

FLEXIBLE FERMENTATION SYSTEMS

from

ELECTROLAB

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Welcome to Electrolab

Electrolab has been successfully designing and manufacturing fermentation and cell culture equipment for over ten years. We can now boast one of the largest single manufacturer installations in Europe with over 200 units at a single site.

As well as to Europe and the USA, our fermentation equipment is exported to many countries throughout the world with the same high level of service and support as is offered in the UK domestic market.

Our philosophy is to manufacture fermenters that are:

- * *Easy to Use*
- * *Flexible Enough to Grow with You*
- * *Robust Enough to Last a Lifetime*

This philosophy has been successfully implemented and incorporated at every level of design and production.

Based in the UK, we service domestic units either at our works or on site. However, because of the uniquely simple design of the fermenters, servicing and maintenance is reduced to an absolute minimum, which is especially attractive to overseas customers. We also welcome feedback from our customers as this information is used directly in the improvement and expansion our product range.

The FerMac 300 Series

Don't think *Modular* - think *Flexible*!



The FerMac 300 Series fermentation system is designed with the modern multifunctional laboratory in mind.

Whether you are embarking on a new fermentation process or scaling up a successful trial, the FerMac 300 offers you the **control** and **footprint** of an integrated system combined with the **flexibility** of a modular system.

The FerMac 300 can be tailored to your culture's requirements without having to purchase unnecessary equipment. When you decide to expand, the "plug-and-go" signal conditioners are already in place to cater for your needs.

Spend time on your fermentation - *not* the instruction manual!

Most biologists use fermentation equipment as a means to an end. Who wants to spend time struggling to understand how equipment works?

The FerMac 300 uses a clear fluorescent display, showing all key parameters on one screen at the same time. A single keystroke takes you into specific calibration screens for each parameter, keeping the display uncluttered and intuitive.

Simple, powerful and effective.



**Reliability that *works* - 24 hours a day,
365 days a year!**



The nature of fermentation demands a high level of reliability from culture equipment. Electrolab has an impressive track record of reliability – just ask us for references.

The secret to our success is in the product design and construction.

Designed using established engineering techniques, every FerMac 300 is put on test for at least 48 hours before delivery. It is constructed using a durable stainless steel framework and the powerful top drive motor is of the highest specification to give maximum performance. The vessels are of tough borosilicate glass which are designed for sterilisation in an autoclave.

The whole assembly provides easy access for removal of vessel, inner parts and drip tray whilst providing a useful stainless steel backplate for mounting additional items such as air control valves and water pipework.

A system which is easy to maintain rarely breaks down!

**Electrolab will look after your
FerMac 300 -
*Or do it yourself - the option is yours!***

Electrolab can support you with service expertise both at our works and in the field.

We would recommend an annual service for your FerMac 300 to check items such as drive shaft seals, bearings and motor brushes.

However, the **UNIQUE** design of the FerMac 300 drive shaft means that these parts can be replaced either by you or by our engineer within minutes, minimising equipment down-time.

Which other fermenter manufacturer offers you this option?

The FerMac 310/60 Bacteriological System

The Next Step Up!

Using a fermenter for bacteriological culture is usually the next step up from shake flasks. Understandably, this can be quite a daunting prospect, which is why Electrolab has designed the FerMac 310/60 to be as simple or as advanced as you demand.



Whether you are working with bacteria or yeast the FerMac 310/60 is flexible enough to cater for all your requirements.

The powerful top drive motor ensures a high, reproducible rate of aeration for maximum cell growth, and the scale-up of cultures is available through a wide range of vessel sizes.

With 4 built-in pumps and an optional two-pump module available, the FerMac 310/60 can efficiently tackle both batch and continuous flow fermentations.

KEY FEATURES of the FerMac 310/60 Series Bacteriological System

Flexible 310 Stirrer System

- * Robust stainless steel framework
- * Small footprint
- * Ample space on frame for flow meters, valves etc
- * Stainless steel drip tray pulls out for easy cleaning and improved vessel handling
- * Easy to clean and maintain
- * Wide speed range

Comprehensive 360 Measurement & Control System

- * Microprocessor controlled
- * Key information is clearly displayed on one screen
- * Single stroke access to individual parameters
- * Levels of password protection available
- * "Plug and go" additional signal conditioners for easy system expansion
- * Full access to PID values
- * Links to purpose built software packages for data logging and control of up to eight fermenters as standard

The Right Vessel for your Fermentation

- * *Unique* drive shaft design allowing easy replacement within minutes, minimising down-time.
- * All vessels are fully autoclavable
- * Large range of vessels between 0.5 to 18 litre working volumes
- * Ports, fittings and even vessels can be ordered to your own specification

Pumps, Pumps, Pumps

- * Four Watson Marlow pumps fitted as standard
- * Additional two-pump module available with connections in place for immediate use
- * All pumps have manual override facility

SPECIFICATIONS

for the

FerMac 310/60 Series Bacteriological System

Temperature	
<i>Range °C</i>	0 to 50°C
<i>Control Action</i>	PID to independent digital outputs for heating and cooling
<i>Heating method</i>	Heater mat or band
<i>Cooling method</i>	Water cooled cold finger tube
pH	
<i>Range</i>	0 to 14 pH
<i>Control Action</i>	PID with adjustable dead band, controlled by independent digital outputs
<i>Pumps</i>	2 Watson Marlow separate acid and base pumps with pump run timers for calculation of acid/base volume
<i>Calibration</i>	Via microprocesor with manual or auto temperature compensation
<i>Alarm</i>	Yes
Agitation	
<i>Range rpm</i>	0 to 1200 rpm
<i>Control Action</i>	PID with 12 BIT output
<i>Alarm</i>	Yes
DO	
<i>Range %</i>	0 to 120%
<i>Control Action</i>	PID with five methods of control:- Agitation only Air only Agitation and air Agitation followed by air Air followed by agitation
<i>Calibration</i>	Via microprocessor with manual or auto zero Via microprocessor with manual or auto temperature compensation
Redox/Millivolts	
<i>Range</i>	± 1000 millivolts
<i>Control Action</i>	PWM logic output or 12 BIT D-A output
<i>Alarm</i>	Yes

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Air

Range 0-15 Standard litres per min. Other ranges available.

Measurement Mass flow meter

Alarm Yes

Foam (2 channels)

Function Foam, Level or Feed

Detection Conductivity probe with variable sensitivity

Pump 1 Watson Marlow pump with run timer

Control Action On/Off/Delay (splash) pump timers range 0 to 999min

Alarm Yes

Pumps (2 channels)

Control Action On/Off timer with delayed start timer

VESSEL DETAILS

Note: Standard vessels are flat bottomed. All items in contact with the media are either glass, stainless steel, PTFE, Viton or silicone.

Materials Glass : Heat resistant borosilicate glass
Top plate and all fittings : 316 Stainless Steel

Finish All stainless steel parts electro-polished

Working Volume	1 litre	2 litre	5 litre	10 litre	18 litre
Total Volume	1.8 litre	2.7 litre	6.4 litre	12 litre	22 litre
Port Sizes/ Numbers	5 x 6.3mm 7 x 12mm	5 x 6.3mm 7 x 12mm	5 x 6.3mm 9 x 12mm	5 x 6.3mm 9 x 12mm	8 x 6.3mm 9 x 12mm
Impellers (dia)	1 x 55mm	2 x 55mm	2 x 84mm	2 x 84mm	2 x 84mm

The FerMac 310/60 Cell Culture System

Don't Think Adapted - Think Specialist

Electrolab understands the specialised needs of cell culture laboratories. We have **tailored** the FerMac 310/60 Cell Culture System to the demands of eukaryotic cells, whilst retaining the highly successful generic structure of the FerMac 300 series base unit.

The FerMac 310/60 Cell Culture System shares the same neat footprint of the FerMac 300 series along with the powerful, intuitive controller.



The stirrer is fitted with a reduction drive which provides constant low speeds and also protects the motor against wear and tear.

Glassware is profiled with a rounded bottom to minimise cell shearing and a low density heater provides essential uniform heating.

Low shear, variable pitched impellers can be designed to your own specification in order to achieve maximum cell growth.

Combine these features with DO and pH control and the FerMac Cell Culture system will tackle any cell line.

KEY FEATURES of the FerMac 300 Series Cell Culture System

Flexible 310 Stirrer System

- * Slow stirrer speed using a reduction drive for maximum stability at low rpm
- * Robust stainless steel framework
- * Small footprint
- * Stainless steel drip tray pulls out for easy cleaning and improved vessel handling
- * Easy to clean and maintain

Comprehensive 360 Measurement & Control System

- * Microprocessor controlled
- * Key information is clearly displayed on one screen
- * Single stroke access to individual parameters
- * "Plug and go" additional signal conditioners for easy system expansion
- * Full access to PID values
- * Links to purpose built software packages for data logging and control of up to eight units
- * Large low-wattage heater for good heat distribution

The Right Vessel for your Fermentation

- * Specifically designed dish-based vessel with low aspect ratio
- * Low shear impellers with variable pitch
- * Large range of vessels from 0.5 to 10 litre working volumes
- * Vessel skirt allows vessel to stand upright for ease of handling

Gas Flow System

- * DO control by blending oxygen/air and nitrogen
- * pH control by CO₂ valve and flow meter, or with standard pump
- * Separate flow meters for O₂, N₂, CO₂ and air

SPECIFICATIONS

for the

FerMac 310/60 Series Cell Culture System

Temperature	
<i>Range °C</i>	0 to 50°C
<i>Control Action</i>	PID to independent digital outputs for heating and cooling
<i>Heating method</i>	Low wattage band heater for even heat distribution
<i>Cooling method</i>	Water cooled cold finger tube
pH	
<i>Range</i>	0 to 14 pH
<i>Control Action</i>	PID with adjustable dead band, controlled by independent digital outputs
<i>Pumps</i>	2 Watson Marlow separate acid and base pumps with pump run timers for calculation of acid/base volume
<i>Calibration</i>	Via microprocessor with manual or auto temperature compensation
<i>Alarm</i>	Yes
<i>Gas Flow</i>	CO ₂ gas flow for control of pH with valve and separate flow meter
Agitation	
<i>Range rpm</i>	0 to 200 rpm
<i>Control Action</i>	PID with 12 BIT output
<i>Alarm</i>	Yes
DO	
<i>Range %</i>	0 to 120%
<i>Control Action</i>	PID control by gas mixing of nitrogen, oxygen, carbon dioxide and air. Each with separate flow meter valve able to sparge through the media or into the head space.
<i>Calibration</i>	Via microprocessor with manual or auto zero Via microprocessor with manual or auto temperature compensation
Redox/Millivolts	
<i>Range</i>	± 1000 millivolts
<i>Control Action</i>	PWM logic output or 12 BIT D-A output
<i>Alarm</i>	Yes

cont'd...
13.

Air

Range	0-15 Standard litres per min. Other ranges available.
Measurement	Mass flow meter
Alarm	Yes

Foam (2 channels)

Function	Foam, Level or Feed
Detection	Conductivity probe with variable sensitivity
Pump	1 Watson Marlow pump with run timer
Control Action	On/Off/Delay (splash) pump timers range 0 to 999min
Alarm	Yes

Pumps (2 channels)

Control Action	On/Off timer with delayed start timer
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VESSEL DETAILS

Note: Standard vessels are dish bottomed with skirt. All items in contact with the media are either glass, stainless steel, PTFE, Viton or silicone.

Materials	Glass : Heat resistant borosilicate glass Top plate and all fittings : 316 Stainless Steel		
Finish	All stainless steel parts electro-polished		
Working Volume	2 litre	5 litre	10 litre
Total Volume	3 litre	6.4 litre	12 litre
Port Sizes/ Numbers	5 x 6.3mm 7 x 12mm	5 x 6.3mm 9 x 12mm	5 x 6.3mm 9 x 12mm
Impellers	1 x variable pitch	1 x variable pitch	1 x variable pitch

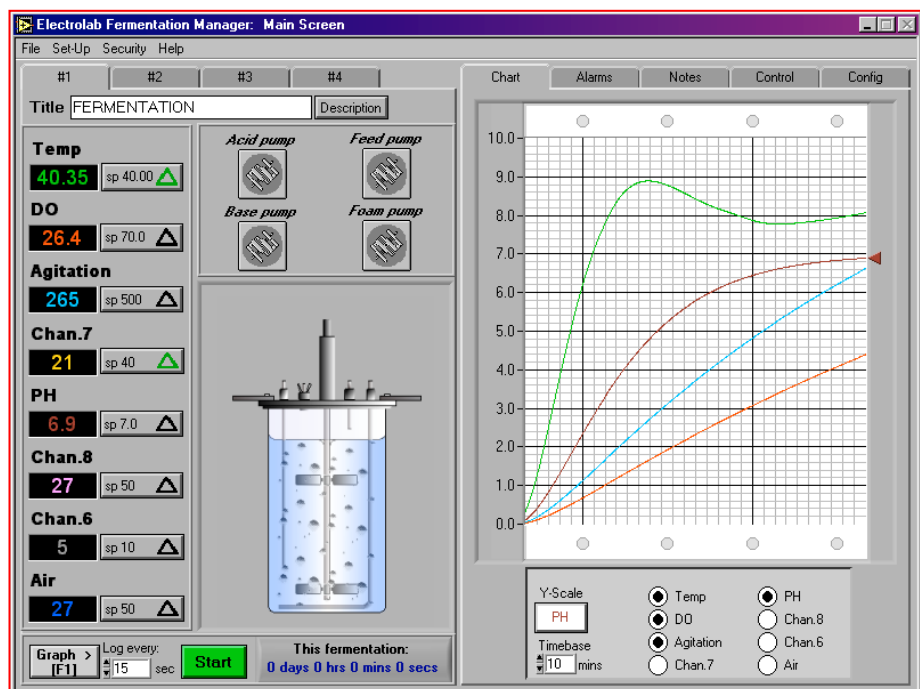
The FerMac Process Management Software

Don't Just Manage - Take Control!

Documentation and **Control** are essential in today's laboratories, especially if fermentation processes are to be scaled up to commercial production level. Electrolab has designed the FerMac Management Software to be one of the most intuitive packages available for fermentation and cell culture. The philosophy underpinning the software is to deliver an **easy to use program** which is also a **powerful tool**.

Virtual Display - Real Time Values

The virtual instrument display allows you to keep an eye on your fermentation run from the comfort of your office. The parameter values are displayed on a real time virtual strip chart, which means you can **monitor** or **change** set points halfway through a run – all without moving from your chair.

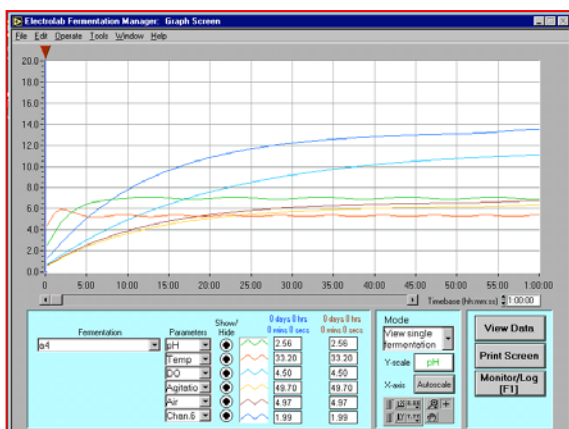


We Make Things Easy

- * Pull down menus, dialogue boxes and visual icons make navigation and programming quick and simple, leaving you more time for your fermentation.
- * The FerMac Management Software even includes a built-in simulator for training so that you can run a trial with total **peace of mind**.
- * Modification of the software for specific purposes is possible as the FerMac Management Software uses National Instruments Labview programming language.

Documentation Facilities

- * The logging facility for fermenter data, alarms, notes, pump outputs etc., keeps all your data in one place rather than on strips of chart recorder paper.
- * Each run can be saved and used as a template for repeat run profiles.



- * The graphing facility allows you easily to compare one fermentation run with another.
- * All data is held in a database which provides a **safe stable environment** in the event of a computer crash. The database can simply be reloaded back into the program.

- * Display ONLY the information channels you want for chosen graphs by using the editing function. Give the channels meaningful names, as well as selecting colour and style of line for maximum flexibility.

Take Control

- * The standard FerMac Management Software can simultaneously control up to eight fermenters, which means the software is ready to expand when you are – **at no extra cost!** An additional program allows for control of up to twelve fermenters.
- * Each fermenter screen can be accessed with the click of a tab, allowing instant comparison and monitoring of simultaneous runs.
- * Parameter set points can be modified mid-run for total flexibility.
- * The database is **compatible with Microsoft® Windows** and most other databases. This gives you the option to transfer your raw data into other processing packages such as Excel®, Word® and graphing facilities.
- * FerMac Process Management Software comes with **free** support for the first year.

The FerMac Air Lift Vessel

Don't Think Stirred - Think Lifted!

Some cell lines are so fragile in culture that any type of mechanical impeller will shear them. A serious alternative to an impeller driven system is one that uses forced air to circulate the cells and growth media.

The FerMac Air Lift vessel is specifically designed for animal and mammalian cell work but still retains a similarly compact footprint to the FerMac 310/60 Series.

The vessel features a stainless steel rounded bottom with three ports to allow short electrodes to be used, which helps further reduce the chance of shearing.

There is one standard vertical baffle for gentle mixing and numerous head plate ports for various fittings and sampling devices.



KEY FEATURES of the FerMac 300 Series Air Lift Vessel

- * Low energy input, high yield alternative to stirred tank
- * Dished stainless steel base with ports for electrodes, temperature sensor and air sparge
- * Single vertical baffle plate
- * Air sparge extending beyond top plate to prevent syphon-back
- * Low shear action providing good oxygen transfer
- * Stainless steel top plate accepting wide range of standard accessories
- * Quick release clamp enabling vessel easily to be stripped for cleaning
- * Three 25mm ports in base allowing short electrodes to be used

SPECIFICATIONS

for the FerMac 300 Series Air Lift Vessel

Materials	Glass : Heat resistant borosilicate glass Top plate and all fittings : 316 stainless steel
Working Volume	8 litres
Total Volume	10 litres
Glassware	Either clear or brown
Glass vessel height	725mm
Glass vessel ID	130mm
Overall height	1050mm
Baffle	Single vertical 600mm long
Ports	
<i>Top plate</i>	6 x 6.3mm 7 x 12mm
<i>Round base</i>	3 x 25mm 1 x PT100 1 x Air sparge

Ancillary Products

Electrolab FerMac 368 Gas Analyser

Providing two additional parameters of gaseous **oxygen** and **carbon dioxide**, The FerMac 368 Gas Analyser offers an additional method of monitoring growth conditions within a fermenter vessel.



Key Features

- * Designed for use with the FerMac 300 Series bacteriological and cell culture systems, or for use with a computer A-D converter
- * High stability CO₂ measurement using an infrared system
- * O₂ measuring cell with integral temperature compensation. Designed specifically for fermentation use, the electrochemical sensor is unaffected by other gases
- * Economically priced

Electrolab Low Flow Rate Pump

Specifically designed for bioprocess applications, Electrolab Low Flow Rate Pumps provide a smooth flow of media with excellent reproducibility over extended periods of time. The modular design allows for stand-alone operation or integration with the FerMac 310/60 fermenters.



Key Features

- * Small footprint (140x230mm, excluding pump heads)
- * Stackable
- * Digitally controlled motor for reliable low speeds
- * Good consistent flow rate over long periods of time
- * Single channel version with spring loaded two-roller pump available - ideal for suspended solids
- * Multi-channel versions with an eight-roller pump also available – ideal for complex feeds
- * 0-20mA or various voltage inputs are available
- * Stand-alone or integrated operation for maximum versatility

Compact 106 Air Compressor



This ultra quiet air compressor will run several fermenters or supply your general laboratory air requirements.

Key Features

- * Ultra quiet – 57 dBs
- * Compact size (560x610x230mm)
- * Safety release valve
- * 6 litre reservoir tank
- * 100 litre per minute maximum flow rate
- * Two-stage pressure regulator for greater control