+	+	+

+ recommended      o recommended in some cases  
- not recommended

**Why gas preparation?**

- Condensate collection to protect the instrument
- Accurate NO<sub>2</sub>, SO<sub>2</sub> measurement
- Unsupervised long-term measurement

**Operation**

Two physical principles:

- Peltier cooling unit
- Permeation dryer

Testo uses the Peltier cooling unit with the following advantages:

- Not affected by dirt and dust
- No service costs
- Lowest absorption of NO<sub>2</sub> and SO<sub>2</sub> level for exact measurements

**Overview and Operation (Example: testo 360)**
