

# F FERMENTORS

## FS-Series, Entry-level Fermentor Bioreactor, 4 - 13.4 Liters

Easy-to-use, entry-level system, with built in controls for operation as a microbial fermentor as well as mammalian/animal cell culture bioreactor. This versatility, coupled with its ability to control up to three independent reactors from a single control station, makes it ideally suited to use in R&D labs, universities, teaching facilities, testing labs, and more.

Applications: Microbes, yeast, insect, plant or mammalian cells, in batch, fed-batch and continuous culture.

### Optional Item:

1. Oxygen Enrichment Device
2. One external pump
3. Fluorescent Lamp On/Off control - Included 4 sets of T5 Fluorescent Lamp & a external Timer on/off control (24hr).


### Software:



	Jacket vessel (Dish bottom)	Single wall with blanket	Single wall (Plain bottom)	Single wall (Dish bottom)	Air lifter
<b>Mammalian Cell Culture</b>	☺	☺	∅	∅	∅
<b>Aerobic Microorganism Culture</b>	☺	☺	☺	☺	◆
<b>Micro-aerobic Microorganism</b>	☺	☺	☺	☺	∅
<b>Anaerobic Microorganism</b>	☺	☺	☺	☺	∅
<b>To culture Fragile Cell</b>	◆	◆	∅	∅	☺
<b>Photosynthesis Culture</b>	∅	∅	◆	☺	☺
<b>Plant Cell Culture</b>	☺	☺	∅	☺	☺
<b>Insect Cell Culture</b>	☺	☺	∅	◆	∅

☺: Excellent ◆: Well ∅: Not Recommended

Field	Products
<b>Medicine Products</b>	Antibiotics; Hormones; Vaccine; Immune Modulators; Blood Proteins etc.,
<b>Agriculture Products</b>	Veterinary Medicine; Biotec Fertilizer; Microbial Insecticides etc.,
<b>Food Additive Products</b>	Amino Acids ; Vitamins ; Organic Acids etc.,
<b>Chemical &amp; Energy Products</b>	Ethanol; Glycerol; Methane etc.,
<b>For Environment Products</b>	Digest Waste Microorganism
<b>Other Product</b>	Bioleaching Of Metals; Genetically Engineered Spiders; Silk Proteins
<b>Biomass Products</b>	Baker's Yeast; Mushrooms; Algae; Single-Cell Proteins etc.,
<b>Enzyme</b>	Amylases; Celluloses; Proteases; Microbial Rennin; Lipases; Glucose Isomerase; Penicillin Acylase; Cholesterol Oxidase etc.,
<b>Metabolism Products</b>	- Fermentation Products – Ethanol; Lacto Acid; Butanol; Acetone - Growth Factors –Amino Acid; Vitamins; Citric Acid etc., - Secondary Metabolites – Antibiotics; Alkaloids etc., - Gene Products: Insulin; Human Growth Hormone; Interferons; Interleukins; Blood-Clotting Factors; Serum Albumin; Hepatitis B Vaccine; Rabies Vaccine And Diarrhea Vaccine For Pigs; Monoclonal Antibodies etc.,


Dry heating system (Plain bottom type vessel)				
Vessel	Single wall vessel (Plain bottom)			
	Total volume(Liter)	3L 4	5L 7	7L 9.3
Control unit	Material	Borosilicate glass / 316L ss for head plate and all fittings		
	Control panel	10.4" Color Touch screen Interface		
	Communication port	Remote control through Ethernet (SCADA)		
	Storage Program	Up to 59,994 program for different kinds of condition		
	Data storage	Up to 10 data files		
	Data storage interface	USB port		
	Cabinet material	ABS front panel and iron painted housing		
	Dimension	Footprint: 400 x 500 mm (W x D) ; Height: 740 mm		
Aeration	Rated voltage	110V or 220V ; 50/60 Hz		
	Inlet Gas Flow-meter	1 – 10 LPM		2 – 20 LPM
	Impeller	Three adjustable Rushton-type impellers		
	Sparger	Orifice ring		
Temperature	Baffle	Removable 316L stainless steel baffles		
	Heating	Bottom heating plate (Base unit)		
	Cooling	Cooling coil (Internal heat exchanger)		
	Range	5°C above coolant up to 90°C		
	Probe	Platinum RTD probe (Pt 100); 0 ~ 90°C		
Agitation	Control mode	Programmable 15 steps PID controller		
	Drive	Removable Top brushless motor		
	Speed Range	Two type of agitation motor : a. 30 – 1200 rpm is for general Fermentor; b. 5 – 300 rpm is for shear-sensitive cell line (optional)		
pH	Control mode	Programmable 15 steps PID controller		
	Range / Probe	2-12 pH / Gel-filled electrode; Autoclavable		
DO	Control mode	PID		
	Range / Probe	0 – 200% / Polarographic DO sensor; Autoclavable		
ORP	Control mode	PID; Cascade function to response to a. Stepping increasing or decreasing agitation speed b. Oxygen Enrichment Device (optional) c. To start substrate feeding program.		
	Transmitter	-/+ 2000 mV		
Foam	Probe	Gel-filled electrode; Autoclavable (optional)		
	Probe	316L stainless steel protector with insulated Teflon tube; On/Off controller		
Peristaltic pump		Built-in 4 sets of pumps; One external pump (optional)		
		Precise Stepping motor; min. speed is 1 rpm		
	Speed range	0 – 65 rpm		
Exhaust	Control mode	Programmable 15 steps feeding control; Pump can be assigned for Acid, Base, Anti foam and Substrate		
		316L Stainless steel condenser		

**Optional Item:**

1. Low Speed Agitation Driver : 5 ~ 300 rpm
2. Oxygen Enrichment Device
3. One external pump  
Specification :  
- Model # : MU-D01  
- Rpm and increment : 20 ~ 300 rpm ; 1 rpm  
- Motor Type : Brush-less motor  
- Number of roller : 1
4. Fluorescent Lamp control - Included 4 sets of T5 Fluorescent Lamp and a external Timer on/off control (24 hr)
5. ORP probe : Gel-filled electrode; Autoclavable

**Utility Requirement:**

1. Building main supply 110V- 60 Hz or 220V - 50 Hz with electrical safety cutoff switch.
2. Autoclave for sterilization.
3. Cooling Circulating Water Bath for cooling purpose.
4. Compressor Air to supply air, which comes with a reducer to control pressure to around 1 kg/cm<sup>2</sup>. This air is to be dry, oil-free and filtered.
5. Computer for remote control.


Dry heating system (Dish bottom type vessel)							
<b>Vessel</b>	Single wall vessel (Dish bottom) with blanket						
	Total volume(Liter)	3L	5L	7L	10L	15L	20L
	Material	Borosilicate glass / 316L ss for headplate and all fittings					
		4	7	9.3	13.4	16.5	23
<b>Control unit</b>	Control panel	10.4" Color Touch screen Interface					
	Communication port	Remote control through Ethernet (SCADA)					
	Storage Program	Up to 59,994 program for different kinds of condition					
	Data storage	Up to 10 data files					
	Data storage interface	USB port					
	Cabinet material	ABS front panel and iron painted housing					
	Dimension	Footprint: 400 x 500 mm (W x D) ; Height: 740 mm					
<b>Aeration</b>	Rated voltage	110V or 220V ; 50/60 Hz					
	Inlet Gas Flow-meter	1 – 10 LPM		2 – 20 LPM		5 – 50 LPM	
	Impeller	Two different type of impeller – a. 3 pcs of adjustable Rushton-type impeller b. 2 pcs of adjustable Pitched-blade impeller note: 1. Rushton-type impeller is for cell line that are not considered shear-sensitive 2. Pitched-blade impeller for shear-sensitive cell line 3. The standard system includes one type impeller. It is option for another type. It is available for customer-made impeller).					
	Sparger	Orifice ring					
<b>Temperature</b>	Baffle	Removable 316L stainless steel baffles					
	Heating	Heating blanket					
	Cooling	Cooling coil (Internal heat exchanger); The finger heat exchanger is for 3L vessel.					
	Range	5°C above coolant up to 60°C					
	Probe	Platinum RTD probe (Pt 100);					
<b>Agitation</b>	Control mode	PID controller for one point or up to 15 steps programmable control.					
	Drive	Removable Top brushless motor					
	Speed Range	Two type of agitation motor : a. 30 – 1200 rpm is for general fermentor; b. 5 – 300 rpm is for shear-sensitive cell line (optional)					
<b>pH</b>	Control mode	PID controller for one point or up to 15 steps programmable control.					
	Range / Probe	2-12 pH / Gel-filled electrode; Autoclavable					
<b>DO</b>	Control mode	One point control					
	Range / Probe	0 – 200% / Polarographic DO sensor; Autoclavable					
<b>ORP</b>	Control mode	PID; Cascade function to response to a. Stepping increasing or decreasing agitation speed b. Oxygen Enrichment Device (optional) c. To start substrate feeding program.					
	Transmitter	-/+ 2000 mV					
<b>Foam</b>	Probe	Gel-filled electrode; Autoclavable (optional)					
	Probe	316L stainless steel protector with insulated Teflon tube; On/Off controller					
<b>Peristaltic pump</b>		Built-in 4 sets of pumps; One external pump (optional)					
		Precise Stepping motor; min. speed is 1 rpm					
	Speed range	0 – 65 rpm					
<b>Exhaust</b>	Control mode	Programmable 15 steps feeding control; Pump can be assigned for Acid, Base, Antifoam and Substrate					
		316L Stainless steel condenser					

### Optional Item:

1. Low Speed Agitation Driver : 5 ~ 300 rpm
2. Oxygen Enrichment Device
3. One external pump  
Specification :  
- Model # : MU-D01  
- Rpm and increment : 20 ~ 300 rpm ; 1 rpm  
- Motor Type : Brush-less motor  
- Number of roller : 1
4. ORP probe : Gel-filled electrode; Autoclavable

### Utility Requirement:

1. Building main supply 110V- 60 Hz or 220V - 50 Hz with electrical safety cutoff switch.
2. Autoclave for sterilization.
3. Cooling Circulating Water Bath for cooling purpose.
4. Compressor Air to supply air, which comes with a reducer to control pressure to around 1 kg/cm<sup>2</sup>. This air is to be dry, oil-free and filtered.
5. Computer for remote control.

Thermostat system (Jacket vessel type)					
<b>Vessel</b>	Jacket vessel (Dish bottom)				
		3L	5L	7L	10L
	Total volume(Liter)	4	7	9.3	13.4
	Material	Borosilicate glass / 316L ss for headplate and all fittings			
<b>Control unit</b>	Control panel	10.4" Color Touch screen Interface			
	Communication port	Remote control through Ethernet (SCADA)			
	Storage Program	Up to 59,994 program for different kinds of condition			
	Data storage	Up to 10 data files			
	Data storage interface	USB port			
	Cabinet material	ABS front panel and iron painted housing			
	Dimension	Footprint: 400 x 500 mm (W x D) ; Height: 735 mm			
<b>Aeration</b>	Rated voltage	110V or 220V ; 50/60 Hz			
	Inlet Gas Flow-meter	1 – 10 LPM	2 – 20 LPM		
	Impeller	Two different type of impeller – a. 3 pcs of adjustable Rushton-type impeller b. 2 pcs of adjustable Pitched-blade impeller note: 1. Rushton-type impeller is for cell line that are not considered shear-sensitive 2. Pitched-blade impeller for shear-sensitive cell line 3. The standard system includes one type impeller. It is option for another type. It is available for customer-made impeller).			
<b>Temperature</b>	Sparger	Orifice ring			
	Baffle	Removable 316L stainless steel baffles			
	Control system	Thermostat system; Built-in heat exchanger (400 W heater/water circulation pump); Automatic cooling water valve			
	Range	5°C above coolant up to 60°C			
<b>Agitation</b>	Probe	Platinum RTD probe (Pt 100)			
	Control mode	Programmable 15 steps PID controller			
	Drive	Removable Top brushless motor			
<b>pH</b>	Speed Range	Two type of agitation motor: a. 30 – 1200 rpm is for general fermentor; b. 5 – 300 rpm is for shear-sensitive cell line (The standard system includes one type of agitation motor. It is option for another type.)			
	Control mode	Programmable 15 steps PID controller			
<b>DO</b>	Range / Probe	2-12 pH / Gel-filled electrode; Autoclavable			
	Control mode	PID			
<b>Foam</b>	Range / Probe	0 – 200% / Polarographic DO sensor; Autoclavable			
	Control mode	PID; Cascade function to response to a. Stepping increasing or decreasing agitation speed b. Oxygen Enrichment Device (optional item) c. To start substrate feeding program.			
<b>Peristaltic pump</b>	Probe	316L stainless steel protector with insulated Teflon tube; On/Off controller			
		Built-in 4 sets of pumps; One external pump (optional)			
		Precise Stepping motor; min. speed is 1 rpm			
<b>Exhaust</b>	Speed range	0 – 100 rpm			
	Control mode	Programmable 15 steps feeding control; Pump can be assigned for Acid, Base, Anti foam and Substrate			


**Optional Item:**

1. Low Speed Agitation Driver : 5 ~ 300 rpm
2. Oxygen Enrichment Device
3. One external pump  
Specification :  
- Model # : MU-D01  
- Rpm and increment : 20 ~ 300 rpm ; 1 rpm  
- Motor Type : Brush-less motor  
- Number of roller : 1
4. ORP probe : Gel-filled electrode; Autoclavable

**Utility Requirement:**

1. Building main supply 110V- 60 Hz or 220V - 50 Hz with electrical safety cutoff switch.
2. Autoclave for sterilization.
3. Cooling Circulating Water Bath for cooling purpose.
4. Compressor Air to supply air, which comes with a reducer to control pressure to around 1 kg/cm<sup>2</sup>. This air is to be dry, oil-free and filtered.
5. Computer for remote control.

# F FERMENTORS


Thermostat system (Dish bottom type vessel)				
<b>Vessel</b>	Single wall vessel (Dish bottom)			
		3L	5L	7L
	Total volume(Liter)	4	7	9.3
	Material	Borosilicate glass / 316L ss for headplate and all fittings		
<b>Control unit</b>	Control panel	10.4" Color Touch screen Interface		
	Communication port	Remote control through Ethernet (SCADA)		
	Storage Program	Up to 59,994 program for different kinds of condition		
	Data storage	Up to 10 data files		
	Data storage interface	USB port		
	Cabinet material	ABS front panel and iron painted housing		
	Dimension	Footprint: 400 x 500 mm (W x D) ; Height: 740 mm		
	Rated voltage	110V or 220V ; 50/60 Hz		
<b>Aeration</b>	Inlet Gas Flow-meter	1 – 10 LPM	2 – 20 LPM	
	Impeller	Two different type of impeller – a. 3 pcs of adjustable Rushton-type impeller b. 2 pcs of adjustable Pitched-blade impeller note: 1. Rushton-type impeller is for cell line that are not considered shear-sensitive 2. Pitched-blade impeller for shear-sensitive cell line 3. The standard system includes one type impeller. It is option for another type. It is available for customer-made impeller).		
	Sparger	Orifice ring		
	Baffle	Removable 316L stainless steel baffles		
<b>Temperature</b>	Control system	Thermostat system; Built-in heat exchanger(400 W heater/water circulation pump); Automatic cooling water valve		
	Range	5°C above coolant up to 60°C		
	Probe	Platinum RTD probe (Pt 100);		
	Control mode	Programmable 15 steps PID controller		
<b>Agitation</b>	Drive	Removable Top brushless motor		
	Speed Range	Two type of agitation motor : a. 30 – 1200 rpm is for general Fermentor; b. 5 – 300 rpm is for shear-sensitive cell line (optional)		
<b>pH</b>	Control mode	Programmable 15 steps PID controller		
	Range / Probe	2-12 pH / Gel-filled electrode; Autoclavable		
<b>DO</b>	Control mode	One point control		
	Range / Probe	0 – 200% / Polarographic DO sensor; Autoclavable		
<b>ORP</b>	Transmitter / Probe	-/+ 2000 mV / Gel-filled electrode; Autoclavable (optional)		
<b>Foam</b>	Probe	316L stainless steel protector with insulated Teflon tube; On/Off controller		
<b>Peristaltic pump</b>	Four built-in Easy tube loading pumps; One external pump (Optional)			
	Precise Stepping motor; min. speed is 1 rpm			
	Speed range	0 – 65 rpm		
<b>Exhaust</b>	Control mode	Programmable 15 steps feeding control; Pump can be assigned for Acid, Base, Anti foam and Substrate		
	316L Stainless steel condenser			

### Optional Item:

1. Low Speed Agitation Driver : 5 ~ 300 rpm
2. Oxygen Enrichment Device
3. One external pump  
Specification :  
- Model # : MU-D01  
- Rpm and increment : 20 ~ 300 rpm ; 1 rpm  
- Motor Type : Brush-less motor  
- Number of roller : 1
4. Fluorescent Lamp control - Included 4 sets of T5 Fluorescent Lamp and a external Timer on/off control (24 hr)
5. ORP probe : Gel-filled electrode; Autoclavable

### Utility Requirement:

1. Building main supply 110V- 60 Hz or 220V - 50 Hz with electrical safety cutoff switch.
2. Autoclave for sterilization.
3. Cooling Circulating Water Bath for cooling purpose.
4. Compressor Air to supply air, which comes with a reducer to control pressure to around 1 kg/cm<sup>2</sup>. This air is to be dry, oil-free and filtered.
5. Computer for remote control.

Thermostat system (Jacket vessel type)		
<b>Vessel</b>	Jacket vessel (Dish bottom)	
	Type	Jacket Single wall (No temp. control system)
	Max. working volume	6.6 Liter
	Total volume	6.6 Liter
	Material	Borosilicate glass / 316L ss for headplate and all fittings
<b>Control unit</b>	Control panel	10.4" Color Touch screen Interface
	Communication port	Remote control through Ethernet (SCADA)
	Storage Program	Up to 59,994 program for different kinds of condition
	Data storage	Up to 10 data files
	Data storage interface	USB port
	Cabinet material	ABS front panel and iron painted housing
	Dimension	Footprint: 400 x 500 mm (W x D) ; Height: 740 mm
	Rated voltage	110V or 220V ; 50/60 Hz
<b>Aeration</b>	Inlet Gas Flow-meter	1 – 10 LPM
	Tube	Adjustable draft tube
	Sparger	Micro-sparger
<b>Temperature</b>	Control system	Thermostat system; Built-in heat exchanger (400 W heater/water circulation pump); Automatic cooling water valve
	Range	5°C above coolant up to 60°C
	Probe	Platinum RTD probe (Pt 100)
	Control mode	Programmable 15 steps PID controller
<b>pH</b>	Range / Probe	2-12 pH / Gel-filled electrode; Autoclavable
	Control mode	One point control
<b>DO</b>	Range / Probe	0 – 200% / Polarographic DO sensor; Autoclavable
	Control mode	PID; Cascade function to response to a. Stepping increasing or decreasing agitation speed b. Oxygen Enrichment Device (optional item) c. To start substrate feeding program.
<b>ORP</b>	Transmitter	-/+ 2000 mV
	Probe	Gel-filled electrode; Autoclavable (optional)
<b>Foam</b>	Probe	316L stainless steel protector with insulated Teflon tube; On/Off controller
<b>Peristaltic pump</b>	Four built-in Easy tube loading pumps; One external pump (optional)	
	Precise Stepping motor; min. speed is 1 rpm	
	Speed range	0 – 65 rpm
	Control mode	Programmable 15 steps feeding control; Pump can be assigned for Acid, Base, Anti foam and Substrate
<b>Exhaust</b>	316L Stainless steel condenser	

**Optional Item:**

1. Low Speed Agitation Driver : 5 ~ 300 rpm
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Specification :  
- Model # : MU-D01  
- Rpm and increment : 20 ~ 300 rpm ; 1 rpm  
- Motor Type : Brush-less motor  
- Number of roller : 1
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