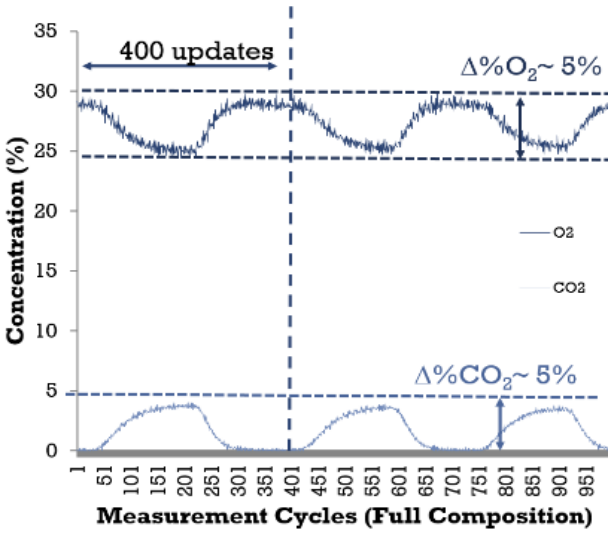
The fast-acquisition breath analysis configuration of the MAX300-LG was designed in collaboration with leaders in the field of respiratory research.

Breath Analyzer Features:

- **Quantitative Analysis** of O_2, CO_2, N_2, H_2O, and trace volatiles
- **Measurement Rates** up to 5 milliseconds per compound
- **Minimum Sample Flow** < 0.04 atm cc/sec
- **Sample Transit** as fast as 0.1 seconds



Mass spectrometry is the ideal gas analysis technique for many respiratory applications. The MAX300-LG™ measures all compounds in a sample, requires minimal sample flow, and delivers rapid data updates[1].

Researchers focusing on the physiological or biomedical study of respiration and metabolism can use breath analysis data to reveal underlying processes within complex biological systems (Fig. 1).

The high repeatability provided by the MAX300-LG ensures that calculated metabolic parameters derived from the gas analysis, like the respiratory quotient (RQ), are accurate and precise (Table 1).

Figure 1. Mass Spectrometry for indirect calorimetry, a clinic patient inspiring 30% O_2 at a normal breathing rate. The MAX300-LG measures all compounds in the sample with 400 full updates per breath. From this data, metabolic parameters, like the respiratory quotient (RQ) can be calculated without the need for additional equipment to measure flow. O_2 and CO_2 measurements are shown, RQ=1 ± 0.007.

Figure 2. The MAX300-LG, laboratory gas analyzer, configured for the real-time quantitation of O_2, CO_2, N_2, H_2O, and trace volatiles within inspired and expired breath gas samples.

Reference:

1. Arieli, R. 2010. Mass Spectrometer for Respiratory Research. Respiratory Physiology & Neurobiology. 170, 183-184

Name	Min. Conc. (%)	Max. Conc. (%)	Det. Mass	STD (+/- ppm)
Water	0	2.5	18	54
Nitrogen	70	80	28	267
Oxygen	15	25	32	142
Argon	0.5	2	40	25
Carbon dioxide	0	10	44	40

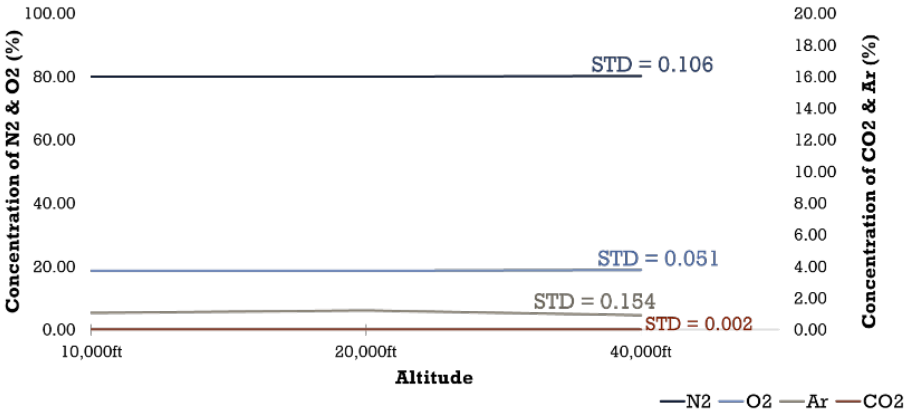
Table 1. Typical MAX300-LG breath analysis performance. The mass spectrometer analyzes all compounds in the sample with very high precision. In addition to the components listed here, the analyzer has the flexibility to measure trace volatiles such as formaldehyde, acetic acid, ammonia, and hydrocarbons for the purpose of diagnostic evaluation.

$$RQ = \frac{CER}{OUR} = \frac{\left(CO_{2\,out} * \frac{N2_{in}}{N2_{out}}\right) - CO_{2\,in}}{O_{2\,in} - \left(O_{2\,out} * \frac{N2_{in}}{N2_{out}}\right)}$$

Equation 1. The Respiratory Quotient (RQ). Nitrogen is not absorbed during respiration, so the ratio of the volumetric % of N_2 in the inspired and expired sample is used to develop an RQ equation in which measured sample flow is not necessary. All O_2, CO_2, and N_2 terms above are measurements of volume %.

The sample inlet of the MAX300-LG is optimized for breath analysis. Configurations exist for sampling from high pressure (hyperbaric) conditions, or sub-atmospheric pressures, such as those found at high altitudes. Regardless of sample pressure, the inlet is designed to automatically adjust, and maintain peak analytical performance (Fig. 3).

The MAX300-LG, laboratory gas analyzer, features a fast acquisition software and inlet configuration designed specifically to produce the full breath-to-breath quantitative profile. It provides high precision measurements of all components in the breath sample, with up to 50 updates for each compound per second. The complete sample composition allows the researcher to calculate metabolic parameters, like the RQ, without the need for integrating additional flow measurements (Eq. 1).



Altitude Above Sea Level (ft)	Absolute Barometer (Torr)
4500	644
10000	523
20000	349
40000	140

Figure 3. Air analysis at sub-atmospheric pressures. High altitude conditions were simulated at the MAX300-LG inlet. The system automatically adjusts and delivers uniform, high precision data regardless of sample pressure.

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