

Unique bio-mimicking "Fish-tail" bioagitator:

- highly efficient mixing without eddies
- free of cutting edges
- produces no shear stress



'FISH-TAIL' AGITATOR

Did you know, it took over 500 millions years for nature to develop a perfect fish tail for energy transmission in the water?

Only LAMBDA uses this know-how of nature to produce a unique Bio-mimicking "Fish-tail" bioagitator...

Move it like a fish!

The agitating discs of the 'fish-tail' bioagitator are elastic and have the typical form of fish tails.

In analogy to a fish tail, this shape of the stirring disc produces an efficient energy transfer in liquid (culture medium).

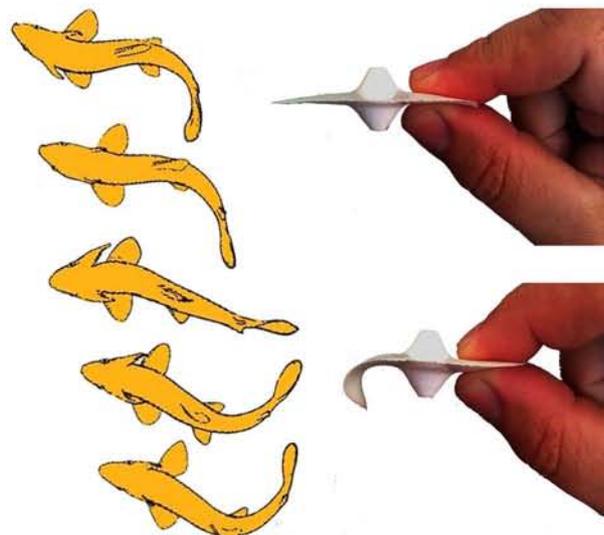


Have you ever seen a fish moving with a propeller instead of a tail?



Bioagitator - An optimal choice for cell culture

- ✓ Gentle and efficient mixing in both horizontal and vertical direction.
- ✓ No cutting edges and no eddies or turbulence formed during the agitation.
- ✓ Efficient medium circulation with the up and down movement of the fish-tail discs.
- ✓ Cells are not broken or destroyed due to the hydrodynamic shear stress.
- ✓ Optimal oxygenation and gas exchange in the medium (no air flooding).



An easy way
to maintain the sterility
of the culture for a
long time...

LAMBDA MINIFOR Fermentor-Bioreactor

Easy Sterility Concept

How is it possible?

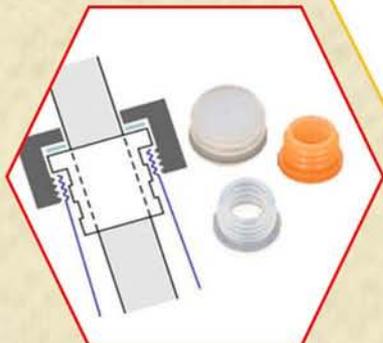
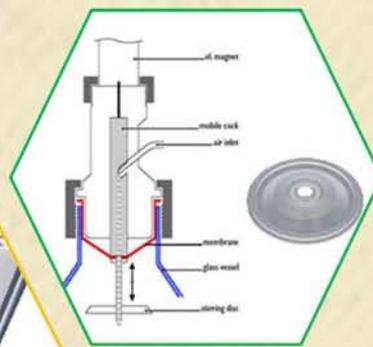


By eliminating the critical points causing contamination in common fermentors and bioreactors.

LAMBDA MINIFOR offers:

- ✓ Complete physical closure of the vessel and the side necks
- ✓ LAMBDA double-seal PEEK tubing connector
- ✓ Permanent stoppers with multiple seals
- ✓ High quality Peristaltic Pumps for long term continuous runs

Unique construction for easy sterility



LAMBDA's unique sterility construction assures you with perfect and easy sterility maintenance for each and every run...



at LOWEST COST

Do you have space for a sheet of A4 paper on your laboratory bench?

Then, there's still enough place for the MINIFOR fermentor bioreactor!

Extremely compact system

Perfect parameter control and smallest footprint



Minimum bioreactor foot print - comparable to the size of an A4 sheet of paper (220 x 400 mm)

Weight of only 7.5 kg - watch it closely, it could be carried away even by a child!

Covers the whole laboratory-scale culture volume range from 35 ml to over 6 liters

Measurement and regulation of °C, pH, pO₂, air flow rate, stirring and a selectable parameter 'X'

Pumps are placed at the rear to keep lines short

Storage bottles are securely placed in magnetic holders behind the fermenter vessel

Parameter regulation and monitoring at a single glance



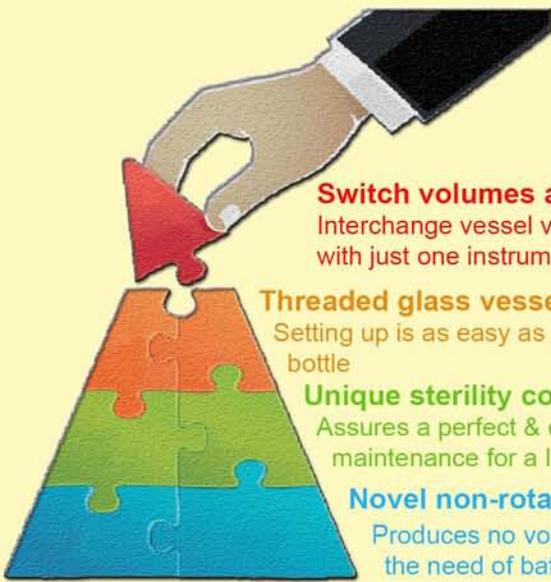
Easily accessible connections: Probes and ports are at an angle of 30° for easy ergonomic handling

Efficient IR heater integrated inside the control unit

Bye-bye head plates!



EASY-TO-USE AND ECONOMICAL SOLUTION

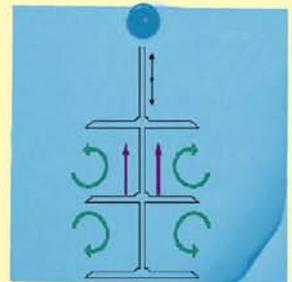
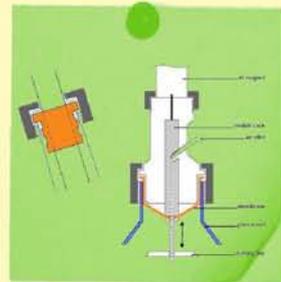


Switch volumes at low cost
Interchange vessel volumes (35 ml to over 6l) with just one instrument

Threaded glass vessel with screw caps
Setting up is as easy as screwing a cap on the bottle

Unique sterility concept
Assures a perfect & easy sterility maintenance for a long time

Novel non-rotational bio-mixing
Produces no vortex which eliminates the need of baffles



WHY LAMBDA ELIMINATED HEAD PLATES?

LIMITED number of ports



REPLACE O-rings before each run



CONTAMINATION due to flattening of O-rings during sterilization



NEED new head plates (probes, O-rings, nuts..) for each new vessel size



COMPLICATED setting up & cleaning process



EXPENSIVE spare parts



TIME consuming set-up

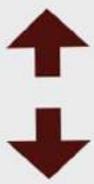


DIFFICULT to make tight connection with shallow threads



? LARGE VESSEL = high medium cost + downstream cost + long sterilization & cooling time + difficulty in disposing infective material





UP AND DOWN AGITATION

Why LAMBDA replaced the traditional rotational stirring with a unique and efficient agitation?

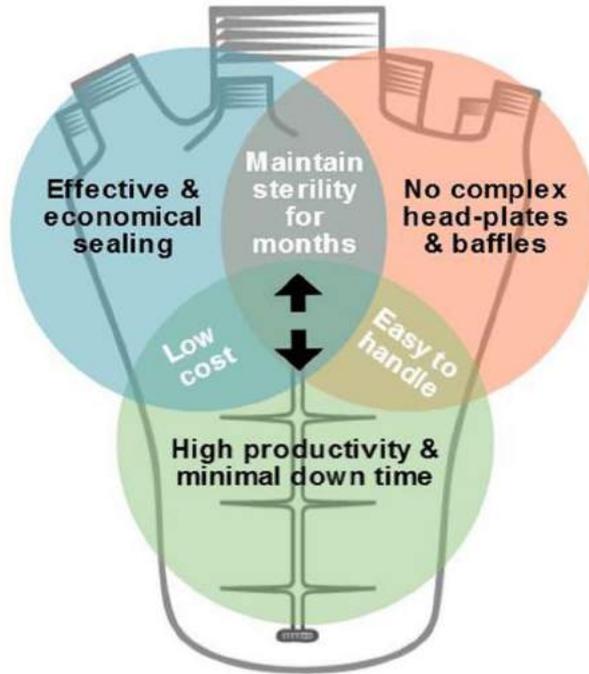
Advantages of LAMBDA's non-rotational agitation



Quality sealing allows to maintain sterility easily for long continuous runs



Increased cell viability with optimal bio-mimicking "fish-tail" agitation



Saves money, simplifies the setting up process and reduces cleaning time

Efficient mixing for all types of culture: bacterial, mammalian & fungal cells

Cells are not destroyed due to shear stress

Optimal oxygen transfer (OTR) without air flooding

Major problems with ROTATIONAL STIRRING

Induces hydrodynamic shear stress to cells

Destructive effect on culture growth

Unreliable seals to close the moving motor axis and immobile vessel

High risk of contamination

Increased handling complexity, downtime, foaming and complex internal environment

Air flooding

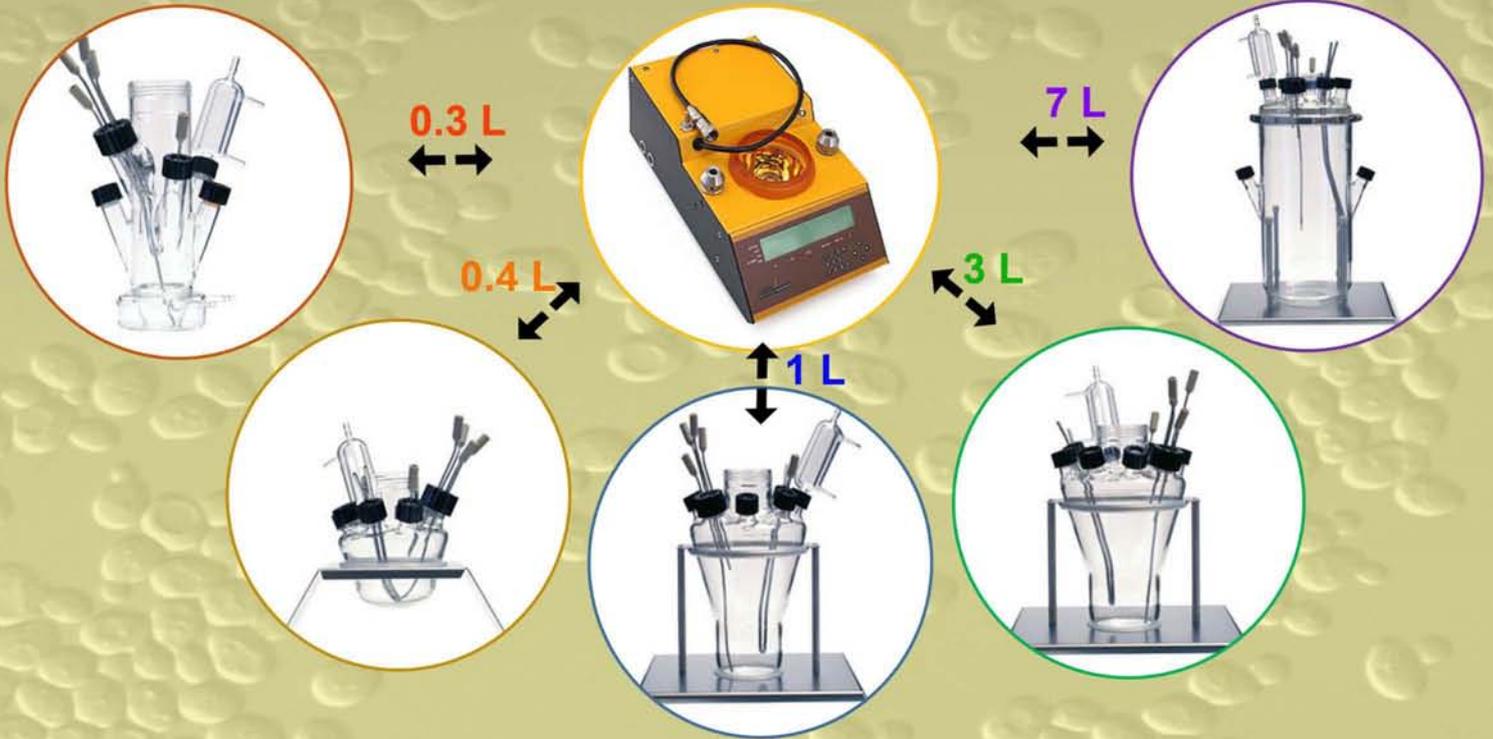
Vortex controlling baffles complicate the set-up & cleaning process

Inefficient gas & mass transfer in the media

**Unprecedented
volume range
from 35 ml to
over 6 litres...**

LAMBDA MINIFOR Fermentor-Bioreactor Optimized Vessel Design

↔ SWITCH VESSEL VOLUMES at low cost



YOUR BENEFITS

- ✦ **Economical & Flexible solution at laboratory stage**
- ✦ **Elimination of complex and expensive head plates**
- ✦ **Optimized, user friendly vessel design**
- ✦ **Unique ergonomic easy sterility concept minimizing contamination**
- ✦ **Reduced heating, cooling and sterilization times**
- ✦ **Perfect visibility into the vessel**
- ✦ **Easy and precise control of the process parameters at any volume**
- ✦ **Modular and cost efficient construction**
- ✦ **Better work productivity due to the elimination of contamination risk**



Infra-red heat rays provide soft heating and optimal temperature maintenance

SUN-LIKE WAY OF HEATING

✗ A big "NO" to heating blankets, jacketed vessels and thermal circulating baths

Why?

- ✗ Very expensive and voluminous
- ✗ Overheating of the medium
- ✗ Prevents natural cooling and a complementary cooling is required
- ✗ Restricted view into the vessel
- ✗ More heat is dissipated outside the vessel (to your lab) than transmitted into the medium
- ✗ Heat transmission occurs mainly by slow and inefficient thermal conduction

How infra-red radiation heating is efficient?

Precise temperature control at low cost

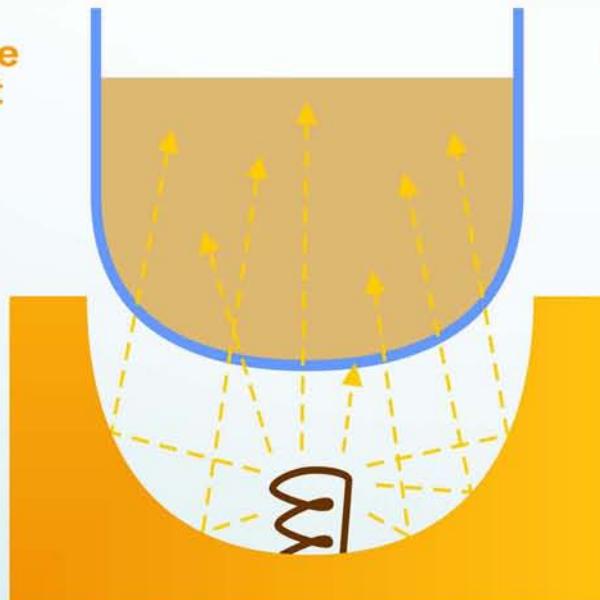
No hot spots at any medium volume

Natural upwards convection even without any agitation

Perfect visibility into the vessels

Imitating soft sun-like way of heating

Heats up and cools down quickly



Convenient & Safe - No cables, tubings, connectors, circulating water supplies



World's smallest ANTIFOAM Control System

Saves both money and valuable bench space around the MINIFOR laboratory fermentor-bioreactor

PRINCIPLE

Presence of foam is detected by the measurement of increase in electrical conductivity.

Save cost
Save space

- No need of an expensive anti-foam probe
- Simply two needles of the fermentor vessel are used as electrodes

ANTIFO



DOZITO



+



- The antifoam detector/controller
- Detects the presence of foam
- Sends control signals to DOZITO
- No additional port needed for the probe

- Miniature Syringe Pump
- Adds antifoam agent based on the received signals
- Prevents overdosing of antifoam liquid
- New motion principle

Watch your cells grow!

Pump flow INTEGRATOR - an economical alternative to Optical Density (OD) measurements

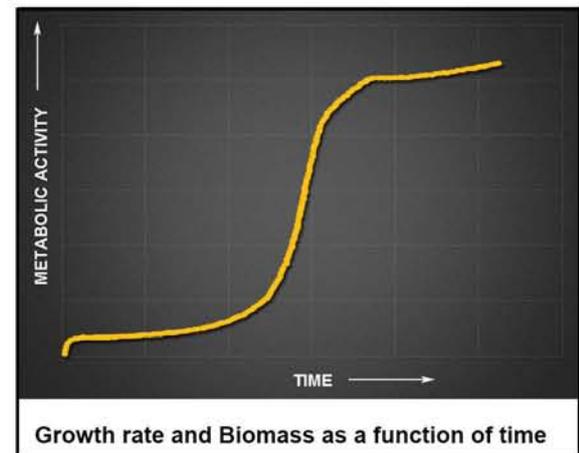
During fermentation, cells produce acid or base which needs to be compensated.

The INTEGRATOR in the pump integrates the amount of added acid or base.

These data allow to assess cell growth or biotransformation with a precision similar to titration.

Advantages you get:

- ✓ Unlike in OD measurements, the results are not affected with the presence of dead cells, cell debris, air bubbles, precipitation & coloration
- ✓ Precise, easy-to-use & maintenance free solution at low cost
- ✓ Integrated within the pumps to save your valuable bench-space



Where to use the INTEGRATOR?

- ☀ Control and quantification of the metabolic activity of cells during fermentation and cell cultures
Eg. by control of pH, rH, pO₂, pCO₂, conductivity or other parameters
- ☀ Measurement of the enzyme activity of numerous enzymes
Eg. esterases, acylases, lipases, proteases and others using a pH stat
- ☀ Recording foam formation (automatic antifoam addition)
- ☀ Recording the addition of reactants during exothermic reactions by a thermostat
- ☀ Recording of the consumption of reactants during titrations and much more applications

Titrate your cell's
METABOLIC ACTIVITY!

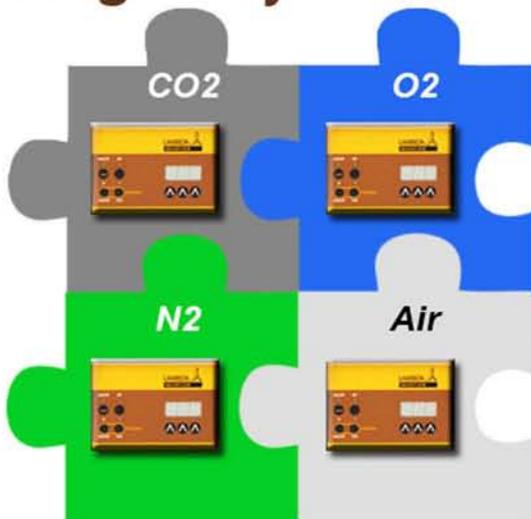


MINI-4-GAS AUTOMATIC GAS-MIX

Build up your own high quality gas station!

- Free selection of gases
- Individual flow rates per gas
- Pressure independent flow rate measurement
- Stand-alone & programmable or remote control by industrial fermentation software SIAM

Which gas do your cells need?



pO₂ control & O₂ enrichment
pH control by CO₂
Constant gas flow

MINI-4-GAS is as easy to put together as puzzle pieces

High quality and cost effective setup

Each MASSFLOW will control one gas in your gas-mixture

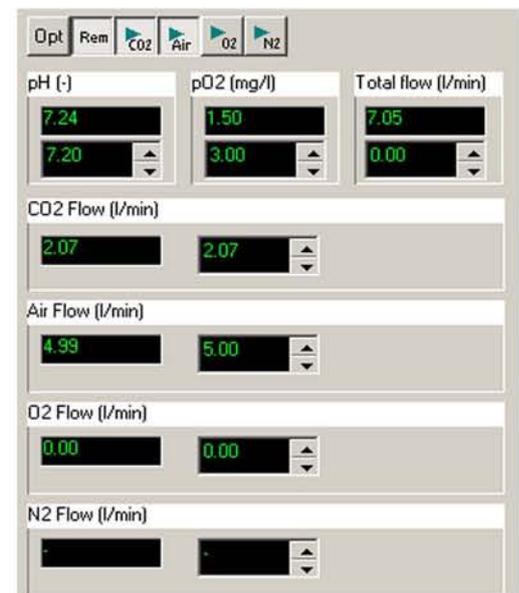
MINI-4-GAS is modular

According to your project, you can choose:

- upto 4 gases of your choice
- in 2 different ranges upto 500 or 5000 ml/min

Why MASSFLOW?

- Specially developed for the precise flow measurement and control of gases
- Uses a high quality laminar mass flow sensor with a very low pressure drop
- Flow rate is regulated by a special proprietary proportional needle valve controlled by a microprocessor
- Flow rate is programmable (up to 50 pairs of flow rates and times)
- Transferred gas volume can be totalized with the INTEGRATOR



MINIFOR provides a high quality, inexpensive & automatic weight-control solution for continuous cultures

CHEMOSTAT

Features of LAMBDA Chemostat

- ➔ Weight control independent of agitation, aeration, temperature, foaming, gas uptake & pressure
- ➔ Efficient optimization of experiments in hours instead of days / weeks
- ➔ Considerably higher productivity, e.g., yield of 3L continuous culture is equal to 30L batch culture
- ➔ High quality & reliable peristaltic pumps specially developed for long term continuous processes
- ➔ Constant flow rate for several weeks with no risk of tubing rupture or other malfunctions
- ➔ Precise & high quality weight control with GLP and GMP conform



Miniature scale module (steel tip) placed under MINIFOR for easy weight control



Pump head with large ball bearing rollers and asymmetric design decreases pulsation and increases tubing life

Advantages of using LAMBDA scale module for continuous cultures



Optimize experiments faster



Increased productivity



Precise and Reproducible results



Cost effective

Bioreactor for animal cell culture

While purchasing a bioreactor (stem cell):

For CHO, HeLa, HEK-293 and other cell lines consider gentle mixing, smallest volume possible, sterility, ideal gas mix, efficient gas exchange, exchangeable vessel volume at low cost, peristaltic pumps for long runs, precise temperature control

9 points to consider while purchasing a bioreactor for animal cell culture

1. Homogeneous & efficient mixing for shear sensitive cells

Up and down agitation with 'fish-tail' discs provides gentle (minimal shear stress) and efficient mixing (perfect gas and mass exchange)

2. Select smallest volume possible

Growth & production media is extremely expensive. MINIFOR bioreactor allows to work with smallest working volume of 35ml to test the culture models

3. Think about the sterility maintenance of the bioreactor

Only a spore is sufficient to overgrow stem cell culture. Easy sterile handling for long runs offered by MINIFOR

4. Human factor and Ergonomics (HF & E)

Bioreactor should be safe to be handled by all the technical people working with it. Work with MINIFOR without depending on GLP/GMP trained technician

5. Get rid of unreliable & manually adjustable rotameters

Ideal gas supply to cell culture varies with temperature & media supplements. Switch to automatic & reliable MINI-4-GAS gas mixing module

6. Choose efficient sparger with non-blockable fine pores

Submerged aeration in cell culture needs an efficient sparger which is not blocked by deposits.

Self-cleaning microsparger of MINIFOR for long runs (for eg. months) with efficient sparging

7. Say no heating blankets, coils for cell culture

It is important to have a precise temperature control without overheating. IR heater in MINIFOR with automatic volume recognition allows precise temperature control

8. Never choose a mono-speed pumps with stoppers for long runs

LAMBDA pumps are specially developed for long term continuous cell cultures with reduced pulsation and stable flow rates

9. Select a bioreactor with inexpensive & exchangeable vessel volumes

Vessel volumes could be exchanged from 35ml to over 6L for downstream processing in a single MINIFOR Bioreactor unit.