

Kuhner shaker

RAMOS

Respiration Activity Monitoring System
for online determination of OTR and CTR

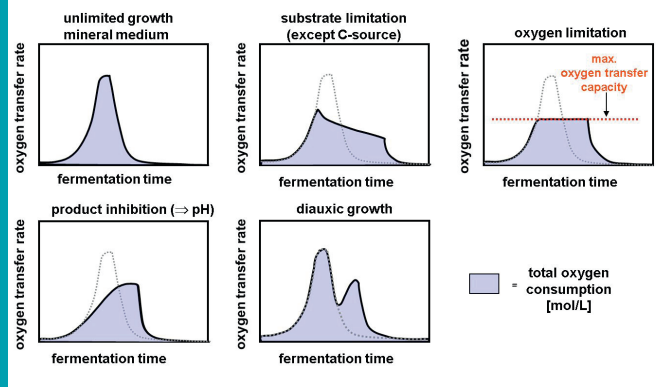


Applicable for the following shaking machines

SBM/SS-X, LT-X, ISF1-X, ISF4-X



Selection of typical biological phenomena



RAMOS

RAMOS (Respiration Activity Monitoring System) determines the oxygen transfer rate (OTR), the carbon dioxide transfer rate (CTR) and the respiratory quotient (RQ) of microbial, plant and cell cultures online. The respiration rates (OTR, CTR) are the most suitable measurable variables to quantify the physiological state of those cultures.

Determination of OTR and CTR

During fermentation a measuring cycle is continually repeated. This measuring cycle is separated into a measuring and a rinsing phase. During the rinsing phase air flows through the measuring flasks. At the beginning of the measuring phase the inlet and outlet valves of the measuring flasks are closed. The sustained respiration activities of the microorganisms lead to a change in the partial pressure of oxygen and carbon dioxide in the headspace of the particular measuring flasks. At the end of the measuring phase a computer uses these changes in partial pressure to calculate the oxygen (OTR) and the carbondioxide transfer rate (CTR).

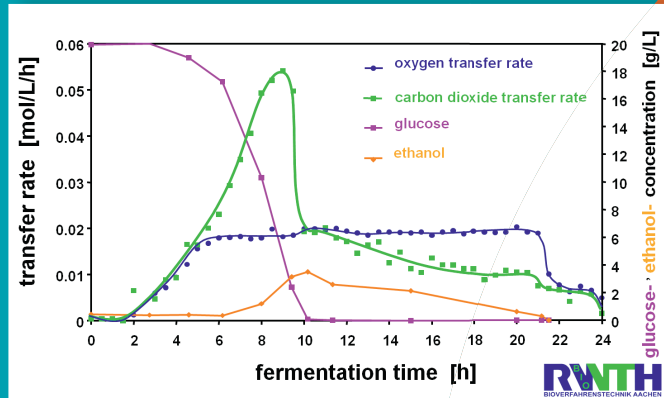
Improvement of screening conditions

RAMOS is the right tool to meet the PAT initiative of the FDA for shaken bioreactors.

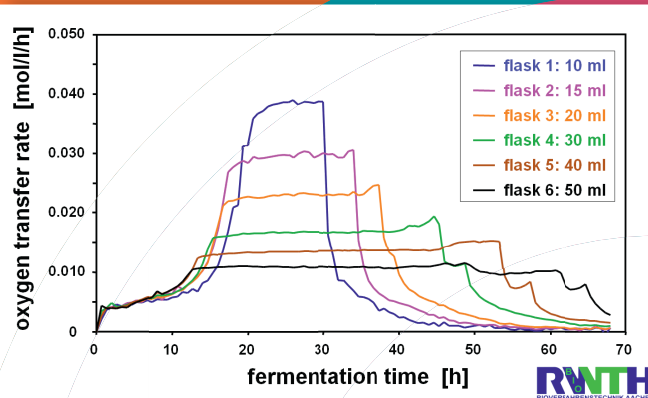
- + 8 parallel fermentations
- + One system for microbial, plant and cell cultures
- + Very easy handling
- + Automated system
- + Reduces optimization time and the "time to market"
- + Replaces time intensive and expensive manual measurements

Pichia stipitis

Complex medium with 20g/L glucose, temperature 30°C, shaking frequency 100 rpm, shaking diameter 50mm, filling volume 10mL

***Corynebacterium glutamicum***

Mineral medium with 30 g/L glucose, temperature 30°C with CaCO_3 , shaking frequency 200 rpm, shaking diameter 50mm

**Parameter****• Dimensions**

WxDxH = 800x550x490 [mm] incl. incubator, without PC

• Weight

app. 66 kg with incubator and shaker

• Size of shaker tray

app. 420x420 [mm]

• Power requirement

230V / 3A, without PC or 110V

• Temperature range

Room temperature + 5°C to 50°C

• Time consistency

of the temperature regulation
±0.05°C

• Spatial deviation

+0.3°/-0.7°C (with LT-X ±0.3°C)

• Gas connectors

only by operating with gas mixtures differing from surrounding air

• Shaker speed

max. 300 rpm

• Shaking diameter

12.5/ 25/ 50 [mm]

• Flasks

8 measurement flasks (250 mL)
+ 6 extra shaker flasks
(sample flasks, not included)
optional 500mL or 100 mL

Pressure sensors**• Measurement uncert.**

≤ ±5%, reference 1 mbar

• Reproducibility

≤ ±1% after zero calibration

• Linearity

≤ ±2% from measurement range

• Stability 2 weeks

≤ ±2% after zero calibration,
from measurement range

Oxygen sensors**• Measurement uncert.**

≤ ±5%

• Reproducibility

≤ ±2%

• Linearity

≤ ±3%

• Stability 2 weeks

≤ ±2%

Gas flow (vol.)**• Measurement uncert.**

≤ ±5%

• Reproducibility

≤ ±3%

• Linearity

≤ ±5%

• Stability 2 weeks

≤ ±5%

• Diff. between flasks

≤ ±3%

Sensitivity**• OTR**

$\leq ((8 \text{ E-6 Mol} \times (\text{flask volume[L]} - \text{culture volume[L]}) / ((\text{real measuring time[h]} - 0.067\text{h(=discharge time)}) \times \text{culture volume})))$

• CTR

$\leq ((1.2 \text{ E-5 Mol} \times (\text{flask volume[L]} - \text{culture volume[L]}) / ((\text{real measuring time[h]} - 0.067\text{h(=discharge time)}) \times \text{culture volume})))$

• RQ

± 0.1



Online measurement of OTR & CTR

www.kuhner.com

Kuhner

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