

Gas Analyser for IR-Sensitive Gases and Oxygen BA 5000



The BA 5000 gas analyser can measure up to 4 gas components. The instrument can be configured a maximum of three infrared gases such as CO, CO₂, NO, SO₂, or CH₄ plus the measurement of O₂ with an electrochemical fuel cell.

The analyser can be used in emission measurement systems and for process and safety monitoring.

- **19" rack mount or portable configurations available**
- **Simple, fast user programming**
- **Calibration with cal gas is only necessary every 6 to 12 months, depending on application**
- **Large, backlit LCD**
- **Two measurement ranges per gas component**
- **Automatic correction atmospheric pressure variations**
- **Low-flow alarm**
- **Maintenance request alert**
- **Three binary inputs**
- **Eight relay outputs**
- **Four potential-free analog outputs 4-20mA**
- **RS 485**

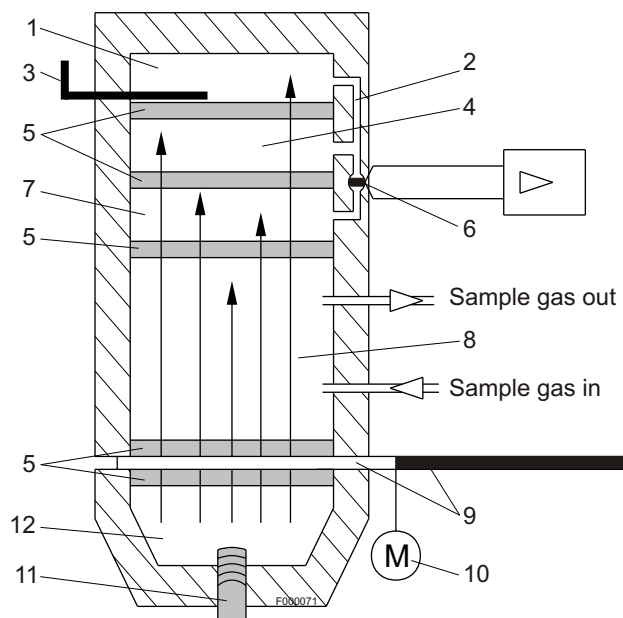
Application Examples

- Optimization of combustion systems
- Monitoring of exhaust gas concentration from combustion systems with all types of fuel (oil, gas and coal) as well as operational measurements for thermal incineration plants
- Room air monitoring
- Monitoring of air in fruit stores, greenhouses, fermenting cellars and warehouses
- Monitoring of process control functions
- Heat treating

Two independent, selective measurement principles are used in the BA 5000.

Infrared Measurement

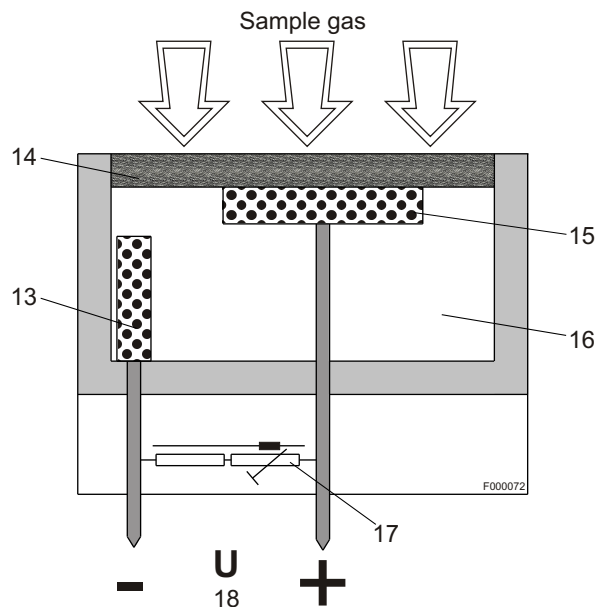
This spectroscopic method is based on the absorption of non-dispersive IR radiation. The attenuation in the radiation of specific wavelengths is a measure of the respective concentration of the gas.



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|----|-----------------------|
| 1 | Third detector layer |
| 2 | Capillary |
| 3 | Slide |
| 4 | Second detector layer |
| 5 | Windows |
| 6 | Microflow sensor |
| 7 | First detector layer |
| 8 | Sample bell |
| 9 | Chopper |
| 10 | Synchronous motor |
| 11 | IR source |
| 12 | Reflector |

Oxygen Measurement

The oxygen sensor operates according to the principle of a fuel cell. The oxygen is converted at the boundary layer between the cathode and electrolyte; the resulting current is proportional to the concentration of oxygen.



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|----|---|
| 13 | Lead anode |
| 14 | Oxygen diffusion membrane made of FEP |
| 15 | Gold cathode |
| 16 | Electrolyte (acetic acid) |
| 17 | Thermistor and load resistor for temperature compensation |
| 18 | Signal output |

General Technical Data

Measured components	max. 4 of which up to 3 infrared-sensitive gases plus oxygen
Analog outputs	max. 4, floating, 0 / 2 / 4 to 20 mA, linearised
Load	$\leq 750 \Omega$
Characteristics	linearised
Membrane keypad	LCD with LED backlighting and contrast control, function keys
Display	80 characters (4 lines / 20 characters)
EMC interference immunity	according to standard requirements of NAMUR NE21 (05/93) or EN 50081-1, EN 50082-2, EN 61010
Position of use	front panel vertical
Relay outputs	8, e.g. for fault, maintenance request, limit, function check, AC/DC 24 V / 1 A
Binary inputs	3, floating for pump on/off, AUTOCAL trigger and synchronisation
Serial interface	RS 485
Warm-up time	approx. 5 min. max. accuracy is achieved after approx. 45 minutes
AUTOCAL function	automatic analyser calibration with ambient air, cycle time adjustable from 1 to 24 hours

Dimensions

Portable analyser	(H x W x D) 170 mm x 465 mm x 392 mm
Frame 19", 4 HU	177 mm x 483 mm x 360 mm

Weight	approx. 10 kg
Degree of protection	IP 21 (EN 60529)

Power supply

Power supply	AC 100 V, + 10% / - 15%, 50 Hz AC 200 V, + 10% / - 15%, 50 Hz AC 230 V, + 10% / - 15%, 50 Hz AC 100 V, + 10% / - 15%, 60 Hz AC 120 V, + 10% / - 15%, 60 Hz AC 230 V, + 10% / - 15%, 60 Hz
Power consumption	approx. 50 VA

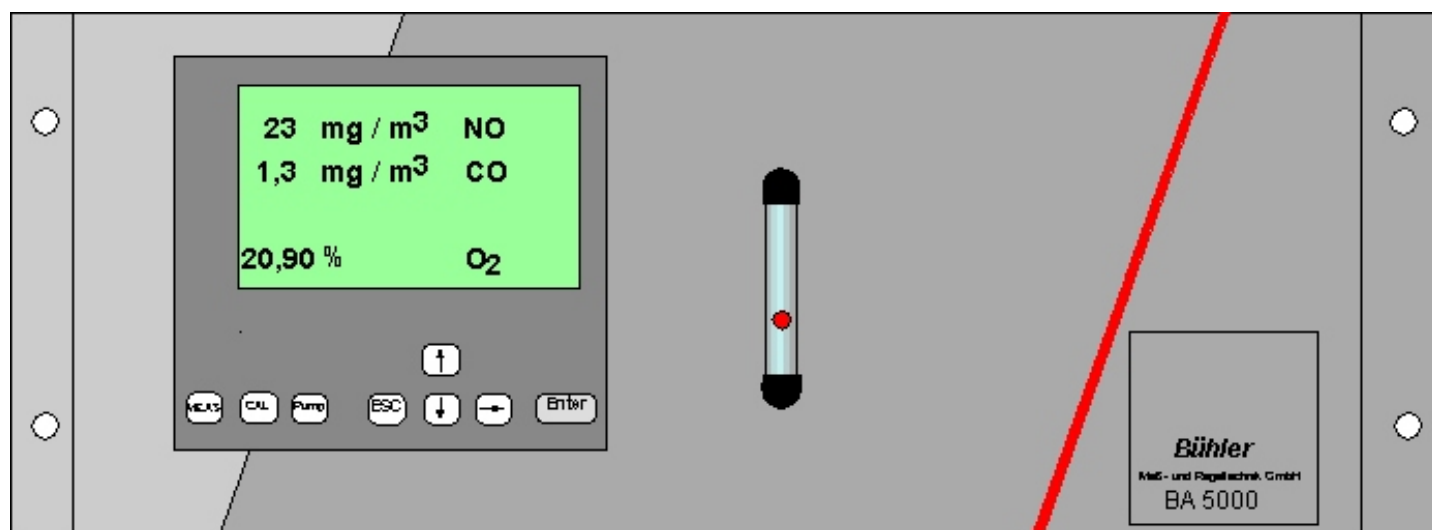
Gas input conditions

Sample gas pressure	0.5 to 1.5 bar absolute
Sample gas flow	66 to 120 l/h (1.1 to 2 l/min.)
Sample gas temperature	0 to 50 °C
Sample gas humidity	< 90% RH ¹⁾ or dependent on measuring task

Ambient conditions

Permissible ambient temperature	
Operation	+5 to +45 °C
Storage and transport	-20 to +60 °C
Permissible ambient humidity	< 90% RH ¹⁾ for storage and transport
Permissible pressure variations	700 to 1200 mbar

¹⁾ RH: relative humidity



Technical Data of Infrared Measurement

Measuring ranges	see ordering data
Influencing variables	
- Drift	
With AUTOCAL	negligible
Without AUTOCAL	< 2% of smallest measurement range / week
- Temperature	max. 2% of smallest possible measurement range according to type plate per 10 K with an AUTOCAL cycle time of 3 h
- Atmospheric pressure	< 0.2% of measurement range per 1% change in pressure, corrected by internal pressure sensor
- Residual gases	Contact Bühler application specialist
- Electric - Voltage	< 0.1% of output signal span with a change of $\pm 10\%$
- Electric - Frequency	$\pm 2\%$ of full-scale value with a change in frequency of $\pm 5\%$
EM field 10 V/m, 80% amplitude modulation	
- 10 kHz to 500 MHz	1% of smallest possible measurement range
- 500 MHz to 1 GHz	2% of smallest possible measurement range
Display delay (T_{90} time)	dependent on dead time and selectable damping
Damping	adjustable from 0 to 99.9 s (electrical time constant)
Output signal noise	< $\pm 1\%$ of smallest possible measurement range (see type plate)
Display resolution	dependent on selected measuring range; selectable number of digits following decimal point
Output signal resolution	< 0.1% of output signal span
Characteristic	linearised
Linearisation error	in largest measurement range: < 1% of full-scale value in smallest measurement range: < 2% of full-scale value
Repeatability	$\leq 1\%$ of smallest measurement range

Technical Data of Oxygen Measurement

Measurement range	0 to 5% or 0, to 25% O ₂ , programmable
Influencing variables	
- Drift	
With AUTOCAL	negligible
Without AUTOCAL	typical 1% O ₂ / year in air
- Temperature	< 0.5% O ₂ per 20 K, referred to a measured value at 20 °C
- Atmospheric pressure	< 0.2% measured value per 1% change in pressure
- Residual gases	residual gases containing heavy metals, H ₂ S and halogens result in analyser failures; O ₂ concentrations < 0.5% are only permissible for a short time
O ₂ error	on measurement of typical exhaust gases: < 0.05% O ₂
Output signal noise	< 0.5% of full-scale value
Response time (T_{90} -time)	dependent on dead time and selectable damping, but not < 30 s with a sample gas flow of approx. 1 l/min.
Display resolution	< 0.2% of full-scale value
Output signal resolution	< 0.2% of output signal span
Service life	approx. 2 years with 21% O ₂
Repeatability	$\leq 0.05\%$ O ₂