

OPTOACOUSTIC ANALYZER OF MULTICOMPONENT GAS MIXTURES

PURPOSE

It is intended for monitoring and measuring a molecular gas concentration in ambient air.

OPERATION PRINCIPLE

It is based on measuring the amplitude of air pressure fluctuations inside a closed cell which appear due to absorption of modulated radiation of a heat source by vibrational transitions of molecules of a gaseous specie being detected. High detection ability, measurement accuracy, and selectivity of the device are provided by successive measurements in different sections of the IR spectrum using a set of interference light filters selected separately.

APPLICATION FIELD

It can be applied to detection of gas pollution sources, monitoring of technological processes, and plant sanitary supervision.

DEVICE ADVANTAGES

- È high selectivity and sensitivity
- È linearity in a wide dynamic range (4–6 orders of magnitude)
- È automatic operation
- È small weight (about 10 kg) and overall dimensions (400×400×160 mm)
- È capability of simultaneously identifying the content of up to five pollution components (by consumer request) according to the list given in the table

Detectable gases and the device detection ability (mg/m³)

C ₃ H ₈	−0.04	CH ₄	−0.07	SO ₂	−0.90
C ₆ H ₁₂	−0.06	C ₂ H ₄ O ₂	−0.08	C ₂ H ₄ O	−0.80
CH ₃ Cl	−0.45	C ₂ H ₅ Br	−3.90	C ₂ H ₅ OH	−0.08
CH ₂ O	−0.08	C ₄ H ₈ O ₂	−0.06	O ₃	−0.17
HCl	−0.65	H ₂ O ₂	−0.15	PH ₃	−0.80
CO ₂	−6.00	C ₂ H ₃ O ₂	−0.10	C ₆ H ₆	−3.00
N ₂ O	−0.07	C ₄ H ₉	−1.10	CH ₃ CN	−10–20
CH ₃ NCO	−0.05	C ₆ H ₁₀ O	−0.16	C ₈ H ₁₀	−1.85
CO	−0.20	C ₃ H ₄ O ₂	−0.20	C ₄ H ₁₀	−7.80
C ₂ H ₂ O ₂	−1.29	H ₂ S	−38.00	C ₂ H ₅ Cl	−1.44
AsH ₃	−0.20	C ₆ H ₅ F	−0.10	C ₄ H ₆ O ₂	−0.58
CS ₂	−3.40	C ₆ H ₅ OH	−7.20	C ₂ H ₃ Cl	−0.42
C ₇ H ₈	−1.23	C ₅ H ₈ O ₂	−0.05	NH ₃	−0.23
HCN	−0.36	COCl ₂	−0.05	C ₈ H ₈	−0.93
HF	−1.10	NO	−1.20	NO ₂	−0.50

THE DEVICE MODIFICATIONS

A design documentation is available for the basic version of the optoacoustic gas analyzer (OGA). Based on this documentation the experimental modifications OGA–10 (CO, CO₂, CH₄, NO, NO₂, H₂O) and OGA–11 (CH₂O, CO, NH₃, CO₂, H₂O), and OGA–12 (SO₂, NO₂, NO, HF, CH₂O) are manufactured.

SPECIFICATIONS

1. Measurement range, mg/m³

SO ₂	1–10000
NO	2–20000
NO ₂	2–20000
CO	0.2–10000
CH ₂ O	0.1–1000
NH ₃	0.2–2000
HF	2–1000

2. Time of a gas mixture analysis — up to 10 min.

3. Built-in processor and a nonvolatile memory provide:

- running and controlling operation regimes,
- automatic calibration,
- storage of the results up to 40 measurements,
- digital indication and data transfer to an external computer (IBM PC).

4. Power supply — 220 V, 50 Hz, and power up to 200 W.

5. Weight — 10 kg.

6. Operation conditions:

- ambient air temperature — from +5 to +40°C,
- air pressure — 630–800 mm Hg,
- vibration-proof to transportation by an automobile.

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