

## **Online Monitoring and Control**

**BIOPROCESS SOLUTIONS** 





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Thank you for considering YSI as your supplier of bioprocess monitoring and control solutions. As increasing consumer and regulatory demands mandate the need for safe, efficacious, low-cost biologically-derived products, it is imperative that robust, cost-effective manufacturing processes are developed for meeting the global demands of biopharmaceutical, biofuel and other industrial biotechnology commodities.

With over 40 years of providing rapid, accurate bio-analytical instruments, YSI Life Sciences has established a legacy of expertise in various industrial applications, including bioprocess monitoring and control. Our online monitoring and control solutions have been designed to help make your job easier, increase your process knowledge and improve your process efficiency.

YSI Life Sciences is here to support you. Our knowledgeable customer service and technical support staff can help with any instrument or application questions you may have.

Thank you for your interest in YSI and for reviewing our catalogue. Please contact us with any questions, comments or concerns. Your input is highly valued.

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William Miller | YSI Life Sciences, Product Manager

### bioprocess **Monitoring & Control**

#### Features at a Glance

Automated Bioreactor Sampling. Fully automated around-theclock process monitoring

Real-time Analysis. YSI's innovative biosensor technology and online monitoring systems assure rapid, accurate measurements of critical nutrients and metabolites in near real-time.

Flexibility. Interfaces with virtually any bioreactor size or type, including single-use systems.

**Scalability.** Scale-independent technology allows you to seamlessly scale-up your unit of operations, regardless of bioreactor size.

**Connectivity.** Connect to any bioreactor controller, SCADA, DAS or LIMS via analog (0-5V), serial (RS-232), ethernet or OPC communication.

**Aseptic Operation.** YSI monitoring systems ensure bioreactor sanitary environment is maintained through automated system sanitization and microfiltration sampling probes.

**Data Management.** Intuitive user interface allows various graphical displays, remote data access, data download and acquisition options.

**Feed control.** Online control of nutrients can be achieved with YSI's monitoring systems by direct communication to a feed pump, bioreactor feed control system or SCADA.

21 CFR, Part 11 compliance. Assures FDA regulatory compliance for electronic records.



**Applications** 

Cell Culture

Fermentation Cell Therapy

Process R&D

2900M

chemistries

2950M

2940 coming soon

chemistries

coming soon Monitor 8 vessels

Analyze up to 6

**OPC** Connectivity coming soon

OPC Data Management

**OPC Data Manager** 

chemistries

Software

2980

Monitor 1 vessel Analyze up to 2

Monitor 1 vessel Analyze up to 6 chemistries

Monitor 4 vessels Analyze up to 6

Process Optimization

Design of Experiments Continuous Processing

cGMP Manufacturing

2900M





# 2900M/2950M Online Monitoring & Control Systems

Our single-vessel systems are designed to provide simple and reliable online monitoring and control solutions for your bioreactor process. Closed loop monitoring and control capability are easily achieved for any scale of operation or type of bioreactor.

#### YSI 2900M/2950M

- Monitor up to 6 chemistries
- Analytical results in 60 seconds
- Graphical interface for easy viewing and menu navigation
- Simultaneous online monitoring and 96-well plate sampling
- Connectivity options for SCADA, DAS or LIMS
- Direct control of up to 2 feed pumps
- Automated cleaning cycle
- Autoclaveable components
- CIP and SIP compatible
- 21 CFR, Part 11 compliant
- GAMP<sup>®</sup> 5 compliant

#### Multiple Connectivity Options Include RS232, Analog (0-5V) and Ethernet





### 2900M/2950M Specifications

Aspirated Sample Volume: User-defined from 10 to 50 ul	Faramete
Analysis Time: 60 seconds	Giucose
Precision: Application specific, typical CV <2%	Glutamate
Linearity: +/- 5% Cal value to maximum	Glutamine
Dimensions: YSI 2900: 8"w x 20.5"d x 15.75"h   20.3cm w x 52.1cm d x 40cm h YSI 2950: 14"w x 20.5"d x 15.75"h   35.6cm w x 52.1cm d x 40cm h Bottle rack adds 9" (22.9cm)	Galactose Lactose
Weight: YSI 2900: 28 lbs /12 7 kg I YSI 2950: 39 lbs /17 7 kg (without bottle rack)	Sucrose
Working Environment: 15 to 35° C ambient temperature 10 to 75% relative humidity (noncondensing)	Choline Ethanol
Power Requirements: 100-120 VAC or 220-240 VAC, 50-60 Hz, 50 Watts nominal	Methanol
Regulatory Compliance: CE, RoHS	Hydrogen F
Automation: Up to 96 samples	Ammonium
21 CFR, Part 11: Compliant	Potassium*
2960 Online Monitor Specifications	*2950M only
Vessel Inputs: 1-channel Autosampler: 1 input	
Dimensions: 6.25"l x 4.75"w x 5.50"h	
Weight: 3.0 lbs	
Power Requirements: 90 - 264 VAC, 1.5 A, 47 - 63 Hz, 30 Watts nominal	
Regulatory Compliance: CE, RoHS	
Sample Flow Rate: 0.1 - 2.5 ml/min (user defined)	
Sample Interval: Time unit: minutes (user defined)	
Antiseptic Cycle: Time unit: minutes (user defined)	
Tubing ID: Sample inlet: 0.020" Peristaltic pump: 0.035" Pinch valve: 0.03" Waste: 0.10"	
Tubing Wetted Materials: Pharmed® tubing (peristaltic pump) C-flex® tubing (pinch valve) Silicone (sample inlet and waste lines)	
I/O Communication Interface Specifications	
Ethernet (FTP): 1 port	
Serial Communication (RS-232): 1 port	

Analog (0-5/10V): Selectable: +10.0 VDC or +5.0 VDC Capable communicating up to 2 chemistries/vessels

USB: 1 port

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### Questionaire

#### **CUSTOMER INFORMATION**

Name	
Company	
Email	
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#### **PROCESS INFORMATION**

- 1. Type of bioreactor process:
- \_\_Animal Cell Culture \_\_Insect Cell Culture
- \_\_Suspension Cell Culture \_\_Bacterial Fermentation
- \_\_Yeast Fermentation
- \_\_Fungal/Filamentous Bacterial Fermentation
- \_Continuous Process \_Other
- 2. Cultivation Method:
- 3. Process Duration:
- \_\_≤ 24 hours \_\_2 7 Days \_\_1 2 Weeks
- \_\_2 4 Weeks \_\_> 4 Weeks

#### 4. Process Working Volume:

- $\_$  ≤ 500 ml  $\_$  500 ml 1 L  $\_$  2 5 L  $\_$  6 10 L
- \_\_11 50 L \_\_51 200 L \_\_> 200 L \_\_Other
- 5. Process Operating Pressure:
- \_ psi/bar
- 6. Fermentation/Cell Culture Media:
- \_\_Chemically Defined \_\_Complex \_\_Other
- 7. Maximum Cell Density:
- \_\_OD/AU \_\_Dry Cell Weight \_\_Wet Cell Weight \_\_cells/ml
- 8. What is the viscosity of your culture/fermentation?
- \_\_≤ 1000 centipoise (cP) \_\_1000 3000 cP \_\_Other
- 9. Fermentation/Cell Culture Product Information:
- \_\_Intracellular \_\_Secreted
- If secreted, what is the molecular entity?\_\_\_\_\_

#### 10. Will YSI be required to perform feed control?

\_\_Yes lf yes, number of pumps/vessel?\_\_\_\_ No

Note: YSI feed control systems provide setpoint (feedback) control using either a PID control loop or simple threshold algorithm. For other feed control options, the YSI analyzer data can be communicated directly to your bioreactor controller or SCADA system using an anolog signal (0-5V), RS-232 communication or ethernet (FTP).

#### **VESSEL INFORMATION**

- **1. Type of bioreactor system:**
- \_\_\_\_\_Stainless steel stirred tank \_\_\_Glass stirred tank
- \_\_Single-use stirred bag \_\_Single-use wave bag
- \_\_Single-use Other\_
- \_\_Airlift bioreactor \_\_Hollow Fiber \_\_Other
- 2. Make/Model of bioreactor system:
- \_\_Sartorious \_\_Eppendorf/New Brunswick
- \_\_\_Eppendort/Dasgip \_\_Applikon \_\_HyClone SUB/SUF \_\_GE/
- Excellerex \_\_Broadley-James \_\_Other

#### 3. Vessel Total Volume:

- 4. How many vessels will be sampled?
- \_\_1-4 \_\_4-8
- 5. What is the vessel sample port size and type?
- \_\_12 mm Headplate \_\_19 mm Headplate
- \_\_19 mm Ingold
- \_\_25 mm Ingold (standard 40 mm port depth)
- \_\_25 mm Ingold (safety 52 mm port depth)
- \_\_\_Sanitary Fitting (1.5 inch tri-clamp)
- Other\_\_\_\_\_
- 6. What type of sample interface will the vessel have?
- \_\_\_Filtration Sample Probe (cell-free sampling)
- \_Dip Tube (cell-containing sampling)

#### Other\_

Note: As a best practice, YSI recommends the use of a filtration sample probe to prevent cell metabolism of the process sample as well as ensure bioreactor sterility.

7. What will be the maximum distance between the vessel and the YSI analyzer?

\_< 5 feet (1.5 meters) \_\_5 - 10 feet (1.5 - 3.0 meters)

#### Other\_

#### 8. What are the vessel sterilization/cleaning requirements?

Steam-in-place \_\_Clean-in-place \_\_Autoclave

Other\_

#### **PROCESS ANALYTICAL INFORMATION**

1. What analytes will be monitored by the YSI analyzer? Check all that apply:

- \_\_Glucose \_\_Galactose \_\_Glutamine \_\_Choline
- \_\_Sucrose \_\_Xylose \_\_Ethanol \_\_Ammonium
- \_\_Fructose \_\_Lactate \_\_Methanol \_\_Potassium
  - \_Lactose \_\_Glutamate \_\_Glycerol \_\_Hydrogen Peroxide
- 2. How frequently will the vessel need to be sampled?

\_\_< 15 minutes \_\_15 minutes \_\_30 minutes \_\_60 minutes</pre>

#### \_1 - 4 times per day

Other\_

3. Will manual samples be analyzed using the same instrument as the automated samples?

#### \_Yes \_\_No

4. Will sample dilution be required prior to conducting sample analysis ?

\_Yes \_No

5. If yes on #4, what dilution factor will be used?

Dilution factor =

4

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#### DATA MANAGEMENT INFORMATION

1. What type of bioprocess management/SCADA system will be used for process monitoring and control?

\_\_Sartorius BioPAT MFCS/win \_\_New Brunswick Biocommand

\_\_Dasgip Dasware \_\_Applikon BioXpert \_\_Delta Other

2. Does the process management/SCADA system have an OPC server or OPC client?

\_\_Yes - OPC Server \_\_Yes - OPC Client \_\_No

3. Does the process management/SCADA system have other I/O communication options?

\_\_Yes - analog 0-5V \_\_Yes - RS - 232

\_\_Yes - ethernet (TCP/IP or FTP)

4. Would you like the YSI analyzer to integrate the real-time analytical data into your bioprocess management or SCADA system?

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\_\_Yes \_\_No Additional Comments

### Order Guide

#### Step 1: Complete Online Monitoring & Control Questionnaire.

Completion of questionnaire assures correct YSI online monitoring system and configuration is ordered.

#### Step 2: Order Online Monitoring System.

All systems include required sample and communication interface hardware.

**2900M:** 1-channel online monitoring & control system for up to 2 chemistries. Includes 2900D, 2 Chemistry Analyzer, and 2960 online monitor & control accessory.

**2950M:** 1-channel online monitoring & control system for 2 - 6 chemistries. 2950D and 2960 must be ordered separately. Refer to YSI Biochemistry Analyzer Selection Guide for 2950D configuration.

#### Step 3: Order Accessories.

2932: IQ/OQ documentation package, 2900

Notes: Consult Online Monitoring & Control Questionnaire to determine quantity and accessory type.

### YSI Life Sciences Media



A wide range of application notes is available online for download **ysi.com**/lifesciences



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1725 Brannum Lane | Yellow Springs, Ohio 45387 Website: ysi.com | Email: support@ysi.com Telephone: (937) 767-7241 | Fax: (937) 767-9320 YSI Life Sciences develops and manufactures scientific instruments, sensors and systems that serve a variety of scientific and industrial markets worldwide. YSI has a long history in the life sciences and bioanalytical markets, most notably with our introduction of the world's first commercial whole blood glucose analyzer in 1975. Today there are over 10,000 YSI instruments installed around the world, trusted in critical situations to provide the most accurate data in the shortest time.

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