ILS Automation®

Bioreactor Control Solutions and Data Management for Research & Process Development Labs

Whether your needs are new, best-in-class bioreactor controllers, modernizing older reactors' controls, or enterprise-wide, web-based batch control and data management software, ILS Automation wants to earn your business.

We listen to our customers and work side-by-side with them to continuously improve our products and processes. This partnership has lead us to become experts in fermentation & cell-culture hardware design & process control strategies.

Batch Expert+ Software

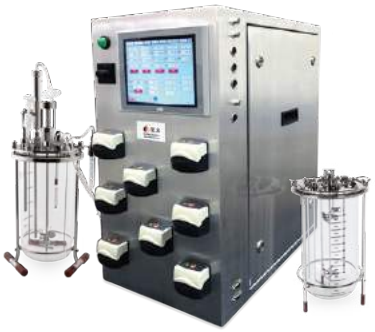
Batch Expert+ is a **web-based, real-time** batch fermentation/cell-culture control system that lets you integrate & manage all of your bioreactors through a single interface from *ANYWHERE.*

Live & Historical Trend Charts

- ✓ Direct Interfaces to Legacy Controllers B. Braun, Sartorius, NBS, Eppendorf, DASGIP, Applikon
- ✓ Integrate Your On-line & Off-line Instruments: Mass Spec, Mass Flow, Cell Density, Pumps, Scales, Operator Comments
- ✓ Intelligent Alarming & Alarm Management
- ✓ Reporting
- ✓ Scheduling
- ✓ Recipe Management
- ✓ Built-In Historian, Non-Proprietary SQL DB
- ✓ Open Architecture, Extensible, Customizable

Fermentation & Cell-Culture Bioreactor Control Systems

Our AFC line of controllers are designed with long-term support & operation in mind. Drop-in replacement controllers, automated SIP/CIP, and **fully customized solutions.**



AFC 927 dual bioreactor controller

ILS Design Principles:

- ✓ Use open, non-proprietary, readily-available, quality components
- ✓ Design our equipment to be serviceable by the customer
- ✓ Design solutions that are tailored to the customer's needs
- ✓ Customize software & interfaces to match the customer's requirements
- ✓ Provide complete documentation & source code
- ✓ Provide ongoing, personal support and technology upgrades for our customers & products

AFC 2000 semi-custom bioreactor controller designed to fit into existing cabinetry

Who Is ILS Automation?

Founded in 2001, ILS Automation has been providing automation systems for a wide variety of industries including: laboratory, batch, chemical process, oil refining, and manufacturing. ILS has deep experience in process control, electrical design, & software engineering.

As our business grew, we realized that a competitive advantage could be gained by offering not only software, but also custom-built hardware to control the products that our software was designed for — with an emphasis on **easy, affordable integration.**

Our customers are scientists and engineers that are looking for improvements in their processes through better and more reliable technology. They recognize the limitations of the off-the-shelf, closed solutions and count on us to take them to the next level of process development.

ILS®

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AFC 900 Series Dual Bioreactor Controllers

Cell Culture & Fermentation Applications

For Research & Process Development Laboratories

Designed as a **"drop-in" replacement system** for benchtop and pilot scale reactors, the AFC line of bioreactor controllers outclasses its competition thanks to a reliable, dedicated and open process control system.

Customizable Hardware

Built with industrial grade, off-the-shelf components, these customizable bioreactor controllers are designed with long-term support and operation in mind.

***AFC 927** 4 VS pumps per reactor*

***AFC 927 Plus 1** 4 VS pumps & 1 micro pump per reactor*

***AFC 929** 6 VS pumps per reactor*

AFC 900 Series Offers Built-in Support for Smart Probes

Mettler-Toledo: ISM pH/Redox

Hamilton: Optical dCO2 and/or Capacitance Cell Density

ABER: Biomass Monitor

Optional Water Box for temperature control of **jacketed** reactors and cooling loops

Standard 350 W stirrer motor (~0.5 HP) supports 2-15 liter reactors

Design Principles

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Specifications

Conventional Data Transmitter/Receiver Connections *(per reactor)*	Qty.
Mettler-Toledo M80/M100SM Modbus, ISM pH/Redox	1
Hamilton or Mettler Optical DO Modbus	1
Hamilton Modbus (Optical dCO2 and/or Capacitance Cell Density)	2
Temperature (PT100)	1
Analog pH	1
Analog DO	1
Foam (optional)	1

Additional Controller I/O *(per reactor)*	Qty.
110V AC Power Plug for Heating Blanket (Heat only temperature control)	1
RS-232 or RS-485 Serial Ports for Digital Scales (or other devices)	2
Addt'l 4-20 mA or 0-10 volt Analog Inputs	4

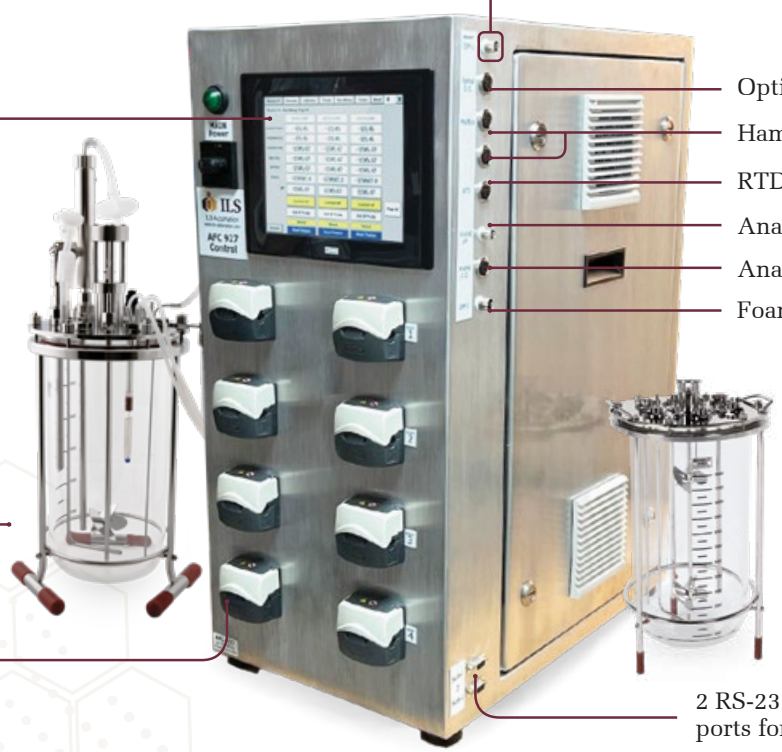
Communication Connections
MODBUS TCP Communication Interface
Kepware OPC (sold separately)
Digital Communications with Alicat MFCs (max 6/reactor)

Included Hardware *(per reactor)*	Qty.
RTD PT100 Temperature Probe with cable (6mm OD)	1
Servo Motor & Controller	1
Coupler "Snout" to connect Servo Motor to the Agitator Shaft	1

Software Specifications
PID Loops for Temperature, pH, and DO as per customer specification, includes:
Temperature - jacket/blanket, heating/cooling
DO Cascade to agitation/gas mixing
Setpoint Deadband for pH
PID Integral Deadband
Acid/Base/Gas mixing for pH
Setpoint profile
Weight Loss PID with Scales & Pumps - Mass Flow, Mass Charge, Level Control
pCO_2 PID with CO_2 and Air/N_2
Level Control for Perfusion
Calibration for all measurements (pH, temperature, gas flow, agitation, DO, pCO_2)

AFC 927 Dual Bioreactor Controller

AFC controllers are **customizable**



Drop-in

Replacement Control System for Sartorius Reactors up to 40L

ILS

AFC 2000 Fermenter & Bioreactor Control System

Keep Your Existing Stainless Steel Tanks

The AFC 2000 provides **replacement controls for existing Sartorius steel reactors up to 40L**. Capitalize on existing steel by modernizing outdated control hardware in a cost-effective way when compared to the expense of purchasing and installing new reactor systems.

The AFC 2000 is based upon modern control hardware and integrates with existing instrumentation and control elements. ILS can customize the AFC 2000 to fit specific needs including updating reactors with modern instrumentation and control elements.

All ILS controllers are fully integrated into our Batch Expert+ software, allowing local and remote operation of our systems.

AFC 2000 bioreactor controller designed to work with 40L Sartorius Biostat C reactor

Why Choose an ILS Controller?

Value

A replacement controller is less than half the cost of a new system and allows you to reuse your existing stainless steel tank.

Functionality

ILS has invested 1000s of programming hours to create the most versatile and flexible system available for cell culture and fermentation processes.

Flexibility

All of our AFC systems work with most existing sensors as well as devices like pumps, load cells, and scales. The controllers and software are designed to be able to integrate future technology.

Implementation

Each system is built to user specifications and is fully tested before leaving our facility. With proper planning, changeover can be as little as one week.

Integration

To provide a complete solution, ILS controllers are coupled with our Batch Expert+ software. BE+ provides user control from anywhere and includes a true SQL data historian, intelligent alarming, batch recipe management, and support for all major controller vendors.

ILS Design Principles

- Quality components are **non-proprietary**, commercially available, industrial, and rugged
- Equipment is designed to be **serviceable** by the customer
- Systems are tailored to the customer's requirements
- Software and interfaces are **customized** to meet the lab's operating requirements
- Complete documentation and source code are provided
- ILS provides ongoing, personal **support and technology upgrades** for our customers & products

AFC 2000/3000 Series Specifications

Supports probes & sensors from Hamilton Visiferm, Mettler-Toledo ISM, Aber, BlueSens, & Broadley James

Technologies include Digital and Analog pH, Optical DO, Polargraphic DO, Dissolved CO2, Redox, Capacitance probes, and Conductivity probes

RS485 or RS232 for multiple Mettler-Toledo, Sartorius, Ohaus scales, along with most other brands

Direct digital communications with Alicat Scientific gas flow controllers, as well as analog control of most other brands

Integration of existing control elements for temperature, pH, DO, and gas control

Automated Steam-in-Place

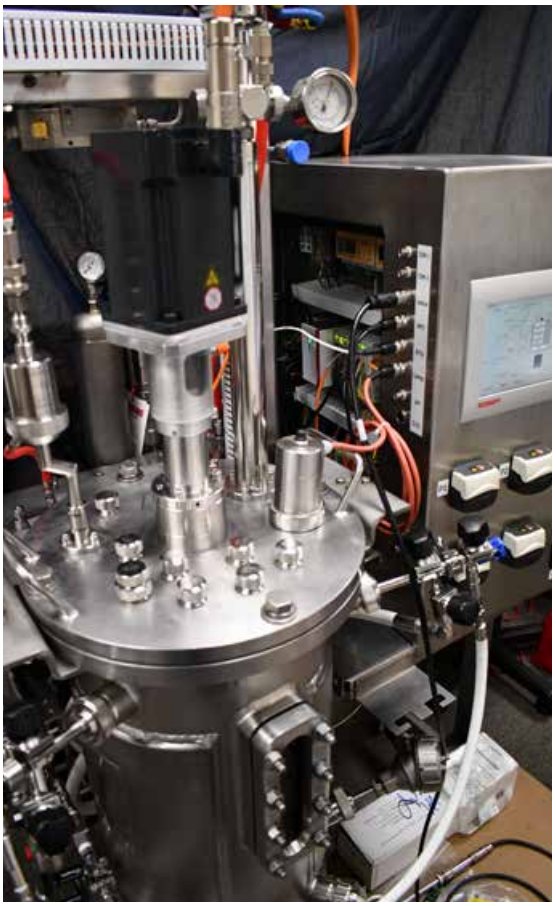
Multiple PID control loops including temperature, pH, DO cascade, & pressure

Built-in Watson Marlow variable speed pumps for pH control and nutrient feeds. Built-in control of external pumps as required.

Valve control elements including AC or DC solenoid valves, and a proportional control valve (PCV) for pressure control

Replacement stirrer motor provided

Built-in Modern OPC-UA Server software



AFC 2000 bioreactor controller designed to work with 40L Sartorius Biostat C reactor

AFC 3000 Control System

Fully Customized Solutions For Larger Reactors

The **AFC 3000** series is designed to replace retired, failing, and outdated controllers of larger SIP/CIP systems. Let ILS customize your controls with open, non-proprietary, commercially available quality components.

ILS will work with you to evaluate your existing reactor and design a replacement system that fits the needs of your lab.

Designs Typically Include:

- Custom Stainless Steel Enclosure
- New Variable Frequency Drive controls and motors
- Integration of automated valves
- Customized SIP Cycles
- Integration of existing sensor along with newer, current technology
- Full Integration with Batch Expert+

AFC 3000 semi-custom 1500L bioreactor controller

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