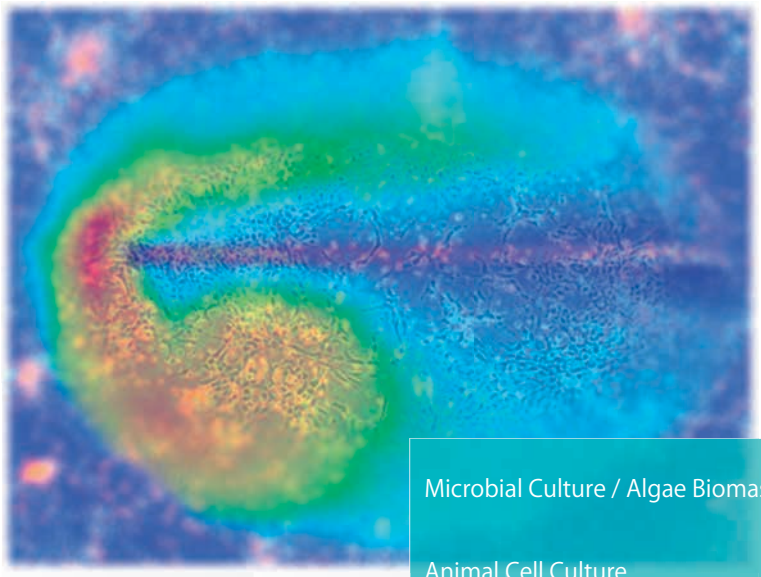
SATAKE MultiMix

Multi Bio System

Bioprocess Equipment Division

SATAKE BIOREACTOR SERIES

Satake Cell Culture Device General Catalogue



Microbial Culture / Algae Biomass

Animal Cell Culture

Regenerative Medicine / iPS Cell Culture / Stem Cell Culture

Next Stage

CAT.No. M-81E(106)

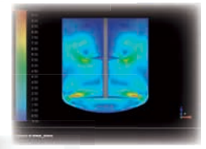
The key word is “Industrialization”. Satake proposes the most optimal “Cell Culture” from laboratory scale to production.

For 30 years since the establishment of our Mixing Technology Laboratory, Satake has been put endless efforts in mixing research and development, mainly focusing on “Flow and its Effect”. By applying these technologies to cell culture field, we succeeded in developing novel bioreactor that can create the most optimal environment for cell culture. As the top manufacturer of mixer with extensive knowledge and experience in mixing technology, we confident that our products will satisfy our customers. In addition, we have also built schemes to customize order-made bioreactor and cell culture systems by working together hand-in-hand with customers. Try it out as we are looking forward to serve you!

Line up

Outsourcing Service for Cell Culture
Outsourcing Service for Numerical Calculation using CFD

Feature of Satake Outsourcing Service for Cell Culture



We are fully equipped with a clean room (cell culture room) dedicated to contracted cell culture in our mixing technology laboratory in order to comply with the various demands of the customers including the “Inability to reproduce the results obtained in the laboratory when scale-up is performed”, “Failure to understand what to do even though optimization in production has been examined earlier”, and “Desire to confirm if buying a new BioReactor would really be effective”, etc. Also, through cooperation with external subcontractors, we are now in possession of equipment with which we can examine scale-up up to the max. 200 L class, equipment and fields with which we can evaluate iPS cell differentiation induction, and at the same time, we can perform operation with the combined use of CFD simulation and contracted numerical fluid calculation, and provide optimum services in line with customers’ needs through our knowledge of the mixing technology cultivated for many years.

Introduction of Equipment Owned

【BioReactors】
- VMF reactor Liquid volume: Approx. 0.2 L to 8 L
- MRF reactor Liquid volume: Approx. 1 L to 6 L
  Two units can run simultaneously
- S-BOX(Controller) dissolved oxygen concentration(DO)、pH control
- SPG membrane sparger / sintering sparger

【Other】
- CO_2 incubator (two units) with shaker
- Centrifuge
- Clean bench
- High-pressure steam sterilizer
- Refrigerator-freezer (-20℃、5℃)
- Deep freezer (-80℃)
- Liquid nitrogen storage container
- Digital microscope (4 to 20 times)
- Optical microscope (4 to 20 times)

Cell handling result

【Cell culture of floating cells】
- CHO cells (Hamster ovary cells)
  CHO-S、CHO-K1、CHO-DG44、CHO 1-15500
- HL60 cells (Human acute myelogenous leukemia)
- U937 cells (Human histiocytic lymphoma)

【Cell culture of attached cells】
- HeLa cells (Human cervical cancer)
- Vero cells (African green monkey’s kidneys)
- MDCK cells (Canine kidneys)

【Various microbial culture】

【Counting of number of cells】
- Blood cell counting chamber
- Cell counter (TC20)

【Component analysis in culture supernatant】
- Multi-function biosensor (BF-7)
  Constituents such as glucose, lactic acid, glutamine, glutamic acid, ammonia, and others need to be discussed.
- Absorbance microplate reader (Multiskan GO)
  Lactate dehydrogenase (LDH) activity (The quantity of antibody needs to be discussed)

Flow contracted culture

① Prior meeting
- Confirmation of customer’s objective, cells, and culture method
- Explanation of equipment

② Quotation

③ Conclusion of an NDA
- Disclosure of detailed information, such as protocols, etc.
- Meeting about cell culture conditions

④ Grant of cell line

⑤ Cell culture experiment
- Counting of number of cells by sampling, analysis of cell culture liquid constituents
- If necessary, the cells and culture supernatant are sent after cell culture

⑥ Result report
- Submission of report, meeting about future course of action

Please contact our Bioprocess Equipment Division for more information. Contact number +81-48-471-9202 E-mail：bio@satake.co.jp

HSF Reactor

High-performance BioReactor with the high-efficiency turbine HS100 / high-discharge axial flow impeller HR100 as a standard

High-Efficiency Turbine, In-Tank Coil Heat Transmission Specs, Dedicated for Actual Machine Scale-up

JPN Pat. No.3919262

The HSF Reactor is a jar fermenter designed for comparatively low-viscosity microbe cultures, plant cell cultures, fungal-based cultures with high viscosity that show non-Newtonian properties, E. coli cultures, etc., in which target cells and bacterial cells have a comparatively strong shear factor, and cultures that require high OTR. It comes with the high-efficiency turbine HS100 and high-discharge axial flow impeller HR100 as a standard. Optimization is possible for scaling up to large-capacity tasks when paired with the S-BOX series controller for culture control.
An optional cooling chiller can be attached, and when using a heat transfer coil type similar to the actual machine, you can achieve conditions that are closer to the actual machine. As a specialty manufacturer of mixing device with the only dedicated mixing technology laboratory in Japan, we can apply final optimizations for actual machine and customize the device according to the physical properties of its contents.

S-BOX X10 Simple
SATAKE INSTRUMENT SYSTEM

This is a simple and inexpensive control BOX that provides DO control/ph control using ON/OFF control. Please select depending on your purpose.

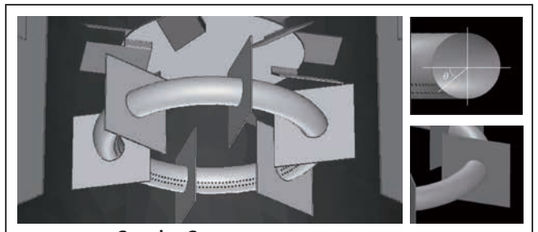
HSF-Reactor

Item		Specifications	
Name		HSF Reactor	
Model		HSF-3	HSF-10
Temp. control device		Band heater (PID control) with over-temperature protection function (Max. 80 [°C]) + (option : In-vessel coil heat exchanger)	
Power transmission		Magnet drive (non-sealing type)	
Gas supply type		Ring sparger (option : SATAKE sparger)	
Performance *1	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])	
	Temp. accuracy	±0.3 [°C] (37 [°C])	
	Rotational speed range	5 - 1500 [min^{-1}]	
Function	Temp. setting	Touch panel input, data output DC1 - 5 [V]	
	Speed setting	Touch panel input, data output DC0 - 10 [V]	
Configuration	Power of band heater	Max. 160 [W]	Max. 480 [W]
	Power of motor	Max. output 100 [W]	Max. output 400 [W]
	Mixing impellers	Super-Mix HS100 turbine + HR100 impeller	
Culture tank	Dimensions	I.D. 140 x Depth 203 [mm]	I.D. 200 x Depth 360 [mm]
	Culture operation volume	2.4 [L]	6 [L]
Usage condition		10 - 35 [°C]	
Outer dimensions		W360×D485×H905 [mm]	W360×D485×H980 [mm]
Weight		Approx. 30 [kg]	Approx. 34 [kg]
Power supply		AC100 [V], 50/60 [Hz]	

*1 The performance is the value under room temperature 20 [°C], power supply AC100 [V], 50 [Hz] and no load condition.

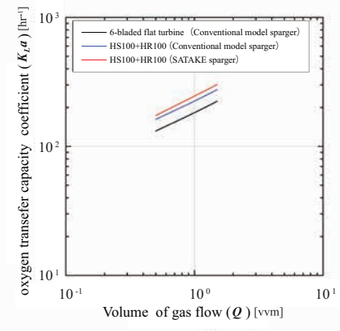
SATAKE Sparger

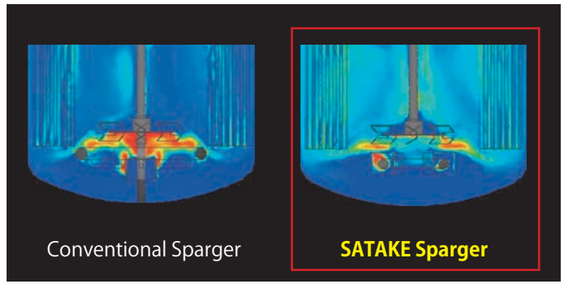
Further efficiency improvement is achieved by examining the whole equipment. We will customize and provide all technologies that assume scale-up.



Satake Sparger JPN Pat.No.6189202

The Satake Sparger is designed with gas discharge direction in mind so that aerated gas passes near the impeller, which is where the shearing field is located. Also, a stationary impeller is attached to the ring, and increasing the velocity gradient of the flow improves shearing and destructive action. Furthermore, the stationary impeller strengthens the discharge action. These actions efficiently disperse gases.





200kL-F culture tank simulation results
Gas-liquid multiphase flow gas fraction analysis

The Satake Sparger is effective when paired with the HS100. The synergistic effect with the optimized mixing impeller significantly improves the gas dispersion action, increasing gas absorption performance. (According to Satake Chemical test results)

S-BOX × 10 MC / S-BOX × 10 Simple

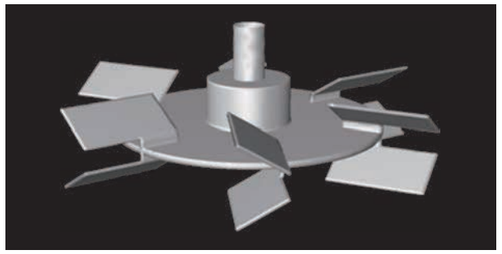
Item	Specifications							
Name	Culture controller				Culture controller			
Model	S-BOX × 10 MC				S-BOX×10 Simple			
Control	pH, DO (Dissolved oxygen), FL (O_2 flow rate), FL (Air flow rate), Pump				pH, DO (Dissolved oxygen)			
Display range/ accuracy	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	Display accuracy: ±0.5 [%] F.S.		pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	Display accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]			DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]		
	FL (O_2 flow rate)	0.4 - 10.0 [L/min]						
	FL (AIR flow rate)	0.4 - 20.0 [L/min]						
Setting range	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]			pH (Hydrogen ion concentration)	0.00 - 14.00 [−]		
	DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]			DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]		
	FL (O_2 flow rate)	0.4 - 10.0 [L/min]						
	FL (AIR flow rate)	0.4 - 20.0 [L/min]						
Control type	pH (Hydrogen ion concentration)	ON/OFF control			pH (Hydrogen ion concentration)	ON/OFF control		
	DO (Dissolved oxygen)				DO (Dissolved oxygen)			
	AF (antifoam)							
Data output	pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V]	Accuracy: ±0.5 [%] F.S.		pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V]	Accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)				DO (Dissolved oxygen)			
	FL (O_2 flow rate)							
	FL (AIR flow rate)							
	AF (antifoam)							
	Rotational speed	DC0 - 10 [V]			Rotational speed	DC0 - 10 [V]		
	Temperature sensor	DC1 - 5 [V]			Temperature sensor	DC1 - 5 [V]		
MTA of outer surface	SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification				SUS304 (no coating), indoor type, non-drip proof, non-explosion proof specification			
Installation	Indoor tabletop type				Indoor tabletop type			
Outer dimensions/weight	W260×D320×H400 [mm] ・ Approx. 15 [kg]				W260×D300×H350 [mm] ・ Approx. 12 [kg]			
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors	Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company				Optical DO sensor manufactured by Automatic System Research Co., Ltd.			
	(Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)				+ pH sensor manufactured by Mettler Toledo company			
Utilities	Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)			Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)		
	O_2	Flow rate 10 [L/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting			O_2	Flow rate 20 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting			CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	AIR (for pH)	Flow rate 5 [L/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting			AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	AIR (for DO)	Flow rate 20 [L/min] or lower (controlled with mass flow controller), supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting			*All of O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.			
	*All of O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.							

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

High performance turbine impeller and axial flow impeller are standard specifications

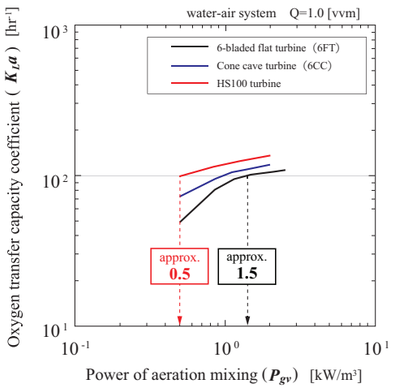
Further efficiency improvement is achieved by examining the whole equipment.We will customize and provide all technologies that assume scale-up.

HS100 turbine

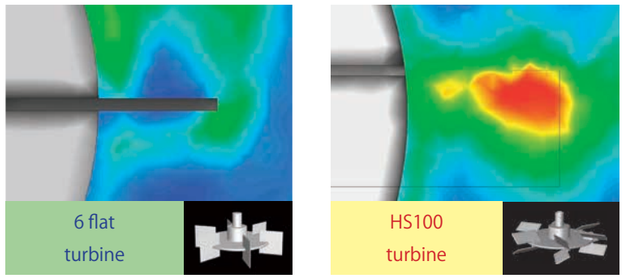


The HS100 turbine achieves an extremely low power number (Power number ratio to 6FT: approx. 65% reduction). Liquid fluidizing action is improved compared to conventional turbines, along with high-performance gas absorption (KLa). Impeller lift at low power creates more focused flow, utilizing pressure gradients and fluctuations of the discharge field to produce powerful shearing and destructive action. When paired with the high-discharge type HR100 Impeller, this impeller achieves overall incredibly highly efficient in-tank liquid fluidizing action, shearing, and destructive action (gas dispersion).

Comparison of gas absorption performance (kLa)



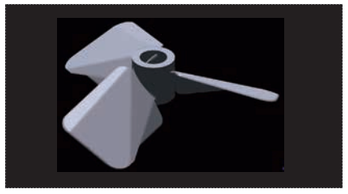
CFD flow analysis result near the blade (blade cross section)



The results of shear stress analysis in the vicinity of the blade under the same-energy (Pv-value) conditions show that the shear stress of HS100 is higher than 6FT in the discharge field.

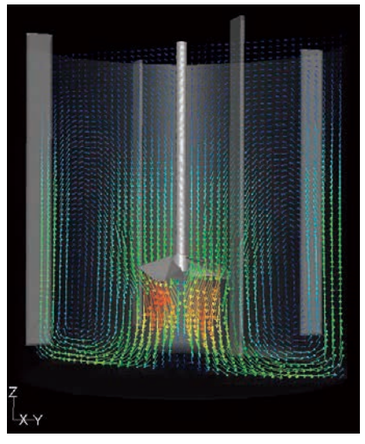
HR100 Impeller

High Discharge Axial Flow impeller for Ultimate Homogenization in Culture Tank. (combined with High-Efficiency Turbines)

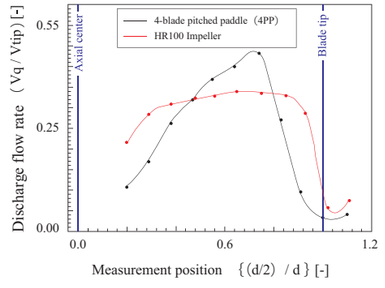


In addition to considerations regarding the plane shape of the impeller, the angle of attack, and the camber ratio, the HR100 Impeller features a multistage curved structure, and suppressing separation on the rear surface of the impeller results in an energy-saving, low-shear type axial flow impeller that boasts high discharge performance at low power. This product excels at liquid-liquid mixing, solid-liquid dispersion, uniform suspension of particles that are fragile and lightweight, emulsified micro-capsules (latex, etc.), and is effective in combinations that utilize superior axial fluidizing action in multi-stage mixing.

Flow pattern of the HR100 Impeller

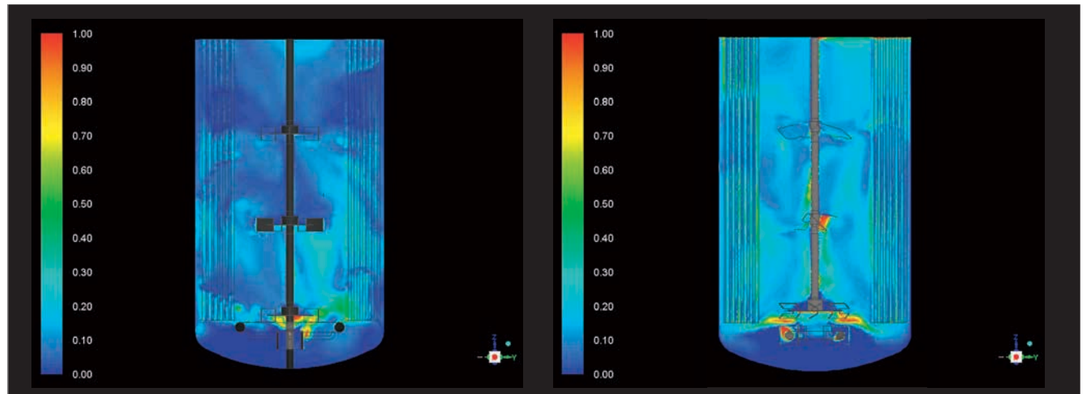


Discharge performance by LDV (compared with conventional 4PP model)



【Test conditions】
Tank dia.：D Impeller dia.：d Rotation speed：N
Vertical axis：Discharge velocity(Vq) / Blade tip velocity(Vtip)
Horizontal axis：Impeller radius
D=490mm d/D=0.3 N=300min^{-1}

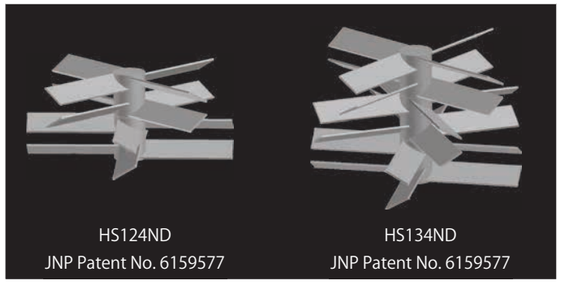
Example of 200 kL Actual Machine CFD Simulation Analysis



When using the conventional 6-bladed flat turbine in multi-stage within a culture tank, the flow is divided creating conditions that are not favorable to uniform dispersion inside the culture tank. With this in mind, a new, high-performance BioReactor is created by utilizing the flow action in the axial direction of high-discharge axial flow impeller HR100 on the top of the tank in combination with high-dispersion turbine HS100 on the bottom of the tank for gas dispersion action, resulting in uniform dispersion inside the culture tank and high-performance gas absorption. HSF reactors are suitable for lab-scale consideration from 3 to 10 L, and can also be scaled up to production machines (large capacity) at the same requirements.

Super-mix® HS124ND, HS134ND Turbine

Impellers to enhance the performance of gas



Ultra high-efficiency turbines HS124ND/HS134ND boast gas absorption performance that exceeds even that of the high-efficiency turbine HS100. The upper and lower impellers create effective discharge action, achieving a high level of gas absorption performance and required OTR. Technology that delivers the world's highest gas absorption performance and required OTR is available at laboratory scale in 200 - 300 kL-class actual machines.

Performance History of Large-size Culture Tank

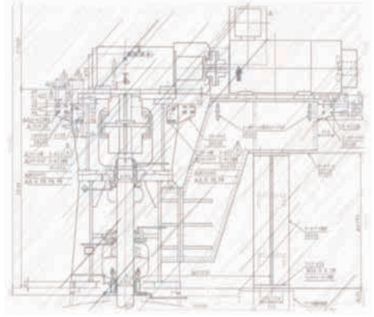
SATAKE takes pride in delivering many culture tanks from small size to large size. Here, we introduce an example of delivery records of large-size cell culture reactors (100 kl to 300 kl class).

If you want to order a culture tank as well, the same will be jointly handled by the tank manufacturer working together.

【Motor power】

- 600kW
- 490kW
- 485kW
- 480kW
- 470kW
- 430kW
- 130kW
- 110kW
- 90 kW

etc.



System development and customization for demand specification are also possible.
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Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

Animal cell culture / Microcarrier culture

MRF Reactor

Rotating type mixer for cell culture equipped with an MR210Bio impeller as a standard

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications

The MRF Reactor is a BioReactor for laboratory use that aim at actual production and scaling up. In addition to a "Simple shape with excellent cleaning ability" that is important for the actual equipment, the "MR210Bio impeller used exclusively for cell culture" that exhibits excellent mixing and homogenizing performance is provided as a standard, and therefore, similar culture results as during laboratory experiments can be reproduced during scale-up too. Moreover, fluid surface fluctuation (fed-batch culture) is supported, because of which the same mixing performance is exhibited no matter how much the liquid volume. A wide range of liquid volumes from small volumes like 1.5 L to large volumes of 20,000 L can be supported.
A dedicated controller "S-BOX × 10 α II "which can control DO,pH is provided. Moreover analog singnals can be input to data logger and record them.

Option Simplified controller S-BOX X10 Simple

This is a simple and inexpensive control BOX that provides DO control/ph control using ON/OFF control. Please select depending on your purpose.

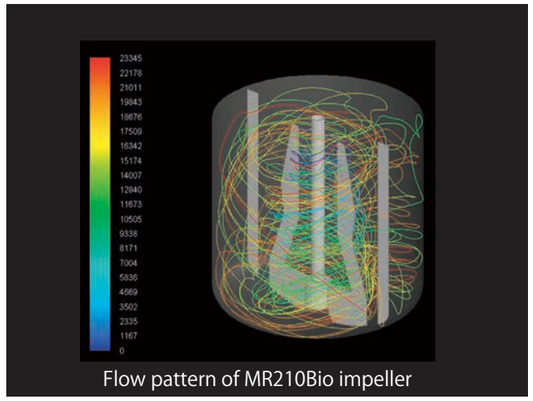
MRF-Reactor

Item		Specifications		
Name		MRF Reactor		
Model		MRF-3	MRF-8 (10 [%] Dish bottom head)	MRF-10
Temp. control device		Band heater (PID control) with over-temperature protection function (Max. 80 [°C])		
Power transmission		Magnet drive (non-sealing type)		
Gas supply type		Shirasu porous glass (SPG) membrane type / sintered metal type (selectable)		
Performance *1	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])		
	Temp. accuracy	±0.3 [°C] (37 [°C])		
	Rotational speed range	5 - 200 [min^{-1}]		
Function	Temp. setting	Touch panel input, data output DC1 - 5 [V]		
	Speed setting	Touch panel input, data output DC0 - 10 [V]		
Configuration	Power of band heater	Max. 160 [W]	Max. 480 [W]	Max. 480 [W]
	Power of motor	Max. output 100 [W]		
	Mixing impeller	Super-Mix MR210Bio impeller		
Culture tank	Dimensions	I.D. 140 x Depth 203 [mm]	I.D. 200 x Depth 330 [mm]	I.D. 200 x Depth 360 [mm]
	Culture operation volume	2.4 [L]	6 [L] (10 [%] Dish bottom head)	7 [L]
Usage condition		10 - 35 [°C]		
Outer dimensions		W360 × D485 × H905 [mm]		
Weight		Approx. 30 [kg]	Approx. 34 [kg]	Approx. 34 [kg]
Power supply		AC100 [V], 50 /60 [Hz]		

*1 The performance is the value under room temperature 20 [°C], power supply AC100 [V], 50 [Hz] and no load condition.

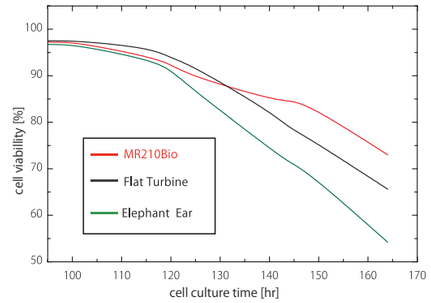
An environment that is best suited for cell culture is created through excellent mixing performance.

Flow condition inside culture tank



Flow pattern of MR210Bio impeller

Culture example



CFD Simulation Analysis Result

The "MR210Bio" impeller developed exclusively for cell culture produces a high circulating flow that runs from the low-pressure area at the bottom of the blades, where the mixing homogeneity inside the tank is high, toward the top of the tank. As a result of this feature, a high homogeneity and fluidity are obtained even at low power and low rotation, and at the same time, the basic flow pattern does not change even when the fluid surface fluctuates. It is known as an impeller used exclusively for cell culture that adapts to unsteadiness, which was not seen in the past in any impeller, and is suitable for operation under conditions where the fluid surface fluctuates as a result of fed-batch culture. A high circulation performance can be seen from the CFD simulation analysis results.

Comparison of the cell viability in the later stage of the culture by CHO cells

Here we show the cell viability in the later stage of the culture under the batch cell culture condition for the turbine type (flat turbine) and wide paddle type (elephant ear) impellers used in the conventional rotating type BioReactor. It can be confirmed that the MRF reactor maintains a higher cell viability than the other conventional impellers in the later stage of the culture. A characteristic of the MR210Bio that has a low shearing action and high mixing homogeneity performance is the realization of scale-up to a large-size reactor through the combined use of numerical fluid calculation.

S-BOX × 10 α II / S-BOX × 10 Simple

Item	Specifications							
Name	Culture controller				Culture controller			
Model	S-BOX×10αII				S-BOX×10 Simple			
Control	pH, DO (Dissolved oxygen), FL (O_2 flow rate), Pump				pH, DO (Dissolved oxygen)			
Display range/accuracy	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	Display accuracy: ±0.5 [%] F.S.		pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	Display accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]			DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]						
Setting range	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]			pH (Hydrogen ion concentration)	0.00 - 14.00 [−]		
	DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]			DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]						
Control type	pH (Hydrogen ion concentration)	ON/OFF control			pH (Hydrogen ion concentration)	ON/OFF control		
	DO (Dissolved oxygen)	O_2 addition/subtraction step control			DO (Dissolved oxygen)			
		O_2 and N_2 ON/OFF control						
		O_2 PI control (slope set method: TIME, %)						
	FL (O_2 flow rate)	PI control (slope set method: TIME, %)						
Data output	pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V]	Accuracy: ±0.5 [%] F.S.		pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V]	Accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)				DO (Dissolved oxygen)			
	FL (O_2 flow rate)							
	Rotational speed	DC0 - 10 [V]			Rotational speed	DC0 - 10 [V]		
	Temperature sensor	DC1 - 5 [V]			Temperature sensor	DC1 - 5 [V]		
MTA of outer surface	SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification				SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification			
Installation	Indoor tabletop type				Indoor tabletop type			
Outer dimensions/weight	W350×D400×H530 [mm] ・ Approx. 15 [kg]				W260×D300×H350 [mm] ・ Approx. 12 [kg]			
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors	Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company				Optical DO sensor manufactured by Automatic System Research Co., Ltd. + pH sensor manufactured by Mettler Toledo company			
	(Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)							
Utilities	Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)			Power supply	AC100[V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)		
	N_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], Connection port φ6 one touch tube fitting			O_2	Flow rate 20 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	O_2	Flow rate 20 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting			CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting			AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting			*All of O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.			
	*All of N_2, O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.							

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

MRF-RB Reactor

Low-shear, high-dispersion mixing system combined with the RB Mixing System

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications

JPN Pat. No.3578782
Other patents have been also applied or registered in japan or other countries.

The MRF-RB Reactor is a BioReactor developed as a high-performance mixers with equipped with the low-shear, high-efficiency Satake Super-mix® RB Mixing System that has been used in up to 3,000-ton class biomass reactors. It is a next-generation mixing system that utilizes the boundary layer effect and principles of tornadoes, offering uniform dispersion performance with superb low shearing and low power performance. In continuous culture applications with the basic condition that there is no liquid surface fluctuation, this product is optimal not only for algae cultures, but also animal cell cultures and regenerative medicine. It is extremely easy to scale up, making it optimal for production consideration during the research stage for the actual machine. It is also possible to customize for single use.

Option Simplified controller S-BOX X10 Simple

This is a simple and inexpensive control BOX that provides DO control/ph control using ON/OFF control. Please select depending on your purpose.

MRF-RB Reactor

Item		Specifications	
Name		MRF-RB Reactor	
Model		MRF-RB-3	MRF-RB-10
Temp. control device		Band heater (PID control) with over-temperature protection function (Max. 80 [°C])	
Power transmission		Magnet drive (non-sealing type)	
Gas supply type		Shirasu porous glass (SPG) membrane type / sintered metal type (selectable)	
Performance *1	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])	
	Temp. accuracy	±0.3 [°C] (37 [°C])	
	Rotational speed range	5 - 200 [min^{-1}]	
Function	Temp. setting	Touch panel input, data output DC1 - 5 [V]	
	Speed setting	Touch panel input, data output DC0 - 10 [V]	
Configuration	Power of band heater	Max. 160 [W]	Max. 480 [W]
	Power of motor	Max. output 100 [W]	
	Mixing impeller	RB Mixing System	
Culture tank	Dimensions	I.D. 140 x Depth 203 [mm]	I.D. 200 x Depth 360 [mm]
	Culture operation volume	2.4 [L]	7 [L]
Usage condition		10 - 35 [°C]	
Outer dimensions		W360×D485×H905 [mm]	
Weight		Approx. 30 [kg]	Approx. 34 [kg]
Power supply		AC100 [V], 50/60 [Hz]	

*1 The performance is the value under room temperature 20 [°C], power supply AC100 [V], 50 [Hz] and no load condition.

Low-power, low shear action continuous BioReactor equipped with high-efficiency mixing system

RB Mixing System

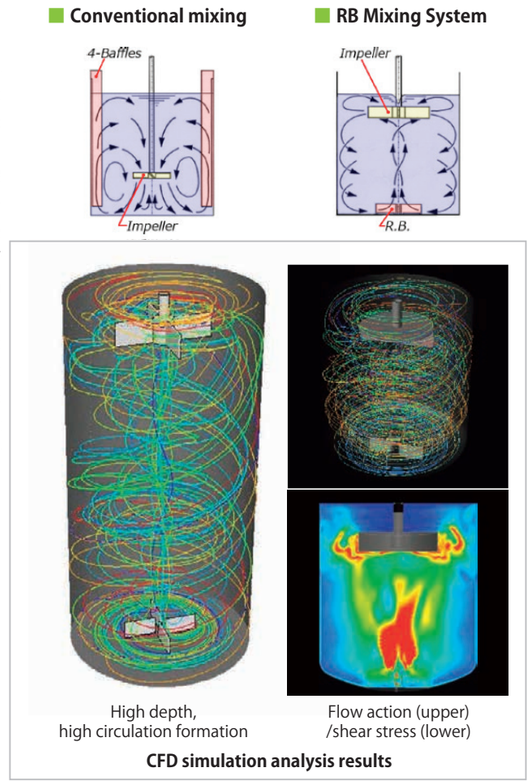
RB Mixing system

In general, mixing is accomplished by using impellers to fluidize liquid. The role of impellers in the RB mixing system is not active mixing. The hint lies in natural flow and rectification action, and tornadoes, which are powerful enough to lift up houses. We wondered what the rectification action and tornado forces would create inside the mixing tank. The RB mixing system consists of an impeller, which generates a swirling flow inside the mixing tank, and radial blades that efficiently exchanges the swirling flow (boundary layer effect) toward the center at the bottom of the mixing tank with a tornado-shaped upward flow, forming a system that creates flow patterns that were unthinkable in conventional mixing. The "RB" in the name comes from its Radial Blade component. Because the swirling flow is the main flow, the relative velocity difference near the blade is diminished, creating an extremely low shear action and superb uniform cell dispersion inside the culture tank, resulting in efficient mixing for biochemicals, pharmaceuticals, energy generation (water treatment), and other applications.

Mixing method comparison table

※Vtip : Blade tip peripheral speed

Mixing method	Maximum upward flow velocity coefficient % (vs. Vtip* ratio)	Impeller/liquid relative velocity difference coefficient (shear velocity ratio)	Maximum possible mixing vertical ratio (depth H/tank diameter D)
SUPER-MIX RB mixing system	87	0.4	5 or more possible
Mixing with four baffle plates	30	0.8	Up to about 2
Mixing without baffle plates	15	0.4	Up to about 1.5



S-BOX × 10 α II / S-BOX × 10 Simple

Item	Specifications							
Name	Culture controller					Culture controller		
Model	S-BOX×10αII					S-BOX×10 Simple		
Control	pH, DO (Dissolved oxygen), FL (O_2 flow rate), Pump					pH, DO (Dissolved oxygen)		
Display range/accuracy	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	Display accuracy: ±0.5 [%] F.S.			pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	Display accuracy: ±0.5 [%] F.S.
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]				DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]	
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]						
Setting range	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]				pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	
	DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]				DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]	
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]						
Control type	pH (Hydrogen ion concentration)	ON/OFF control				pH (Hydrogen ion concentration)	ON/OFF control	
	DO (Dissolved oxygen)	O_2 addition/subtraction step control				DO (Dissolved oxygen)		
		O_2 and N_2 ON/OFF control						
		O_2 PI control (slope set method: TIME, %)						
	FL (O_2 flow rate)	PI control (slope set method: TIME, %)						
Data output	pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V]	Accuracy: ±0.5 [%] F.S.			pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V]	Accuracy: ±0.5 [%] F.S.
	DO (Dissolved oxygen)					DO (Dissolved oxygen)		
	FL (O_2 flow rate)							
	Rotational speed	DC0 - 10 [V]				Rotational speed	DC0 - 10 [V]	
	Temperature sensor	DC1 - 5 [V]				Temperature sensor	DC1 - 5 [V]	
MTA of outer surface	SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification					SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification		
Installation	Indoor tabletop type					Indoor tabletop type		
Outer dimensions/weight	W350×D400×H530 [mm] ・ Approx. 15 [kg]					W260×D300×H350 [mm] ・ Approx. 12 [kg]		
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)		Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors	Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company					Optical DO sensor manufactured by Automatic System Research Co., Ltd. + pH sensor manufactured by Mettler Toledo company		
	(Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)							
Utilities	Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)				Power supply	AC100[V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)		
	N_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], Connection port φ6 one touch tube fitting				O_2	Flow rate 20 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	O_2	Flow rate 20 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting				CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting				AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting				*All of O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.			
	*All of N_2, O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.								

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

VMF Reactor

Vertical reciprocating motion type mixer for cell culture

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications

The VMF Reactor is a vertical reciprocating motion type next-generation reciprocating mixer for cell culture that combines together excellent blending performance and gentle mixing. Unlike the general rotating type, severe shear stress control is possible. Moreover, a "completely enclosed structure" that does not require a complex rotating-axis seal mechanism is implemented. There is no threat of contamination or leakage, and it has a high level of sterility and cleanliness.

A dedicated controller "S-BOX × 10 α II "which can control DO,pH is provided. Moreover analog singnals can be input to data logger and record them. Through customization, up to eight machines in series are supported.

Option Dedicated controller with non-contact sensor **S-BOX X10α II NC**

This controller enables continuous DO and ph control with non-contact sensors, also applicable to single use.

Image source：Mettler-Toledo International Inc.

VMF Reactor

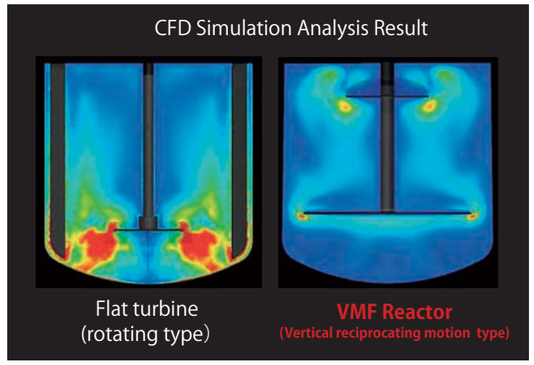
Item		Specifications			
Name		VMF Reactor			
Model		VMF-05	VMF-1	VMF-3	VMF-10
Temp. control device		Band heater (PID control) with over-temperature protection function (Max. 80 [°C])			
Power transmission		Linear shaft drive non-sealing type			
Gas supply type		Liquid surface gas absorption (option: sintered metal type)			
Performance *1	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])			
	Temp. accuracy	±0.3 [°C] (37 [°C])			
	Max. shaft stroke	40 [mm]			
	Max. shaft speed	300 [mm/s]			
Function	Temp. setting	Touch panel input, data output DC1 - 5 [V]			
	Vertical motion setting	Touch panel input, data output DC0 - 5 [V]			
Configuration	Power of band heater	Max. 60 [W]	Max. 105 [W]	Max. 160 [W]	Max. 480 [W]
	Power of motor	Max. output 800 [W]			
	Mixing impellers	VM200	VM100+VM200 *2		
Culture tank	Dimensions	I.D. 90 x Depth 200 [mm]	I.D. 110 x Depth 169 [mm]	I.D. 140 x Depth 203 [mm]	I.D. 200 x Depth 360 [mm]
	Culture operation volume	0.3 [L]	1.2 [L]	2.4 [L]	7 [L]
Usage condition		10 - 35 [°C]			
Outer dimensions		W360 × D485 × H905 [mm]			
Weight		Approx. 28 [kg]	Approx. 28 [kg]	Approx. 30 [kg]	Approx. 34 [kg]
Power supply		AC100 [V], 50/60 [Hz]			

*1 The performance is the value under room temperature 20 [°C], power supply AC100 [V], 50 [Hz] and no load condition.

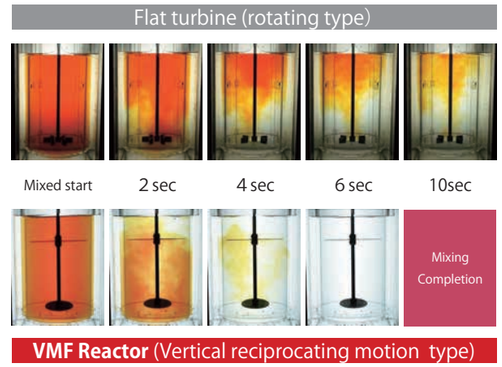
*2 Depending on the Culture operation volume, the only mixing impeller may be only the VM200.

Control of the shearing action and a good mixing action are both established, and an environment that is best suited for cell culture is created!!

Comparison of shear stress

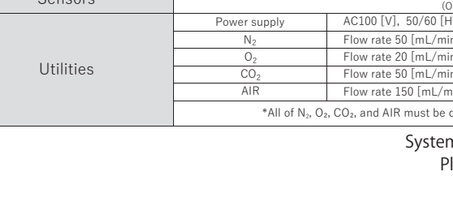


Comparison of mixing Performance (Pv=const.)



From the CFD simulation analysis results, it is clearly shown that, shear stress is more uniform in VMF reactor using novel vertical motion impeller, compared to the conventional reactor using the rotating type of flat turbine impeller.
Furthermore, comparison of mixing performance at similar power consumption showed that, complete mixing also can be reached.

Culture example



Comparison of cell culture by CHO cells

The VMF reactor provides cells with the optimal physical environment in the culture tank, creating a suitable tank environment for cell cultivation compared to rotational BioReactors, maintaining a high rate of living cells compared to MRF reactors.

Although this superior effect is weakened for cells that are resistant to shear damage, this product offers superior performance for cell culture that relies on shear damage. This results in increased productivity.

S-BOX × 10 α II

Item	Specifications			
Name	Culture controller			
Model	S-BOX × 10 α II			
Control	pH, DO (Dissolved oxygen), FL (O_2 flow rate), Pump			
Display range/accuracy	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]	Display accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]		
Setting range	pH (Hydrogen ion concentration)	0.00 - 14.00 [−]		
	DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]		
Control type	pH (Hydrogen ion concentration)	ON/OFF control		
	DO (Dissolved oxygen)	O_2 addition/subtraction step control		
		O_2 and N_2 ON/OFF control		
		O_2 PI control (slope set method: TIME, %)		
	FL (O_2 flow rate)	PI control (slope set method: TIME, %)		
Data output	pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V] (option : Load factor can be outputted.)	Accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)			
	FL (O_2 flow rate)			
	Mixing frequency			
	Temperature sensor	DC1 - 5 [V]		
MTA of outer surface	SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification			
Installation	Indoor tabletop type			
Outer dimensions/weight	W350 × D400 × H530 [mm] ・ Approx. 15 [kg]			
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors	Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company (Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)			
Utilities	Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)		
	N_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	O_2	Flow rate 20 [mL/min] or lower, supply pressure 0.2 [Mpa] connection port φ6 one touch tube fitting		
	CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	*All of N_2, O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.			

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

VerSus Reactor®

Collaboration of VMF Reactor/SPG membrane sparger

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications

JPN Pat.No.6534665
USA Pat.No. 10,799,841
Other patents have been also applied or registered in japan or other countries.

The VerSus Reactor is a new and innovative BioReactor for animal cell culture in which the technology of "SPG membrane sparger*" by which micro-bubbles with extremely high homogeneity can be generated is fused with a VMF Reactor. Through an efficient oxygen supply by the SPG membrane sparger, oxygen can be supplied efficiently without putting stress on the animal cells in the culture tank. Also, due to a decline in the DO air flow rate, a foam layer can be prevented. A decicated controller "S-BOX × 10 α II "which can control DO,pH is provided. Moreover analog singnals can be input to data logger and record them.

*SPG membrane sparger has been developed jointly by MIYAZAKI PREFECTURE INDUSTRIAL TECHNOLOGY CENTER and JGC Corporation.

Option Dedicated controller with non-contact sensor **S-BOX X10α II NC** SATAKE INSTRUMENT SYSTEM

This controller enables continuous DO and ph control with non-contact sensors, also applicable to single use.

Image source：Mettler-Toledo International Inc.

VerSus Reactor

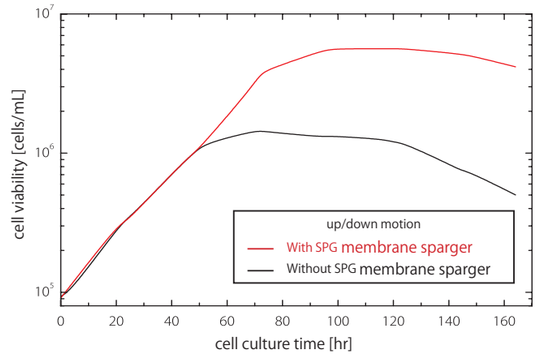
Item		Specifications			
Name		VerSus Reactor			
Model		VSR-05	VSR-1	VSR-3	VSR-10
Temp. control device		Band heater (PID control) with over-temperature protection function (Max. 80 [°C])			
Power transmission		Linear shaft drive non-sealing type			
Gas supply type		Shirasu porous glass (SPG) membrane type (additional option : sintered metal type)			
Performance *1	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])			
	Temp. accuracy	±0.3 [°C] (37 [°C])			
	Max. shaft stroke	40 [mm]			
	Max. shaft speed	300 [mm/s]			
Function	Temp. setting	Touch panel input, data output DC1 - 5 [V]			
	Vertical motion setting	Touch panel input, data output DC0 - 5 [V]			
Configuration	Power of band heater	60 [W]	105 [W]	160 [W]	480 [W]
	Power of motor	Max. power 800 [W]			
	Mixing impellers	VM200	VM100+VM200 *2		
Culture tank	Dimensions	I.D. 90 x Depth 200 [mm]	I.D. 110 x Depth 169 [mm]	I.D. 140 x Depth 203 [mm]	I.D. 200 x Depth 360 [mm]
	Culture operation volume	0.3 [L]	1.2 [L]	2.4 [L]	7 [L]
Usage condition		10 - 35 [°C]			
Outer dimensions		W360×D485×H905 [mm]			
Weight		Approx. 28 [kg]	Approx. 28 [kg]	Approx. 30 [kg]	Approx. 34 [kg]
Power supply		AC100 [V], 50/60 [Hz]			

*1 The performance is the value under room temperature 20 [°C], power supply AC100 [V], 50 [Hz] and no load condition.

*2 Depending on the Culture operation volume, the only mixing impeller may be only the VM200.

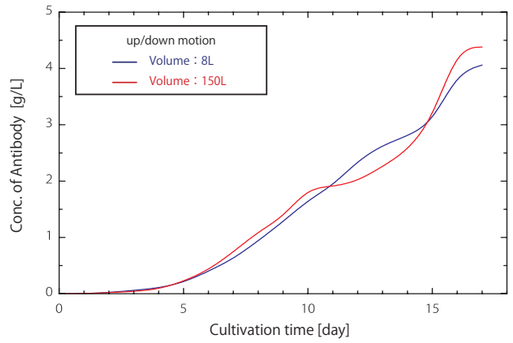
We promise further improvement in production efficiency with the "VerSus Reactor" which is a collaboration of the "VMF Reactor" that controls the physical action in the cell culture tank and "SPG membrane sparger", which is an excellent micro bubble technology.

Culture example



Comparison of cell viability by CHO cells

The growth curve of CHO cells based on the presence of SPG membrane sparger is shown by using the VMF reactor. It is understood that the culture results improves significantly by using the SPG membrane sparger. Due to micro-bubbles having extremely high homogeneity, the high gas absorption performance significantly reduces the DO air flow rate, which is the cause of formation of a foam layer, without disturbing the weak flow. VerSus reactor has a significantly improved total performance.



Comparison of production of antibodies by CHO cells

The result* of scale-up from the control quantity of 8 l to 150 l by using CHO cells having high dependability on the shear stress is shown below. Here, the actually commercially-available production of antibodies is undertaken. As a result, in the 150-l scale-up condition, either almost the same or more volume of production of antibodies than the control quantity of 8 l was obtained. This scale-up is performed by the numerical fluid calculation at a constant shear factor, and its advantage in the combined use of computational fluid dynamics and cell culture has been proved.

※ The result of joint research with JGC Corporation

S-BOX × 10 α II

Item	Specifications			
Name	Culture controller			
Model	S-BOX×10αII			
Control	pH, DO (Dissolved oxygen), FL (O_2 flow rate), Pump			
Display range/accuracy	pH (Hydrogen ion concentration)	0.00 - 14.00 [－]	Display accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]		
Setting range	pH (Hydrogen ion concentration)	0.00 - 14.00 [－]		
	DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]		
Control type	pH (Hydrogen ion concentration)	ON/OFF control		
	DO (Dissolved oxygen)	O_2 addition/subtraction step control		
		O_2 and N_2 ON/OFF control		
		O_2 PI control (slope set method: TIME, %)		
	FL (O_2 flow rate)	PI control (slope set method: TIME, %)		
Data output	pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V] (option : Load factor can be outputted.)	Accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)			
	FL (O_2 flow rate)			
	Mixing frequency			
	Temperature sensor	DC1 - 5 [V]		
MTA of outer surface	SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification			
Installation	Indoor tabletop type			
Outer dimensions/weight	W350×D400×H530 [mm] ・ Approx. 15 [kg]			
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors	Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company (Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)			
Utilities	Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)		
	N_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	O_2	Flow rate 20 [mL/min] or lower, supply pressure 0.2 [Mpa] connection port φ6 one touch tube fitting		
	CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	*All of N_2, O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.			

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

VMF-WSUB Reactor/TCS Controller

Equipped with weight management perfusion system for commercial regenerative medicine production

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications

Long-term continuous medium replacement and automated medium replacement are controllable!

JPN Pat.No.5702924
USA Pat.No. 8,246,242
Other patents have been also applied or registered in japan or other countries.

When using iPS cells in 3D floating undifferentiated culture for regenerative medicine, efficient culture medium replacement is important. By stopping the mixing BioReactor for culture medium replacement, cells settle to the bottom of the culture tank having the ability of arbitrarily sticking together on the spot. This process results in uneven cell aggregation (sphere diameter), sometimes adversely affecting induced differentiation efficiency. When induced differentiation is the goal, single cells are discharged along with the culture medium, making it necessary to modify the inside of the culture tank so that they are not affixed to the surface. To satisfy these requirements, clogs must be avoided and culture medium discharge must be stabilized over a long period of time. A control system is an important part of maintaining continuous, precise culture medium replacement. The VMF-WSUB / TCS system has achieved these goals and features specifications that are capable of actual production.

VMF-W Reactor

Item		Specifications	
Name		VMF-W Reactor	
Model		VMF-05W	VMF-3W
Temp. control device		Band heater (PID control) with over-temperature protection function (Max. 60 [°C])	
Power transmission		Linear shaft drive non-sealing type	
Gas supply type		Liquid surface gas absorption (option : sintered metal type)	
Performance *1	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])	
	Temp. accuracy	±0.3 [°C] (37 [°C])	
	Max. shaft stroke	40 [mm]	
	Max. shaft speed	300 [mm/s]	
Function	Temp. setting	Touch panel input, data output DC1 - 5 [V]	
	Vertical motion setting	Touch panel input, data output DC0 - 5 [V]	
Configuration	Power of band heater	60 [W] (Max. 60 [°C])	160 [W] (Max. 60 [°C])
	Power of motor	Max. power 800 [W]	
	Mixing impellers	VM200	VM100+VM200
Culture tank	Dimensions	I.D. 94/87 x Depth 110 [mm]	I.D. 159/138 x Depth 202 [mm]
	Culture operation volume	0.25 - 0.3 [L]	1.8 - 2.5 [L]
Usage condition		10 - 35 [°C]	
Outer dimensions		W360×D485×H905 [mm]	
Weight		Approx. 28 [kg]	Approx. 30 [kg]
Power supply		AC100 [V], 50/60 [Hz]	

*1 The performance is the value under room temperature 20 [°C], power supply AC100 [V], 50 [Hz] and no load condition.

Regenerative medicine / iPS Drug discovery / Low shear resistance cell

A perfusion system that makes long-term, continuous culturing possible!
Long-term, clog-free operation from undifferentiated cultures to differentiation!

Load cell for culture tank weight measurement

Mixing BioReactors experience frequent weight fluctuations, and this production system makes it possible to accurately gauge only the target weight inside the culture tank as well as culture medium replacement and perfusion control.

Culture medium replacement holder and membrane set MED-CH

This culture medium replacement holder and membrane set keeps the tank free from clogging for long periods of time and offers superb practical separation of cells and culture medium inside the tank.
There are several different types of membrane section depending on your purpose.

S-BOX × TCS

Item		Specifications		
Name		Culture controller		
Model		S-BOX×TCS		
Control		pH, DO (Dissolved oxygen), FL (O_2 flow rate), Pump ON/OFF		
Display range/accuracy	pH (Hydrogen ion concentration)	0.00 - 14.00 [–]		Display accuracy: ±0.5 [%] F.S.
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]		
	In-vessel weight	0 - 6118 [g]		
	Supply balance weight W1	-3200.00 - 3200.00 [g]		
	Discharge balance weight W2	-3200.00 - 3200.00 [g]		
	Supply pump speed P1	0.0 - 200.0 [min^{-1}]		
	Discharge pump speed P2	0.0 - 200.0 [min^{-1}]		
Setting range	pH (Hydrogen ion concentration)	0.00 - 14.00 [–]		
	DO (Dissolved oxygen)	0.00 - 10.00 [mg/L]		
	FL (O_2 flow rate)	0.00 - 20.00 [mL/min]		
	In-vessel weight	0 - 6118 [g]		
	Supply balance weight W1	-3200.00 - 3200.00 [g]		
	Discharge balance weight W2	-3200.00 - 3200.00 [g]		
	Supply pump speed P1	0.0 - 200.0 [min^{-1}]		
	Discharge pump speed P2	0.0 - 200.0 [min^{-1}]		
Control type	pH (Hydrogen ion concentration)	ON/OFF control		
	DO (Dissolved oxygen)	O_2 addition/subtraction step control		
		O_2 and N_2 ON/OFF control		
		O_2 PI control (slope set method: TIME, %)		
	FL (O_2 flow rate)	PI control (slope set method: TIME, %)		
	Fed-batch control (1)	Intermittent culture medium replacement control by in-vessel weight and roller pump		
		Continuous culture medium replacement control by in-vessel weight and roller pump		
	Fed-batch control (2)	Intermittent culture medium replacement control by culture medium supply/discharge balance weight and roller pump		
		Continuous culture medium replacement control by culture medium supply/discharge balance weight and roller pump		
Data output	pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V] (option : Load factor can be outputted.)		Accuracy: ±0.5 [%] F.S.
	DO (Dissolved oxygen)			
	FL (O_2 flow rate)			
	Mixing frequency			
	Temperature sensor	DC1 - 5 [V]		
	In-vessel weight	Digital input type		
	Supply/discharge balance weight			
	Supply/discharge pump speed			
MTA of outer surface		SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification		
Installation		Indoor tabletop type		
Outer dimensions/weight		W350×D400×H538 [mm] ・ Approx. 26 [kg]		
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors		Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company		
		(Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)		
Utilities	Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit and recorder)		
	N_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	O_2	Flow rate 20/50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
	AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port φ6 one touch tube fitting		
		*All of N_2, O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.		

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

HiD 4 × 4

3D floating iPS cell differentiation induction BioReactorr

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications

JPN Pat. No.5702924
USA Pat.No. 8,246,242
Other patents have been also applied or registered in japan or other countries.

The HiD 4 × 4 Reactor is the world's first "Single-use mixer for 3D floating cell cultures" used exclusively for iPS cell differentiation induction. A BioReactor that achieves a high-volume production of uniform and homogeneous iPS cells is indispensable not only in regenerative medicine, but also in the "Use of human iPS cells in drug development" that aims at industrialization and commercial production. By promoting joint research and development with excellent research institutes or companies in Japan, we have succeeded in commercialization an iPS cell differentiation induction BioReactor for the first time in the world. 4, 8, 12, and 16 (or even more) such BioReactors can be controlled in a consolidated manner, and these are also best suited for screening. Moreover, we have also taken into consideration the adaptation to ES cells while performing development. With the help of the dedicated controller "S-BOX × 02", changes in various parameters including PI control, and production control in accordance with the purpose can be performed.

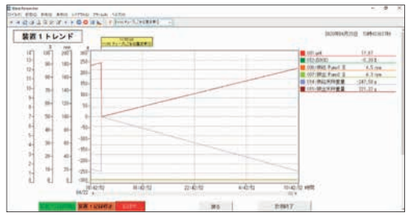
HiD 4 × 4

Item		Specifications			
Name		HiD4 × 4			
Model		HiD4-4			
Temp. control device		Hot plate + chiller / heating & cooling type (PID control) with over-temperature protection function			
Power transmission		Linear shaft drive non-sealing type			
Performance *1	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])			
	Temp. accuracy	±0.3 [°C] (37 [°C])			
	Max. shaft stroke	40 [mm]			
	Max. shaft speed	150 [mm/s]			
Function	Temp. setting	Touch panel input, data output DC1 - 5 [V]			
	Vertical motion setting	Touch panel input, (option : mixing frequency data output DC0 - 5 [V])			
Configuration	Power of hot plate	235 [W] × 4			
	Chiller	Cooling type, 450 [W], HFC R-404A			
	Power of motor	Max. output 800 [W]			
	Mixing impeller	VM200			
Culture tank	Dimensions	I.D. 94/87 x Depth 110 [mm]			
	Culture operation volume	0.25 - 0.3 [L]			
Usage condition		10 - 35[°C]			
Outer dimensions		Main unit (HiD4 × 4)	W680 × D480 × H914 [mm]	Chiller (SCA-32)	W205 × D405 × H545 [mm]
Weight		Main unit (HiD4 × 4)	Approx. 70 [kg]	Chiller (SCA-32)	Approx. 28 [kg]
Power supply		AC100 [V], 50/60 [Hz]			

*1 The performance is the value under room temperature 20 [°C], power supply AC100 [V], 50 [Hz] and no load condition.

Dedicated data logger / software

Using a dedicated data logger connected to a computer via Ethernet cable and Satake Chemical proprietary software, you can set an interval at which to acquire data on changes over time such as DO, pH, temperature, O_2 flow rate, frequency, and number of revolutions during culturing, which can then be saved in CSV format.



Data logger

Item		Specifications
Data gathering module GM10	Material	Polycarbonate
	Outer dimensions	W45.1 × D107.1 × H111 [mm]
	Weight	Approx. 0.25 [kg]
	Power supply	From GM90PS power supply module
	Power consumption	2.8 [W] or less
Power supply module GM90PS	Material	Polycarbonate
	Rated voltage	AC 100 - 240 [V]
	Outer dimensions	W88 × D126.7 × H135 [mm]
	Weight	Approx. 0.55 [kg]
Module base GM90MB	Material	Polycarbonate
	Outer dimensions	W57.7 × D103.5 × H135 [mm]
	Weight	Approx. 0.15 [kg]

Single-use bottle 0.5 L

This product features a 0.5 L single-use bottle as a standard, making it perfect for upscaling and commercial or industrial production. It is designed not only for safety, but with a focus on usability for more efficient culturing.

Various materials used in impellers, bottles, and bags

Materials conforming to USP Class VI (United States Pharmacopoeia Class 6) are used. All these materials have been developed jointly by Japan's material manufacturers. Since these are Made in Japan, we promise to provide a stable supply at all times even in small lots. There is no need to have a lot of Inventory due to the supply risk caused by overseas products.

Sterilized standard bottles

The bottles have already undergone EOG sterilization.
We have prepared certification for each lot.
An elution certificate can be provided (at an additional charge) upon request for production specifications.

S-BOX × 02

Item	Specifications			
Name	Culture controller			
Model	S-BOX × 02			
Control	pH, DO (Dissolved oxygen)			
Display range/accuracy	pH (Hydrogen ion concentration)	0.00 - 14.00 [–]	Display accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]		
Setting range	pH (Hydrogen ion concentration)	0.00 - 14.00 [–]		
	DO (Dissolved oxygen)	0.00 - 20.00 [mg/L]		
Control type	pH (Hydrogen ion concentration)	CO_2 ON/OFF control		
	DO (Dissolved oxygen)	O_2 ON/OFF control		
Data output	pH (Hydrogen ion concentration)	With data logger DC0 - 5 [V] (option : Mixing frequencyand Load factor can be outputted.)	Accuracy: ±0.5 [%] F.S.	
	DO (Dissolved oxygen)			
	Temperature sensor	With data logger DC1 - 5 [V]		
MTA of outer surface	SUS304 (no coating) , indoor type, non-waterproof, non-explosion proof specification			
Installation	Indoor stand-alone type			
Outer dimensions/weight	W600 × D500 × H914 [mm] *Does not include protrusions approx. 70 [kg]			
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors	Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company			
	(Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)			
Utilities	Power supply	AC100 [V], 50/60 [Hz], electrical outlet 2 gang (for main control unit, and laptop)		
	N_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port ϕ6 one touch tube fitting		
	O_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port ϕ6 one touch tube fitting		
	CO_2	Flow rate 50 [mL/min] or lower, supply pressure 0.2 [MPa], connection port ϕ6 one touch tube fitting		
	AIR	Flow rate 150 [mL/min] or lower, supply pressure 0.2 [MPa], connection port ϕ6 one touch tube fitting		
	*All of N_2, O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.			

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

Single-use BioReactor
VMF-50L/200L SUB

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications

SATAKE VMOVE MIXER VMF Single-Use Bioreactor

JPN Pat. No.5702924
USA Pat.No.8,246,242
Other patents have been also applied or registered in japan or other countries.

VMF-50L/200L SUB is Single-use Bioreactor for commercial production, and the lineup consists of models from 50 to 200L (development planned for up to 1,000L).Single-ues Bioreactor from 0.5 to 10L is tabletop type. On the other hand, VMF-50L/200L SUB applied for 50L and more is self-standing type. This is the largest model in the standard VMF reactor series and a commercial production device that is perfectly scalable, offering an unprecedented starting size of 0.5L.

※ Regarding to the tabletop type, please refer to VMF Reactor P12-13.

The S-BOX ×200 controller is included as a standard, offering full control over DO, pH, temperature, in-bag pressure, etc., and is equipped with four embedded pumps in a series, a dedicated internal digital data logger, Satake data logger software, and a BioReactor data collection system, etc. It also supports computerized system validation, and documents are provided for qualification confirmation during the design stage, during installation, and during operation. We also provide support for clients who are not accustomed to creating user requested specifications. We guarantee just-in-time supply in small lots of locally-manufactured single-use bags for sterilization validation.

We can meet various demands required for commercial production, so please feel free to contact us.

VMF-50L/200L SUB

Item		Specifications
Name		VMF Reactor
Model		VMF-50L SUB *1
Temp. control device		Rubber heater (PID control) with over-temperature protection function
Power transmission		Linear shaft drive non-sealing type
Gas supply type		Shirasu porous glass (SPG) membrane type / sintered metal type (selectable)
Performance *2	Temp. control range	Room temperature + 5 - 20 [°C] (normally set to 37 [°C])
	Temp. accuracy	±0.3 [°C] (37 [°C])
	Max. shaft stroke	100 [mm]
	Max. shaft speed	800 [mm/s]
Function	Temp. setting	S-BOX×200 Touch panel input
	Vertical motion setting	S-BOX×200 Touch panel input
Configuration	Power of rubber heater	1.5 [kW]
	Power of motor	Max. output 800 [W]
	Mixing impellers	VM100+VM200
Culture tank	Dimensions	I.D. 369 x Depth 650 [mm]
	Culture operation volume	40 - 45 [L]
Usage condition		10 - 35 [°C]
Outer dimensions		W780×D800×H2000 [mm]
Weight		Main unit approx. 135 [kg]
Power supply		Power is supplied from controller S-BOX × 200

*1 For VMF-200L SUB, please contact us for further information.

*2 The performance is the value under room temperature 20 [°C], power supply AC200 [V], 50 [Hz] and no load condition.

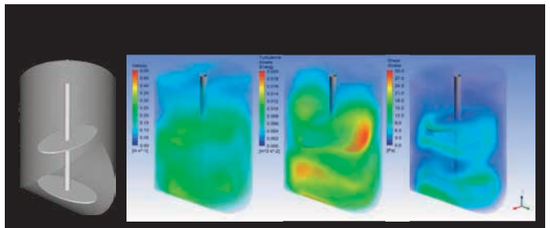
Each sensor

Each sensor is attached to the culture tank as shown in the photo. The DO and pH sensors are attached using a Thermo Fisher Scientific bioreactor probe assembly with a sterile AseptiQuik Connector from CPC. The temperature sensor is installed inside a silicone tube sheath. It enables accurate temperature readings of production equipment without injecting water into the sheath.

Bag for Single-use JNP Patent No.6313635

- A completely hermetically sealed construction ensures a contamination-free environment.
- Since this is a 100% local product, we can always provide a stable supply even in small lots.
- Since sterilization has already been performed,you need not perform washing and sterilization at the time of use.
- The bag, impeller, shaft, and tube, etc. use materials conforming to USP Class VI (United States Pharmacopoeia Class 6).
- The DO/pH sensor is attached after high-pressure steam sterilizer in an autoclave.
- An optional single-use pressure sensor is also available.

CFD simulation analysis results



Consideration of commercial production scale-up and utilization of numerical fluid calculation

S-BOX × 200

Item	Specifications			
Name	Culture controller			
Model	S-BOX × 200			
Control	pH, DO (Dissolved oxygen), FL (O_2 flow rate), TH (Temperature), Shaft motion, Medium weight, Pump ON/OFF			
Display range/accuracy	TH (Temperature)	0.0 - 150.0 [°C]	DO (Dissolved oxygen)	0.0 - 100.0 [%]
	Linear shaft (mixing)	Stroke 0-100 [mm], Speed setting 0-800 [mm/s]	FL (O_2 flow rate)	0.00 - 5.00 [L/min]
	pH (Hydrogen ion concentration)	0.00 - 14.00 [－]	Electronic balance (for culture medium supply)	0.1 [g] - 21 [kg]
Setting range	TH (Temperature)	0.0 - 60.0 [°C]	DO (Dissolved oxygen)	0.0 - 100.0 [%]
	Linear shaft (mixing)	Stroke 0-100 [mm], Speed setting 0-800 [mm/s]	FL (O_2 flow rate)	0.50 - 5.00 [L/min]
	pH (Hydrogen ion concentration)	0.00 - 14.00 [－]	Electronic balance (for culture medium supply)	0.1 [g] - 21 [kg]
Control type	TH (Temperature)	PI control (slope set method: TIME, %)		
	Linear shaft (mixing)	In-place control by shaft driver		
	pH (Hydrogen ion concentration)	ON/OFF control of CO_2 gas supply and alkaline water pump (selectable)		
	DO (Dissolved oxygen)	PI control (slope set method: TIME, %) Using mass flow controller		
	FL (O_2 flow rate)	PI control (slope set method: TIME, %)		
	FEED	ON/OFF control with FEED pump		
	Culture medium supply/discharge	Supply and discharge by electronic balances, culture medium supply, and discharge pumps		
Data output	pH (hydrogen ion concentration), DO (dissolved oxygen), FL (O_2 flow rate), temperature, (option: mixing frequency ,Load factor by data logger 10ch)			
MTA of outer surface	SUS304 (no coating) , indoor type, non-waterproof, non-explosion proof specification			
Installation	Indoor stand-alone type			
Outer dimensions/weight	Outer dimensions W550×D550×H1000 [mm] *Does not include protrusions approx. 90 [kg]			
Usage conditions	Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Sensors	Polarographic DO sensor/pH sensor manufactured by Mettler Toledo company			
	(Option: Optical DO sensor manufactured by Automatic System Research Co., Ltd.)			
Utilities	Power supply	1 [ϕ], AC200 [V], 30 [A] (2P + E, electrical outlet for 30 A hook-type plug) 1 gang		
	O_2	Flow rate 5 [L/min] or lower, supply pressure 0.2 [MPa], connection port ϕ6 one touch tube fitting		
	CO_2			
	AIR			
	*All of O_2, CO_2, and AIR must be dry and clean gases that do not contain corrosive components, dust, and oil mist.			

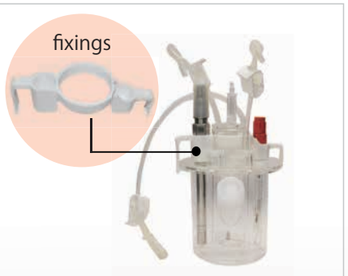
System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

Single-use Bottles/Single-use Bags

JPN Pat. No.6313635

In biomedical products, regenerative medicine, and other such areas, single-use products are preferable from the perspectives of increased productivity and prevention of contamination. At SATAKE, we provide single-use products with total capacities ranging from 0.5L to 200L (with plans to develop products of up to 1000L in capacity) to meet a wide range of needs. Our products achieve cell culture in a scalable manner from the laboratory to actual production.

Single-use Bottles



For DO/pH sensor
fixings (for reuse) included.

VMH-500
1-Stage Impeller
Operation volume: 0.25 - 0.3 L
(total capacity 0.5 L)

VMH-1000
1-Stage Impeller
Operation volume: 0.8 - 1.2 L
(total capacity 3 L)

VMH-3000
2-Stage Impeller
Operation volume: 1.8 - 2.5 L
(total capacity 3 L)

*The 0.5L single-use bottle is compatible with the "VMF Reactor VMF-05 and HiD4 × 4"
*The 3L single-use bottle is compatible with the" VMF Reactor VMF-3" and also with 2 to 8 optional devices connected .

Single-use Bags (3D)

VMB-10
Operation volume: 8 - 9 L
(Total capacity 10 L)

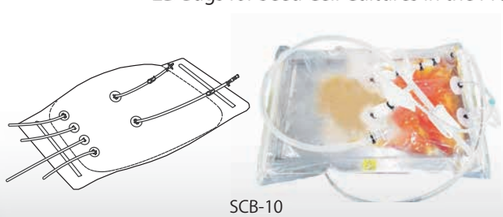
VMB-50
Operation volume: 40 - 45 L
(Total capacity 50 L)

VMB-200
Operation volume: 160~180 L
(Total capacity 200 L)

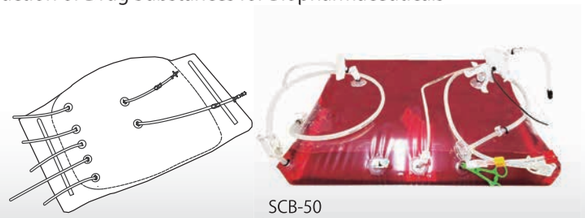
*The single-use bag is compatible with the "VMF Reactor VMF-10 and VMF Reactor VMF-50L / 200L SUB".

Single-use Bags (2D)

2D Bags for Seed Cell Cultures in the Production of Drug Substances for Biopharmaceuticals



SCB-10
Total capacity 10L



SCB-50
Total capacity 50L

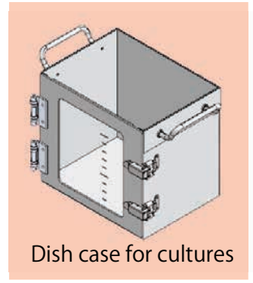
Single-use Bottles/Single-use Bags

Item	Specifications						
Name	Single-use Bottles		Single-use Bags (3D)			Single-use Bags (2D)	
Model	VMH-500	VMH-1000/3000	VMB-10	VMB-50	VMB-200	SCB-10	SCB-50
Culture operation volume	0.25 - 0.3 [L]	0.8 - 1.2/1.8 - 2.5 [L]	8 - 9 [L]	40 - 45 [L]	160 - 180 [L]	10 [L]	50 [L]
Dimensions	I.D. 94 (87) [mm]	I.D. 159 (138) [mm]	I.D. 206 [mm]	I.D. 369 [mm]	I.D. 590 [mm]	560×330 [mm]	740×705 [mm]
	Depth 110 [mm]	Depth 202 [mm]	Depth 360 [mm]	Depth 650 [mm]	Depth 1015 [mm]	(Outer dimensions)	(Outer dimensions)
Ports *1	Gas inlet/outlet, sampling, temperature sensor, DO sensor, pH sensor, culture medium replacement, inoculation port		Culture medium inlet/outlet, sampling, substrate inlet, cell inlet, air inlet/outlet, O_2 inlet, temperature sensor, DO sensor, pH sensor			Gas inlet/outlet, harvest, sampling, cell inlet, culture medium inlet, spare *2	

*1 The port equipped with the bag can be customized by consultation.
*2 Spare port only on SCB-50

Multipurpose Bag

This bag can be used for various purposes such as supply, discharge, and reagent use during continuous culture medium replacement. It can also be customized, so please feel free to inquire. γ-ray sterilization is employed to make this bag suitable for use with pharmaceuticals.



Dish case for cultures

Bottles/Bags with Single-use Sensors

Single-use sensors (DO, pH) made by Mettler Toledo - well-known for culture-related products - are pre-attached to the bottle/bag. These can be used without autoclave sterilization, enabling preparation time to be shortened. They are also perfect for contamination prevention.

Fitted as standard with a single-use DO sensor and pH sensor

InSUS_607

InSUS_310

Image source：Mettler-Toledo International Inc.

Various materials used in impellers,bottles, and bags

Materials conforming to USP Class VI (United States Pharmacopoeia Class 6) are used. All these materials have been developed jointly by Japan's material manufacturers. Since these are Made in Japan, we promise to provide a stable supply at all times.

Sterilized standard bottles and bags

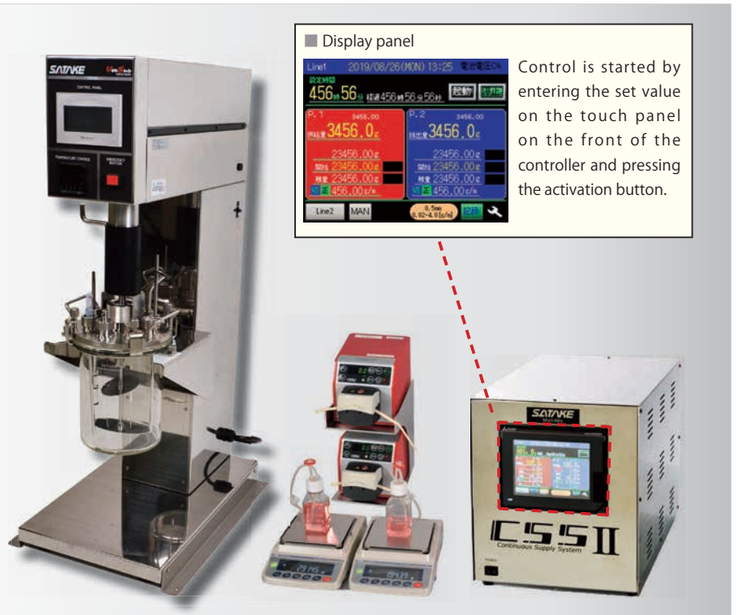
We prepare hard bottles and bags in the range of 0.5 to 200L. Since EOG sterilization for hard bottles, γ sterilization for bags has already been performed, you can start using these products as soon as you receive them. We have prepared certification for each lot.
Various testing has been conducted and conformity confirmed on each material used so you can use the products immediately without worry.

Proposal of application development and customization

The single-use bag product lineup has a maximum capacity of 200 L, but we can also support bags of 500 to 1000 L capacity according to the application.If you have a request for customized products that match the equipment, please contact us.

CSS II continuous culture and perfusion system connectable to Satake BioReactor

Development, Customization, and Single-use support of Exclusive Reactor in Accordance with Requirements Specifications



Various bioreactor

Accessories
Electronic balance・pump

Controller：CSS II

Patent pending

Culture medium replacement inside the culture tank utilizes the electronic balance and feed pump attached to the controller (CSS II) to supply culture medium at the set time and weight and simultaneously discharge the culture medium.
The feed pump automatically calculates the optimal number of revolutions from the set time, pump flow rate value (select the tube diameter) and current weight value of the electronic balance, and operation continues until the specified time. Additionally, the balance weight is monitored every 0.1 seconds during control operations, and the number of pump revolutions automatically changes. Control automatically stops once the specified time is reached. The standard included pump is generally used at medicine manufacturing sites and in culture laboratories: Watson-Marlow 120U/DV analogue control variable speed pump, and electronic balance: A&D GX3002A included as a standard.

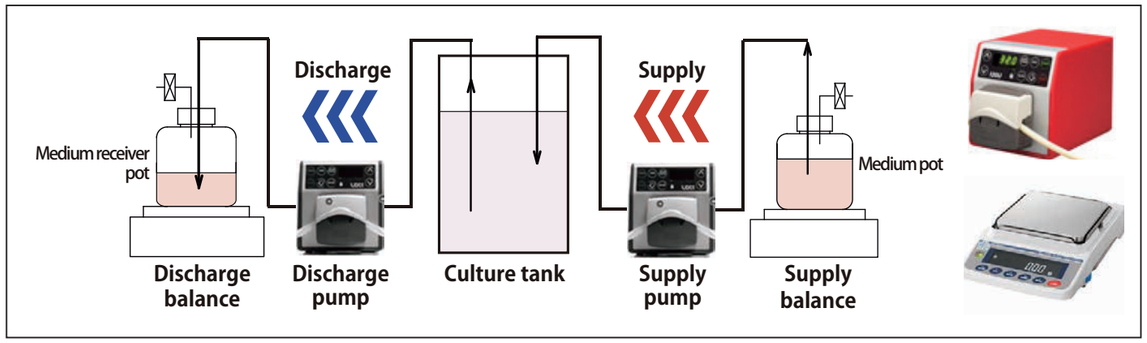
CSS II

Item		Specifications			
Name		Double Medium Replacement Controller			
Model		CSS II			
Display range	Supply balance weight W1	0.01 - 3200.00 [g] *The specification can be customized in accordance with customer's requirement.			
	Discharge balance weight W2				
	Supply balance weight W3				
	Discharge balance weight W4				
Setting range	Supply pump P1 supply volume	0.0 - 3200.00 [g] Display accuracy: ±0.5 [%] F.S. *The specification can be customized in accordance with customer's requirement.			
	Discharge pump P2 discharge volume				
	Supply pump P3 supply volume				
	Discharge pump P4 discharge volume				
	Culture medium supply / discharge time setting	1 [minute] ~ 9999 [hours] 99 [minutes]			
Control type	Culture medium supply	Continuous culture medium supply control by weight and fluid feed pump			
	Culture medium discharge				
Record Data	Balance weight	W1, W2, W3, W4			
	Pump discharge volume	P1, P2, P3, P4			
MTA of outer surface		SUS304 (no paint), Indoor type, non-waterproof, non-explosion proof specification			
Installation		Tabletop			
Outer dimensions/weight		W260×D400×H225 [mm] ・Approx. 10[kg]			
Usage conditions		Temperature	5 - 45 [°C]	Humidity	20 - 85 [%] RH (No condensation)
Electronic balance/pump		Electronic balance: A&D Company GX3002A x 2 (Option: GX-22001M)			
		Pump: Watson-Marlow 120U x 2			
Utilities		Power supply	AC100 [V], 50/60 [Hz] electrical outlet 9 gang (Main control unit, electronic balance x 4, fluid feed pump x 4)		

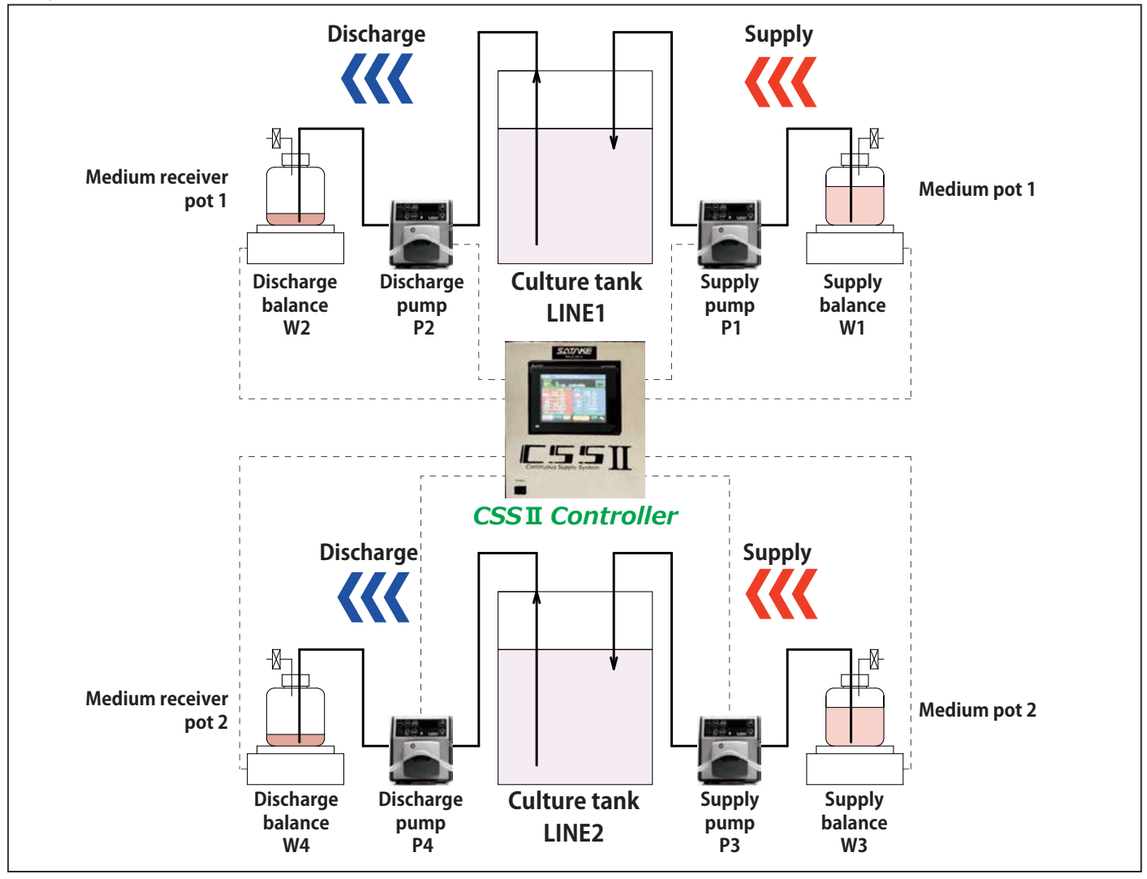
Introducing an example system

The continuous culture and perfusion system CSS II device flow and system flow are shown in the figure. Connecting the supply and discharge pump and electronic balance as shown in the figure enables automatic culture medium replacement. Additionally, a single CSS II can be used for culture medium replacement in two culture tanks.

Device flow



System flow



※ The supply and discharge of the system flow chart can be controlled up to 2 systems.

We also provide pump systems and perfusion systems tailored to customer needs.
Please feel free to contact us regarding specialized designs for actual production, such as a single balance/pump configuration, and liquid surface control to prevent adhesion during culturing and production while conducting perfusion.

Low-temperature Incubator SLI-4090

Use with SATAKE perfusion systems

Culture medium temperature meets temperature demands for 3 - 10℃

Laboratory Incubator

SLI-4090-C

This incubator keeps the culture medium stable at a low temperature when used with TCS and CSSII perfusion systems.There are two products in the lineup for use not only in labs but also in cell processing centers (CPC).
With an assumed culture medium temperature display function, this incubator enables more accurate temperature management than others.
A culture medium storage vessel smaller than Multipurpose Bag for 10L can be accommodated.

※ Regarding to Multipurpose Bag, Please refer to page 23.
※ A culture medium storage Bottle up to 2L vessel can be accommodated.

- Able to adjust culture medium temperature to any temperature between 3 - 10℃ ± 1.0℃ (ambient temperature 19℃)
- Equipped with frost removal function (once every 8 hours approx.)
- Equipped with automatic condensate evaporator function
- CPC model equipped with low pressure loss HEPA filter
- CPC model equipped with assumed culture medium temperature analog output function
- Equipped with culture medium supply tube holder

■ **SLI-4090-C**

Item	Specifications		
Name	Low-temperature Incubator		
Model	SLI-4090-C		
Usage conditions	Environment temp. range		+18 - 22 [°C] *1
	Power supply		AC100 [V], 50/60 [Hz] *2
	Rated current		5 [A]
	Installation space		Ensure space of at least 10 [cm] around the main unit
Temp. control	Internal temperature	Setting range	+3.0 - 10.0 [°C] *3
		Accuracy	±2.5 [°C] (at center of inside) *4
	Temp. display		Digital display (1. internal temperature display, 2. flask interior fluid assumed temperature display) *3, 5
	Temp. correction		Single point correction
	Cooling type		Refrigerator (freon gas R-134a filling volume 170 [g])
	Mixing type		Forced mixing by internal fan motor
Safety devices	Electric leakage, overcurrent circuit breaker, fuse, anti-icing thermostat *6		
Other functions	Defrosting function (forced stop of refrigerator for approx. 15 [mins] once every 8 [hours] approx.)		
	Automatic dew condensation water evaporation function		
	Hose holder for O.D. ϕ6 (installed at the bottom right side of interior entrance)		
	Left side surface of the unit has a ϕ36 connecting hole to the inside.		
Internal dimensions	W505×D386×H461 [mm]		
Outer dimensions	W600×D696×H643 [mm]		
Weight	Approx. 90[kg]		
Standard accessories	Power cable x 1 / fuse x 1 (in receptacle) / light plug x 1		

*1 Must be no condensation in main unit. May not fulfill product specifications at temperatures other than the above environmental temperatures.
*2 Voltage fluctuation tolerance ±10 [%]
*3 At shipment, the internal setting temperature are adjusted so that the assumed temperature of the liquid in the flask is within +6.0±1.0 [°C] (@19.0 [°C]).
*4 In the environment temp. 19 [°C]. This does not include temperature changes due to the defrosting function.
*5 The assumed temperature of the liquid in the flask is the temperature of the measuring rod located at the upper left rear corner of the chamber.
*6 Activates when an irregular low temperature is detected. Forces the cooler to stop when it activates (with automatic reactivation)

This incubator has an HEPA filter making it suitable for CPC use

SLI-4090-B

■ **SLI-4090-B**

Item	Specifications		
Name	Low-temperature Incubator		
Model	SLI-4090-B		
Usage conditions*1	Environment temp. range		+18 - 22 [°C] *2
	Power supply		AC100 [V], 50/60 [Hz] *3
	Rated current		5 [A]
	Installation space		Ensure space of at least 10cm around the main unit
Temp. control	Internal temperature	Setting range	+3.0 - 10.0 [°C] *4
		Accuracy	±2.5 [°C] (at center of inside) *5
	Temp. display		Digital display (1. internal temperature display, 2. flask interior fluid assumed temperature display) *4, 6
	Temp. correction		Single point correction
	Cooling type		Refrigerator (freon gas R-134a filling volume 170 [g])
	Mixing type		Forced mixing by internal fan motor
Safety devices	Electric leakage/overcurrent circuit breaker, fuse (built-in), sensor disconnection,		
	sample protection high/low temperature alarm (factory settings *7), safety device for built-in HEPA filter		
	(Circuit protector 1 [A], high temperature safety device 90 [°C])		
	Anti-icing thermostat *8		
Output to external *9	Temperature		Pt100 [Ω] sensor (-20 - 50 [°C]: 0 - 5 [V])
	Alarm		High/low temp. alarm output (normal: open, error: close / AC250 [V], 1 [A] resistive load)
Other functions	Defrosting function (forced stop of refrigerator for approx. 15 [mins] once every 8 [hours] approx.)		
	Automatic dew condensation water evaporation function		
	Hose holder for O.D. ϕ6 (installed at the bottom right side of interior entrance)		
	Left side surface of the unit has a ϕ36 connecting hole to the inside.		
HEPA filter	Low pressure loss HEPA filter 400 × 400 × t50 [mm]		
Air flow	Approx. 3.0 [㎥/min]		
Manostar gauge	Pressure range 0 - 300 [Pa]		
Internal dimensions	W505×D386×H461 [mm]		
Outer dimensions	W626×D696×H830 - 900 [mm]		
Weight	Approx. 110 [kg]		
Standard accessories	Power cable x 1 / fuse x 1 (in receptacle) / light plug x 1 / temperature sensor test report x1		

*1 Cleanliness class of the installation environment is ISO class 7 or higher.
*2 Must be no condensation in main unit. May not fulfill product specifications at temperatures other than the above environmental temperatures.
*3 Voltage fluctuation tolerance up to ±10 [%] When decontaminating the room, turn off the breaker of the main unit and put the cover to the refrigerator air inlet.
*4 At shipment, the internal setting temperature are adjusted so that the assumed temperature of the liquid in the flask is within +6.0±1.0 [°C] (@19.0 [°C]).
*5 In the environment temp. 19 [°C]. This does not include temperature changes due to the defrosting function.
*6 The assumed temperature of the liquid in the flask is the temperature of the measuring rod located at the upper left rear corner of the chamber
*7 Sample material protect alarm setting: low temperature -5 [°C]/high temperature 20 [°C]
*8 Activates when an irregular low temperature is detected. Forces the cooler to stop when it activates (with automatic reactivation)
*9 2[m] cable from main unit, cable terminal: Y terminal
・High/low temperature alarm (normal: open, error: close (line color: black/green))
・External temperature data (0 - 5 [V], line color: red/white)

Option parts

Optional items that can be connected to Satake BioReactors

■ Aeration unit

This unit is equipped with a compressor for easy air supply to a compact culture tank.

【Feature】

- Compact size for easy installation even in narrow spaces.
- Lightweight for air tank-style installations, eliminating the need to find installation locations.

■ Aeration unit

Item			Specifications			
Name			Aeration Unit			
Model			SAU-3505	SAU-3525	SAU8050	SAU80100
Performance	Flow meter*		50 - 500 [NmL/min]	0.2 - 2.5 [NL/min]	0.5 - 5 [NL/min]	1.0 - 10 [NL/min]
	Compressor	Rated pressure	6.86×10^4 [Pa] (0.7 [kgf･cm^2])		9.81×10^4 [Pa] (1.0 [kgf･cm^2])	
		Rated flow rate	3.5 [L/min]		8 [L/min]	
		Max. pressure	9.81×10^4 [Pa] (1.0 [kgf･cm^2])		1.47×10^5 [Pa] (1.5 [kgf･cm^2])	
Configuration	Flow rate adjustment		Constant flow valve for secondary pressure fluctuation			
	Air outlet		O.D. ϕ8 [mm]			
Others	Outer dimensions		W136×D306×H236 [mm]		W136×D306×H301 [mm]	
	Power consumption		0.25 [A], 25 [VA]		0.6 [A], 60 [VA]	
	Power supply		AC100 [V], 50/60 [Hz]			
	Weight		Approx. 6 [kg]		Approx. 8 [kg]	
Remarks			Needle valve (air relief valve) built-in			

*[NmL/min] or [NL/min] indicates the flow rate converted to 0 [°C] and 1 [atm] (101.3 [kPa])

■ Single-use pressure control system

This pressure controller enables culture tank pressure control at a constant level.

【Feature】

- It can be connected to a glass culture tank or single-use culture tank and the digital pressure switch regulates the electromagnetic valve for maintaining the culture tank pressure at a constant level.
- Fine tuning the opening of the manual bypass valve controls hunting, enabling mild control.

■ Pressure control system

Item	Specifications
Name	In-vessel pressure controller
Model	Si-P1
Display range	Pressure: -10.00 - 10.00 [kPa], Display accuracy: ±2 [%] (±1 [digit] F.S.)
Setting range	Pressure: -10.50 - 10.50 [kPa]
Control type	ON/OFF control
Output	Analog signal: 1 - 5 [V]
MTA of outer surface	SUS304 (no coating), indoor type, non-waterproof, non-explosion proof specification
Installation	Tabletop
Outer dimensions	W125×D225×H100 [mm]
Usage conditions	Pressure resist: 50 [kPa], temperature: 5 - 45 [°C], humidity: 20 - 85 [%] RH (No condensation)
Utilities	Connection port : ϕ4 one touch tube fitting

■ Cooling water circulator - Satake Cool Ace SCA-32

The Cool Ace is a cooling water circulator that uses a refrigeration unit to chill the liquid in the included reservoir for external circulation, cooling each component that generates heat, such as the evaporator (1 L), culture tank, reaction tank, and various analytical devices and other equipment.

【Feature】

- It is a compact, tabletop type that can be installed even in narrow spaces.
- In addition to cooling the heat producing components of the BioReactor, it can be used for a variety of other purposes, such as analytical equipment.
- Temperature control is achieved with a simple panel.
- Temperature settings range from -20 to 30 ℃ for versatile applications.
- The circulation nozzle can be moved in 360°, reducing the load on tubes.

【Use Case】

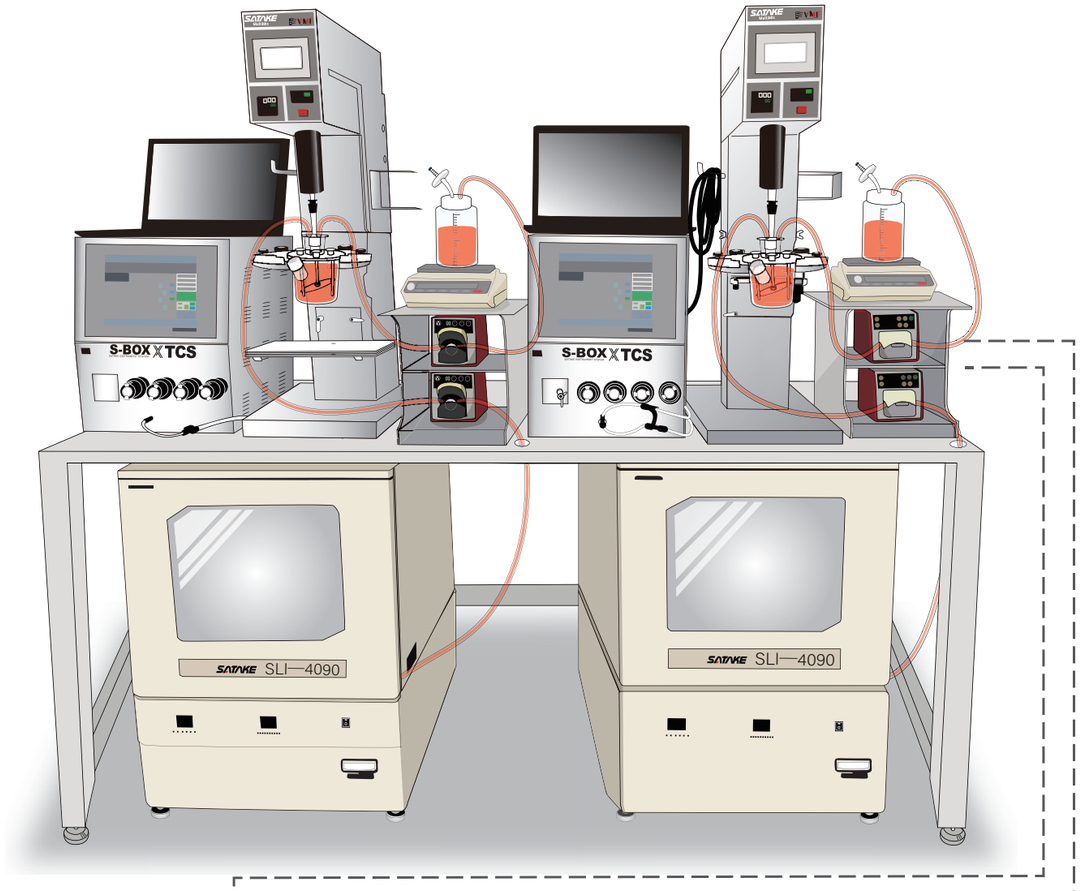
Culture tank, cooling tube attached to reactor tank, culture tank temperature controller, viscosity gauge, etc.

■ Cooling water circulator

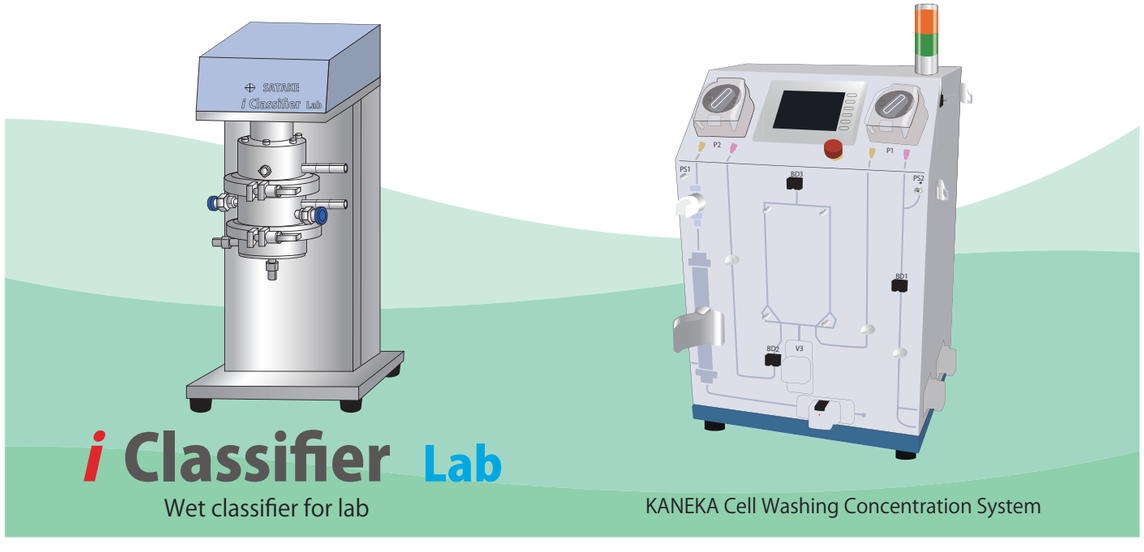
Item			Specifications
Name			Cooling water circulator SATAKE Cool Ace
Model			SCA-32
Circulation type			Closed system directional circulation
Performance	Temp. control range		-20 - 30 [°C]
	Temp. accuracy		Setting -1 - -20 [°C]: ±2 [°C], setting 0 - 20 [°C]) ±1 [°C]
	Cooling		-10 [°C] : 310 [W] 10 [°C] : 450 [W] 0 [°C] : 350 [W]
	Circulation	Max. pump head	4.2 [m] ±0.5 / 5.6 [m] ±0.5 (50/60 [Hz])
		Max. flow rate	9 [L/min] / 10 [L/min] (50/60 [Hz])
Function	Temp. control type		Freezer ON/OFF control
	Temp. setting/display		Touch panel input configuration, digital switching display of measured temperature or setting temperature (resolution: 1 [°C])
	Safety functions		Electric leakage/overcurrent circuit breaker, freezer overload relay, self-diagnostic functions (freezer error, sensor error, watchdog timer), freezer protection timer, circulation pump impedance protection
	Optional functions		Flow control valve, metal nozzle, cool keeping hose set, trolley, product fixing parts, cooling water communication cable, communication cable (Linked with NVC-3000)
Configuration	Temp. control		Touch panel input configuration and digital display
	Temp. sensor		Pt sensor
	Freezer		Air-cooled type, 450 [W], HFC, R-404A
	Water tank		Total capacity approx. 3.2 [L], Actual capacity approx. 2.7 [L] Material SUS304
	MTA of cooling coil		SUS316L
	Circulation nozzle size		O.D. 10 [mm] × I.D. 6.5 [mm]
Tank inner dimensions			W130×D230×H115 [mm]
Usage condition			5 - 35 [°C]
Outer dimensions			W205×D405×H545 [mm]
Weight			Approx. 28 [kg]
Power consumption			8 [A], 800 [VA]
Power supply			AC100 [V], 50/60 [Hz]

System development and customization for demand specification are also possible.
Please contact our Bioprocess Equipment Division below for more information.
Contact number +81-48-471-9202 e-mail address：bio@satake.co.jp

Example of option system



Example of system up



i Classifier Lab

Wet classifier for lab

KANEKA Cell Washing Concentration System

Cultivation, cleaning, and concentration in a single line! Cell concentration cleaning system

KANEKA Cell Washing Concentration System

As an improvement on the cell culture system, we sell a connected, completely closed system that consists of our reactor and attached Kaneka Corporation cell concentration cleaning system.[*1] This system can be customized upon request.
From culture to cell washing and concentration, this product enables consistent processing in a closed system, streamlining the work process. A pump is built into the cell wash concentrator body, making preparations unnecessary, enabling simple installation by following the pictures and colors on the accessories and body.

*1 Cell Washing Concentration System is KANEKA CORPORATION made product for regenerative medicine.

Disposable Kit

Cell strainer　Circulation circuit　Filtration circuit

Disposable Kit for Cell Concentration Washer

- Sterilization method
  Filter : γ sterilization
  Circuit : EOG sterilization
- Safety
  Passed the test specified by ISO10993(Cytotoxicity, sensitization, intradermal reaction, acute toxicity, hemolysis, pyrogenicity)

Please contact the following contact window when you purchase.
Biomaster, Inc.　TEL : +81-45-222-3363

Cell washing concentration system

Item				
Name	[Cell Washing Concentration System] Tubing Pump System			
Model	R-CS-S			
Pump	Flow rate range	[Circulation pump]	20 - 500 [mL/min] (depending on fluid temperature)	
		[Feed pump / Drain pump]	20 - 350 [mL/min] (depending on fluid temperature)	
	Accuracy	±10 [%]	Pump diameter	ϕ80 [mm]
	No. of rollers	2	Clearance control	Automatic adjustment
	Applicable tube	[Circulation pump]	ϕ8.00 × ϕ12.00±0.15 [mm] (PVC based)	
		[Feed pump / Drain pump]	ϕ6.40 × ϕ 9.50±0.15 [mm] (PVC based)	
	No. of units	3		
Valve	Type	Normally close	Shut-off pressure	750 [mmHg] and more
	Applicable tube	ϕ3.50×ϕ5.50 [mm] / ϕ3.00×ϕ4.30 [mm] (PVC based)		
	No. of units	4		
Pressure sensor	Type	Pressure transitor		
	Measuring range	-750 - 750 [mmHg] (pressure gauge)		
	Accuracy	±5 [%]		
	Fitting	Luer lock	No. of units	2
Display	Type	TFT color LCD	Effective display dimensions	116×87 [mm] (5.7 inch)
	Operational method	Touch panel (analog resistive film type)		
Outer dimensions	W450×D400×H695 [mm]			
Weight	43 [kg]			
Power supply	AC100 [V], 50/60 [Hz], 360 [W] (cable length: 2 [m])			
Water proof protection class	IPX1			
Environment temperature	Operation: 15 - 35 [°C] / Transportation: 0 - 50 [°C]			
Environment humidity	Operation: 35 - 85 [%] RH with no condensation / Transportation: 30 - 90 [%] RH with no condensation			
Fluid temperature	15 - 35 [°C]			
External color	SBY-S white (matte) / SBY blue (matte)			

We are constantly committed to improve the quality of our products, thereby the design and specifications of our products may differ from those shown in the catalog. Please understand this in advance.

Bioreactor exports from Japan fall under paragraph 3-2 (2) 2 of the Appendix Table 1 of the Export Trade Control Order, and products whose tank capacity is equal to or more than 20L are subject to the regulation.(as of December, 2024)
In addition, export to users that listed in catch-all regulations is prohibited.
When you export bioreactors, please confirm the latest laws and regulations of export country.

We dedicated to manufacture products that satisfy our customers and are safe to use.

SATAKE MultiMix

SATAKE MultiMix Corporation

Bioprocess Equipment Division : Room 502, Saitama Industrial Technology Center, SKIP City, 3-12-18 Kami-Aoki, Kawaguchi-Shi, Saitama 333-0844, Japan

Phone：81-48-471-9202 E-mail：bio@satake.co.jp

Product
https://www.satake.co.jp/en/product/cultivate/

Bio Top (JPN)
https://www.satake.co.jp/bio/

(Distributor for oversea customer)

TAITEC CORPORATION : 2693-1, Nishikata, Koshigaya City, Saitama 343-0822 , Japan
Phone : 81-48-988-8371

ISO 9001 certificate acquisition
Tokyo office
Bioprocess Equipment Div.

Scope of Review:
Design, manufacture, sales management, IQ/OQ of BioReactors and parts concerned

ISO 14001 certificate acquisition
Tokyo office
Bioprocess Equipment Div.

Tokyo Office is including the laboratory
Scope of Certification:
Business operations relating research, development, design, manufacture and repair of BioReactors

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