# Fermentors

## LiFlus GX / GM

- HIgh density fermentation
- Individually controlled 4 peristaltic pump for pH, DO, anti-foam and feeding
- Wide range vessels from 0.5 liter to 14 liter
- Easy control of external devices ($O_2$/$CO_2$ anlayzer, glucose analyzer, gas mixer, etc.)
- Data tracking and analysis through RS232
- Accurate PID temperature sensor
- Intelligent 7" wide color touch screen

### Various of vessels

Single vessel

Double vessel

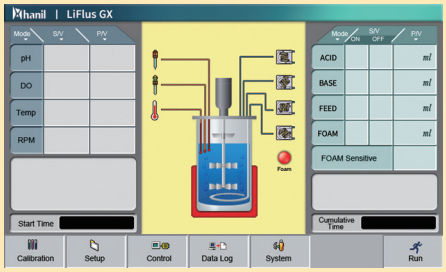
PBR vessel

Round bottom vessel

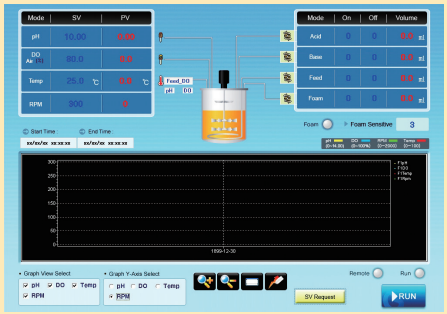
Bowl vessel

### Easy to use program control

Main control screen




PC monitoring software

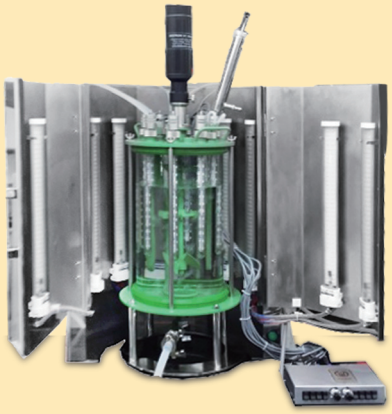


Specification

| Model | LiFlus GX | LiFlus GM |
|---|---|---|
| Type | Single | Multi |
| Display | 7 inch wide touch screen | |
| Agitation Range | 50~1,200 rpm | |
| Impellers | Rushton standard with fermentation /<br>Pitched blade standard with cell culture marine blade or spin filter | |
| Peristaltic pumps | 4 x built-in feeding pump | |
| Power Requirement | AC110~220V, 50/60 Hz, 500W | |
| Dimension (W x D x H) | 188 x 350 x 620 mm | |
| Weight | 15 Kg (controller only) | |
| Thermostat system | 8~70°C (±0.1°C) / Pt-100 probe heating & cooling PID control /<br>built-in heat exchanger / automatic cooling water valve | |
| Aeration | Ring sparger (round type), Air-flow meter (standard) or 2 gas and 4 gas Mixer (option) | |
| **Sensor** | | |
| Temp | 8~70°C | |
| pH | 2.0~12.0 pH of set point | |
| DO | 0~200%, DO cascade to Agitation | |
| Anti-foam | Conductivity type | |

# Photo Bioreactor

- Photosynthetic microorganism cultivation
- Various types of photo bioreactor (flat, α-type, pipe and etc.)
- LED illumination with full spectrum imitates natural sunlight by emitting light at 430 nm, 630 nm, white LED
- Easy to scale up



PBR Lab Scale

PBR Pilot Scale

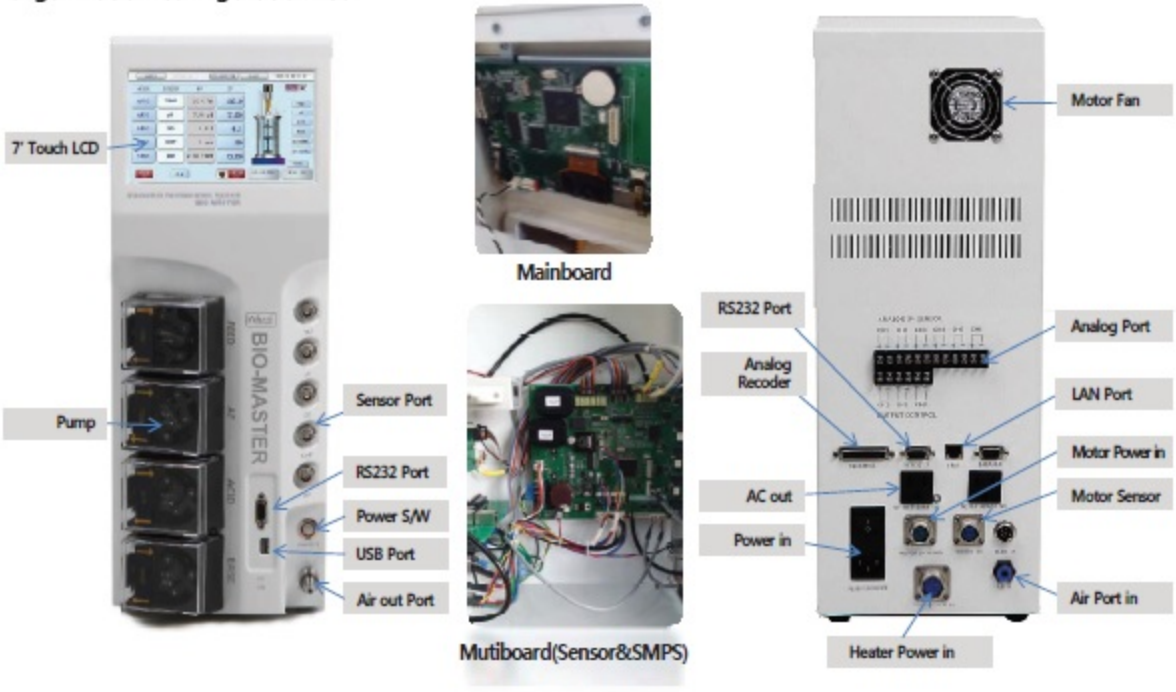
## Standard products

| | |
|---|---|
| Display | 7inch Wide Touch TFT LCD |
| Agitation Range | 10 ~ 1500rpm |
| Motor drive | AC Servo Motor, BLDC Motor / Top drive motor(mechanical drive) |
| Peristaltic Pumps | 4 x Built in Feeding Pump(Watsom Malow &Boxer) |
| Power Requirements | AC110~220V, 50/60Hz,Single Phase, 500W(FreeVoltage) |
| Dimension | W188mm x D350mm x H620mm |
| Weight | 10Kg (Controller Only) |

| | | |
|---|---|---|
| Sensor | Basic | TEMP<br>PH<br>DO<br>Anti Foam<br>ORP |
| | Optional | OD<br>O2<br>CO2<br>MFM or MFC<br>Pressure<br>Balancer |

| | | |
|---|---|---|
| Control System Control | Built-in SCADA System | - Built-in SCADA System<br>- Voltage Specifications : 90~260V 50/60Hz Free Voltage<br>- Built-in type SMPS Module UL certification.<br>- CE product certification to enable component selection and PCB ARTWORK.<br>- PWM frequency control AC Servo Motor, Ac induction Motor, BLDC Motor and is, slow down as fast and smooth implementation.<br>- RS232 x 2, RS422 or RS485 communication port, USB port, apply<br>- Analog Input: 12 points, analog output: 12 points, analog record: 12 points<br>- Temp. PH, DO Cascade,ORP,OD,O2,Co2,Agitation,MFC,Pressure Balancer Control |
| Communication port | Ethenet | 1PC 6-8 connected to one controller (after completion of standard controller progress) Data logging, trend graph PC Contorl: process control (PID, the upper and lower values , programs, cascade, Feed) |
| | Record Output | Each sensor can be output by selecting data. D-SUB 25Pin Female Type, USB Excel file stored separately. |
| | USB | Measured data, setup data stored in the USB |

## Organization configuration list



## specifications

| | | |
|---|---|---|
| Vessel | Type | Single & Double 500ml~14L Total Vol. STS316L Top Plate Vessel, Borosilicate glass Autoclavable<br>pH, DO, Foam,Level,Pressure Probe, Addition Ports, Exhaust Port, Baffles 316L,Condenser |
| Aeration | Flow rate | Rotameters : 0~5LPM |
| | Option | Mass Flow Controller / Mass Flow Manual |
| | Sparger | Standard : Ring Sparger/Micro Sparger |
| | Inlet Filter | 0.2㎛ Disposable Hydrophobic Filter |
| Agitation | Drive | Direct Top Drive Servo Motor 200W~400W,BLDC Motor / Single Mechanical seal |
| | Range | 10~1500rpm |
| | Impellers | Rushton Standard With Fermentation / Pitched Blade Standard With Cell Culture Marine Blade or Spin Filter |
| Temperature | Thermostat system | 0~150℃ ±0.1℃ / pt100Ω Probe Heating&Cooling PID Control / Built-in Heat Exchanger / Automatic Cooling Water Valve |
| pH | Range / Sensor | 0~14pH±0.01 / InPro 3030 / Mettler Toledo temperature range - 0 ~ 140°C, the maximum pressure - 6bar |
| DO | Range / Sensor | 0 to 200%, accuracy 1% or 4ppb, 0.0 ~ 100.0% O2, maximum pressure - 12bar<br>PID Control DO Cascade to Agitation, Mas Flow Control, Feeding Pump Control Polarographic<br>Galvanic Oxygen Sensor -> Mettler Toledo |
| ORP | Range / Sensor | Measuring range - 1000 ~ -1000 mv, Temperature range - 0 ~ 140°C, the maximum, pressure - 2.5bar (Redox potential -><br>Oxidation of measurements) / Mettler Toledo |
| Anti Foam | Range / Sensor | Conductivity 0 ~ 300kΩ (Measuring the amount of foam) |
| OD (Optional) | Range / Sensor | Measuring range 0 ... 100 EBC 0 ... 100 EBC0 ... 400 FTU (Turbidity measurement) |
| MFM or MFC (Optional) | Range / Sensor | 0~5 l/min (Air flow measurement) / MFC(FCM-0005AIH61AN1K) |
| O2, CO2 (Optional) | Range / Sensor | **Concentration ranges :**<br>1. CO2: 0 - 10 Vol.%, O2: 0.1 - 25 Vol.%<br>2. CO2: 0 - 25 Vol.%, O2: 0.1 - 25 Vol.%<br>3. CO2: 0 - 10 Vol.%, O2: 1 - 50 Vol.%<br>4. CO2: 0 - 25 Vol.%, O2: 1 - 50 Vol.%<br>**Measuring principle :**<br>IR(CO2), ZrO2 (O2)<br>**Temperature inside of the sensor unit :**<br>580°C/1076°F (O2 sensor unit) |
| Feed Control Mode | Control | Fed-Batch Culture by DO,pH Interlock pump Control 4 x Built-in Feeding Pump(Watsom-Malow :<br>England) External pump 2ea |
| Level Control (Optional) | Control | Electrode type Hi/Low Level control |
| Balancer (Optional) | Controll | 9,999.99g / RS232C Measured by the amount of weight on the scale output |

# Accessory

## Single Vessel

- Basic vessel for microorganism fermentation
- High-speed agitation by applying durable Tob Drive Motor
- Single glass type : Pyrex / Stainless 316
- Temperature control : Heater plate in underbody, coldfinger(from 3L) inside

| Volume | Order No. | Description |
|---|---|---|
| Single 1.5L | 101 0102 | I.D 115mm, V.H 170mm, 1:1.5 |
| Single 3L | 101 0103 | I.D 133mm, V.H 220mm, 1:1.7 |
| Single 5L | 101 0104 | I.D 170mm, V.H 220mm, 1:1.3 |
| Single 7L | 101 0105 | I.D 170mm, V.H 310mm, 1:1.8 |
| Single 10 | 101 0106 | I.D 190mm, V.H 355mm, 1:1.8 |

## 500ml Single Vessel

- Small vessel for microorganism fermentation
- High-speed agitation by applying durable Tob Drive Motor
- Single glass type : Pyrex / Stainless 316
- Temperature control: Heater plate in underbody
- Applied pH, DO, Inoculum port on side wall

| Volume | Order No. | Description |
|---|---|---|
| Single 500ml | 101 0101 | I.D 85mm, V.H 120mm |

## Double Vessel

- Double glass type vessel
- Circulating water in double jacket for effective temperature control by large contact surface
- Connected to extra Water Bath for temperature control

| Volume | Order No. | Description |
|---|---|---|
| Double 1.5L | 101 0201 | I.D 110mm, V.H 150mm, 1:1.3 |
| Double 3L | 101 0202 | I.D 130mm, V.H 220mm, 1:1.7 |
| Double 5L | 101 0203 | I.D 145mm, V.H 300mm, 1:1.2 |
| Double 7L | 101 0204 | I.D 160mm, V.H 330mm, 1:1.7 |

## Bowl Vessel

- Stainless Double Jacket in upper body, Single Glass in under body
- Circulating water in double jacket for effective temperature control by large contact surface
- Connected to extra Water Bath for temperature

| Volume | Order No. | Description |
|---|---|---|
| Bowl 10L | 101 0301 | I.D 190mm, V.H 355mm, 1:1.8 |
| Bowl 14L | 101 0302 | I.D 190mm, V.H 500mm, 1:2.6 |

## Single Round Vessel

- Single round vessel: round type under body
- Temperature control: Glass surrounding heating blanket
- Usually applied in animal cell fermentation

| Volume | Order No. | Description |
|---|---|---|
| Single Round 2L | 101 0405 | I.D 115mm |
| Single Round 3L | 101 0402 | I.D 133mm |
| Single Round 5L | 101 0403 | I.D 170mm |
| Single Round 7L | 101 0404 | I.D 170mm |

## PBR Single Vessel

- Single vessel type, LED Bar inside to make growth by exposing light into algae
- LED inside / flourscent jacke

| Volume | Order No. | Description |
|---|---|---|
| Single 1.5L | 101 0102 | I.D 115mm, V.H 170mm, 1:1.5 |
| Single 3L | 101 0103 | I.D 133mm, V.H 220mm, 1:1.7 |
| Single 5L | 101 0104 | I.D 170mm, V.H 220mm, 1:1.3 |
| Single 7L | 101 0105 | I.D 170mm, V.H 310mm, 1:1.8 |
| Single 10 | 101 0106 | I.D 190mm, V.H 355mm, 1:1.8 |

## Rushton turbine impeller

- Rushton turbine impeller is located from middle to bottom and basically used to agitate liquid in vessel.
- It makes the flow to the same direction with turning radius and has features of paddle and propeller types to be available for high-speed rotation by minimizing resistance.
- General model to be used due to the highest ventilation efficiency

## Foam Breaker

- Installed in upper side of inside shaft, used in bursting fermentation foam.
- It is not used in the case of animal cell fermentation since there is barely any foam.
- 1 ea / 1 vessel

## Marine Impeller

- Applied to damageable cell
- It stirs liquid from down to up rotating in low-speed since it has the large surface of wings

## Hollowed Paddle Impeller

- It stirs liquid from up to down rotating in low-speed since it has the large surface of wings.
- Extra additional it