

# Bench scale and Pilot plant steam-in-place bioreactor systems

Applikon's concept of modularity (using standard modules to customize the functions of the bioreactor) is extended to the stainless steel pilot plant bioreactors as well. For scale up purposes the range of the Bio Bench and Pilot Systems, designed and built to the latest standards on hygienic processing and cGMP and GAMP validation requirements, complements the laboratory scale bioreactor systems. Scale-up from laboratory scale to pilot plant and small scale production is simplified by the consistent bioreactor design and the scalable control solutions. All systems are designed to be cleaned-in-place. Applikon offers CIP systems ranging from fully manual control to fully automated. Standardized bioreactor systems are available up to 140 liter total volume and custom build units can be supplied up to 2000 liter total volume.

## Features

- Easy to clean mirror polished external finish
- Electropolished finish of all parts in contact with the culture ( $Ra = 0.4 \mu m$ ) to allow efficient clean-in-place
- Modular design allows easy adaptation to changing process demands
- Magnetically coupled agitator for peace of mind
- cGMP compliant design simplifies validation
- Compact design reduces floor space needed
- Open frame construction gives easy access for maintenance and operation

## Applications

- Scale-up studies
- Medium optimization
- Process optimization
- Small scale production
- Microbial and Cell culture
- Batch, Fed-Batch, Perfusion and Continuous cultivation



## Specifications

|                           | Total volume (liter) | Working volume (liter) | Minimum working volume (liter) | Aspect ratio total volume | Aspect ratio working volume |
|---------------------------|----------------------|------------------------|--------------------------------|---------------------------|-----------------------------|
| 7 liter Bio Bench         | 7                    | 5                      | 2                              | 2.2                       | 1.5                         |
| 15 liter Bio Bench        | 15                   | 10                     | 4                              | 2.1                       | 1.4                         |
| 20 liter Bio Bench        | 20                   | 15                     | 4                              | 3.0                       | 2.2                         |
| 30 liter Bio Bench        | 30                   | 22.5                   | 7                              | 2.0                       | 1.6                         |
| 30 liter Pilot Cell       | 30                   | 20                     | 7.5                            | 1.5                       | 1.0                         |
| 60 liter Pilot Cell       | 60                   | 40                     | 10                             | 1.5                       | 1.0                         |
| 130 liter Pilot Cell      | 130                  | 100                    | 28                             | 1.5                       | 1.0                         |
| 20 liter Pilot Microbial  | 20                   | 15                     | 4                              | 3.0                       | 2.2                         |
| 40 liter Pilot Microbial  | 40                   | 30                     | 7.5                            | 3.0                       | 2.2                         |
| 70 liter Pilot Microbial  | 70                   | 50                     | 10                             | 3.0                       | 2.2                         |
| 140 liter Pilot Microbial | 140                  | 100                    | 20                             | 3.0                       | 2.2                         |

**Custom build bioreactor systems are available up to 2000 liter total volume**

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| <b>Drive system</b>                    | Direct drive, magnetically coupled, optional mechanical seal, bottom or top mounted agitator for microbial cultures and top mounted for cell culture systems   |
| <b>Maximum agitator tipspeed (m/s)</b> | 5 m/s for microbial cultures and 1 m/s for cell cultures   |
| <b>Impellers</b>                       | Rushton and marine with outside diameters 0.33 – 0.5 vessel diameter   |
| <b>Gas sparger</b>                     | Porous sparger or Ring-type sparger  |
| <b>Gas overlay</b>                     | Optional gas overlay line  |
| <b>Exhaust gas</b>                     | Water cooled exhaust gas condenser with internal spiral and/or jacketed  |
| <b>Sampling</b>                        | Optional resterilizable sample system in DN25 port in lower side wall  |
| <b>Draining</b>                        | Resterilizable bottom mounted bellows drain  |
| <b>Additions</b>                       | Sterilizable additions (push valves) and resterilizable addition ports   |
| <b>pH</b>                              | Measurement: 12 mm classic pH sensor in DN25 port in lower side wall<br>Control: via acid pump or CO <sub>2</sub> gas (rotameter or MFC) in combination with alkali pump   |
| <b>DO<sub>2</sub></b>                  | Measurement: 12 mm polarographic DO <sub>2</sub> sensor in DN25 port in lower side wall<br>Control: via a combination of N <sub>2</sub> , Air, O <sub>2</sub> (Rotameter or MFC) and agitation or nutrient addition pump |
| <b>Temperature</b>                     | Measurement: Pt-100 sensor in in DN25 port in lower side wall<br>Cultivation control: cooling and heating jacket via bioreactor wall   |
| <b>Foam</b>                            | Measurement: Height adjustable conductivity based foam sensor<br>Control: Anti foam addition pump  |
| <b>Level</b>                           | Measurement: Height adjustable conductivity based level sensor or loadcells in bioreactor frame<br>Control: pump for liquid addition or removal  |

