HyPerforma Single-Use Mixer with Touchscreen Console

The next generation of efficiency and performance

The Thermo Scientific™ HyPerforma™ Single-Use Mixer (S.U.M.) with Touchscreen Console offers enhanced functionality, ease of use, and efficiency. The complete HyPerforma S.U.M. system consists of a mixer tank, available in 50, 100, 200, 500, 1,000, and 2,000 L sizes, with the Touchscreen Console. The HyPerforma S.U.M. has a 5:1 turndown mixing ratio and maintains traditional stirred-tank mixer design principles with a directly coupled motor impeller drive assembly and a cylindrical tank with a specific height-to-diameter ratio. This allows quick turnaround times for both liquid-to-liquid mixing and powder-to-liquid mixing.

500 L HyPerforma S.U.M. standard configurations

- DC motor

- 3x load cell weighing system

- Touchscreen Console

Critical upstream application steps

- Media preparation

- Final formulation steps

- Buffer preparation

- Large-volume mixing

Critical downstream application steps

- Pooling and liquid transfer

- Product suspension

- Mixing and storing multiple batches

- Buffer preparation

- Viral inactivation


Touchscreen Console capabilities

The Touchscreen Console offers state-of-the-art in-process monitoring and automation capability for the HyPerforma S.U.M. Its modular design allows for an easy-to-use custom user interface. Capabilities include control of agitation speed, pumps, pinch clamps, and the temperature control unit (TCU). Users can easily view measurements from load cells, pH sensors, conductivity sensors, resistance temperature detectors (RTDs), and pressure sensors.

Simple, routine processes can be automated by utilizing measurement values to control the pumps, temperature control unit (TCU), and agitation motor. The Touchscreen Console can help users semi-automate their formulation, pH, or saline titrations, and viral inactivation processes. This allows users to program their HyPerforma S.U.M. for a process and trust that the measurements are accurate, precise, and controlled. The data measured during a process can be exported remotely via Ethernet, Profibus, or Modbus remote terminal unit (RTU), and can also be accessed locally with a USB flash drive.

**Thermo Fisher**
S C I E N T I F I C

HyPerforma S.U.M. design features and options

1. Powder hanger for 1 kg, 5 kg, and 25 kg Thermo Scientific™ Powdertainer™ BioProcess Containers (BPCs)

2. Mixing assembly with shield

3. Bearing port receiver with clamp

4. Mixer motor

5. Shelves and basket (optional)

6. Drive shaft, stored

7. Liquid sight window

8. Touchscreen Console

9. Probe clip hangers

10. Probe access windows

11. Cart assembly

12. Standard tool set: 10 mm (3/8 in.) x 16.9 Nm (150 in.-lb.) square torque wrench; load cell and motor cap lockout wrench

13. 0.95 cm (3/8 in.) dimpled jacket

14. Stainless steel outer support container

15. Handles with cable management clips

16. Cutout with removable brace for BPC loading

17. Bottom cutouts/pins for BPC attachment and alignment

18. Bleed valve (jacketed models only)

19. 3.8 cm (1.5 in.) tri-clamp connection ports for water inlet/outlet (jacketed models only)

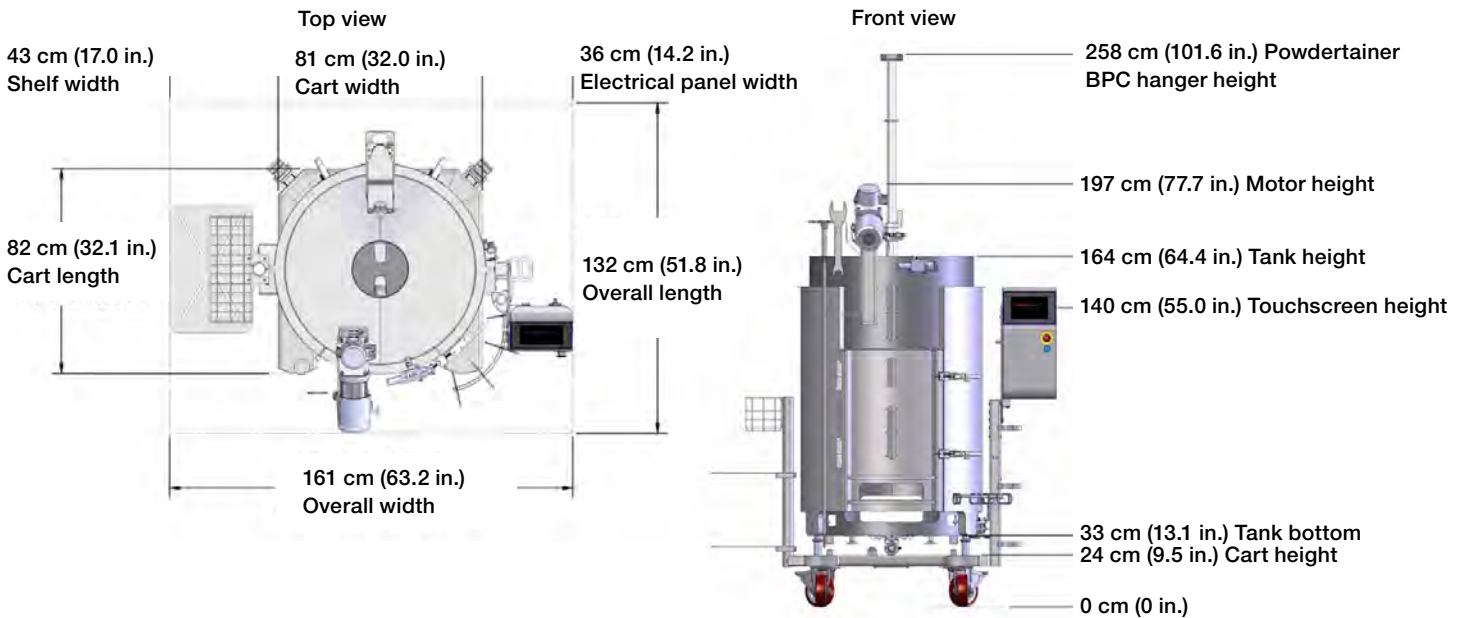20. Casters (2 swiveling, 2 fixed)

Front view
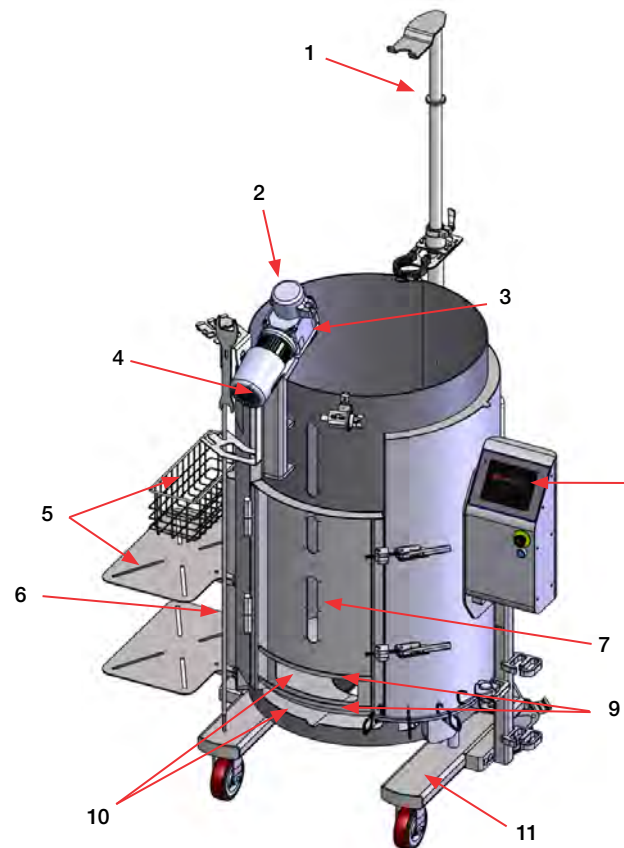
Back view
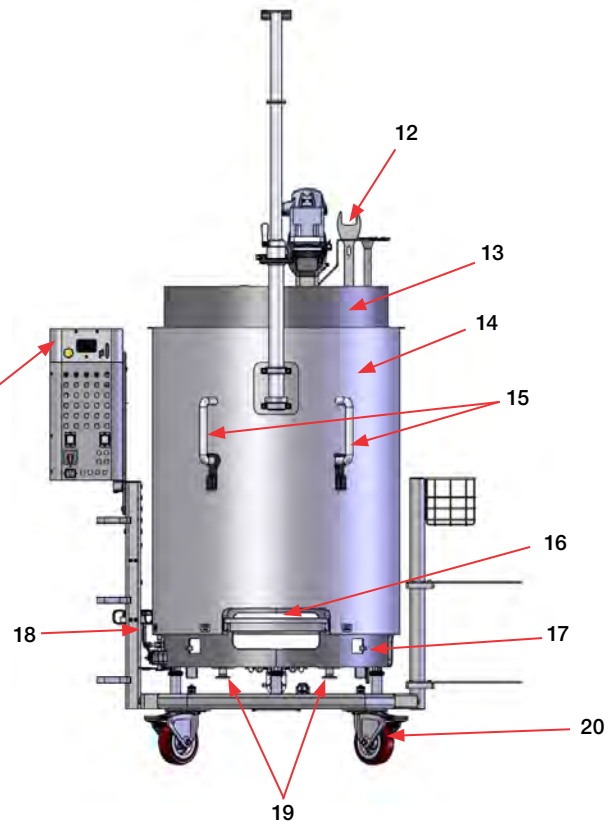
Note: Models without water jackets include the same features as the water-jacketed models shown here, but without the jacket and inlet/outlet ports.
Optional load cells and cable management system are not shown. See the accessories section for more information about these items.

HyPerforma S.U.M. design specifications

Top view

43 cm (17.0 in.) Shelf width

81 cm (32.0 in.) Cart width

36 cm (14.2 in.) Electrical panel width

82 cm (32.1 in.) Cart length

132 cm (51.8 in.) Overall length

161 cm (63.2 in.) Overall width

Front view

258 cm (101.6 in.) Powdertainer BPC hanger height

197 cm (77.7 in.) Motor height

164 cm (64.4 in.) Tank height

140 cm (55.0 in.) Touchscreen height

33 cm (13.1 in.) Tank bottom
24 cm (9.5 in.) Cart height

0 cm (0 in.)

Touchscreen Console measurement options and specifications					
	Load cell	Temperature	pH	Conductivity	BPC and in-line liquid pressure
Accuracy after calibration	±0.5% of full scale	0.2°C	±0.05 pH unit	±5%	±3.5% of full scale (30 psi)
Calibration	1 to 3 points and zero/tare function	1 to 3 points	1 to 3 points	1 to 3 points	1 point; zero/tare function
Resolution	0.1 kg	0.01°C	0.01 pH unit	1 µS/cm	0.01 psi
Sensor range	0 to 900 kg	0 to 200°C	0 to 14	20 to 20,000 µS/cm	0 to 30 psi
Measurement unit	kg	°C	pH unit	µS/cm	psi
Probe type	3 x Mettler Toledo™ MTB load cells	RTD	Electrochemical with 225 mm S8 connector	Two-pole conductivity sensor	Single-use sensor part of the BPC and/or fluid transfer assembly design

HyPerforma S.U.M. DeltaV capability enhancement

As an engineer-to-order product, the Thermo Scientific™ HyPerforma™ Single-Use Mixer (S.U.M.) with Touchscreen Console can be fully integrated with either Thermo Scientific™ HyPerforma™ G3 Bioprocess Controllers or controllers from other manufacturers—providing an open-architecture mixing solution configured to your unique requirements. The Touchscreen Console has the capability to integrate Thermo Scientific™ TruBio™ automation software powered by the DeltaV™ Distributed Control Platform from Emerson, enabling users to optimize data acquisition while maintaining full compliance with 21 CFR Part 11.

Accessories

Sensors and pinch valves

Reusable pH and conductivity probes as well as single-use pressure sensors have been approved and qualified for use with the Touchscreen Console. pH and conductivity measurements can be used to control titration pumps, which enable automatic titration capabilities. Pressure sensors are used in the BPC or line sets to monitor the BPC or liquid pressure, respectively. The BPC can be filled with the proper amount of air when using the pressure sensor in the BPC. The liquid pressure module in the Touchscreen Console is used to control a transfer pump, based on the liquid pressure. Optional pneumatic pinch valves can be used on the fill and harvest lines. These valves automatically open and shut when using the fill and/or harvest modules in the Touchscreen Console.

Ordering information

Standard	Manufacturer	Cat. No.
pH sensor	Thermo Fisher Scientific	SV51147.02
	Mettler Toledo	SV51147.01
	Broadley James	SV51147.03
Conductivity sensor	JUMO	SV51148.01
	Mettler Toledo	SV51148.02
Pressure sensor (single-use, included in BPC and/or fluid transfer assembly)	PendoTECH 3/8 in. ID tubing	SV20826.05
	PendoTECH 1/2 in. ID tubing	SV20826.01
Pinch valve, harvest line	Thermo Fisher Scientific	SV51108.08
Pinch valve, fill line	Thermo Fisher Scientific	SV51108.05

Heavy-duty tubing clamps

Heavy-duty clamps are used to pinch off line sets that are not in use, to prevent process fluids from escaping. Prior to insertion of sterile probes, tubing clamps must be in place to close off probe ports.

Ordering information

Description	Cat. No.
Heavy-duty tubing clamp (single)	SV20664.01
Heavy-duty tubing clamp (10 pack)	SV20664.04

Load cells

Load cells are typically radially mounted in sets of three. The mounting location varies slightly for each size in order to allow easy access to the bottom drain or sparging mechanisms and tubing.

Probe clips

Probe clips are used to hold the probes in place on the S.U.M. tank. The independently movable probe clips hang on a thin brace above the probe port tank cutout.
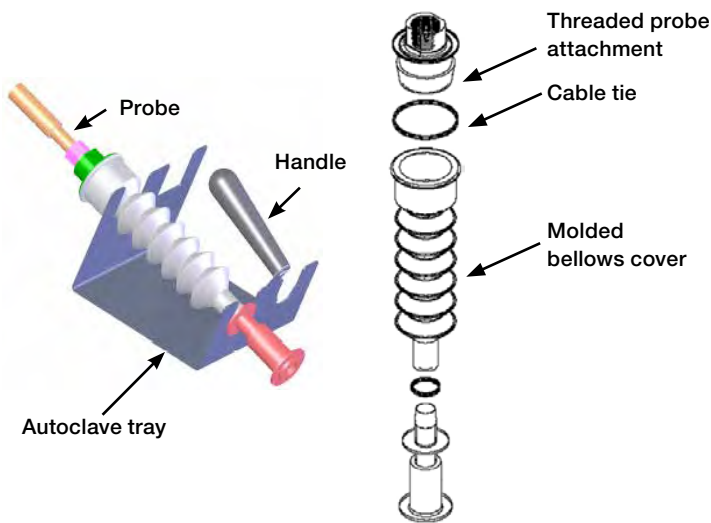

Ordering information

Description	Cat. No.
4 plastic probe clips	SV50177P.01

4

Autoclave tray and probe assembly

The autoclave tray holds the electrochemical probes and bellows in place during the autoclave sterilization process. Design elements include the following:

• Fabricated from stainless steel

• Plastic handle provides for easy transport right out of the autoclave

• Positions probes on 15% incline for greater probe and membrane longevity

• Prevents probe bellows from collapsing during sterilization

• Probe holder accommodates two probes

Ordering information

Description	Cat. No.
Autoclave tray (stainless steel with plastic carrying handle)	SV50177.01

Cable management system

The optional cable management system connects to the left side of the S.U.M. and is used to properly route tubing and cables along the side of the S.U.M.
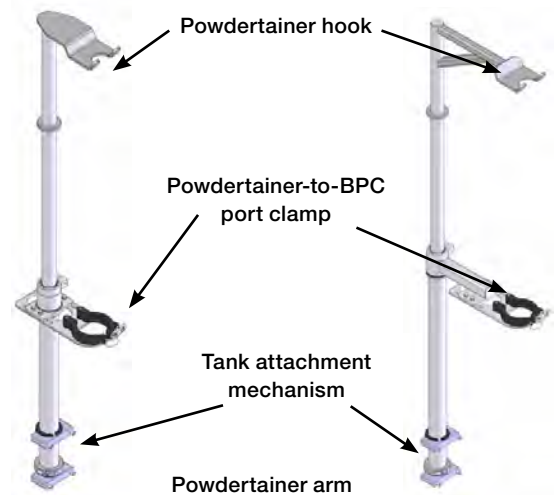

Ordering information

Description	Cat. No.
Cable management system (500 L–2,000 L)	SV50992.03

Powdertainer arm

A Powdertainer arm is available as an option for powder-to-liquid applications. It holds the container of powder above the mixer and attaches it to the BPC with a clamp. The arm adjusts vertically and swivels to enable convenient lifting of the Powdertainer BPC onto the hanger.

Ordering information

Description	Cat. No.
Powdertainer arm (50 L—1,000 L)	SV51002.01

Standard 500 L S.U.M. hardware

500 L S.U.M. specifications		Jacketed and non-jacketed
Mixer geometry	Rated liquid working volume	500 L
	Minimum liquid working volume	100 L (complete impeller coverage)
	Total chamber volume (liquid and gas)	660 L
	BPC chamber diameter	75.56 cm (29.75 in.)
	BPC chamber shoulder height	146 cm (57.5 in.)
	Liquid height at rated working volume	111.8 cm (44 in.)
	Fluid geometry at working volume (height:diameter ratio)	1.5:1
	Hold-up volume	<100 mL
	Overall mixer geometry (height:diameter ratio)	1.7:1
	Tank baffles	None
Impeller	Impeller (quantity x blade count)	1 x 3
	Impeller scaling (impeller diameter:tank diameter)	9:34
	Impeller blade pitch (angle)	45°
	Impeller diameter	20 cm (7.87 in.)
Agitation	Mixing rate range	30–356 rpm
	Tip speed	31.4–366.6 cm/sec (61.9–721.6 ft/min)
	Counterclockwise mixing flow direction	Down-pumping
	Agitation shaft resolved angle	20°
	Agitation shaft centerline offset	10.56 cm (4.16 in.)
	Overall drive shaft length	152.4 cm (60 in.)
	Drive shaft diameter	1.27 cm (0.5 in.)
	Drive shaft poly-sheath outside diameter	2.54 cm (1 in.)
	Impeller clearance from tank bottom	7.52 cm (2.96 in.)
Motor	Agitation motor drive (type, voltage, phase)	Brushless, 48 VDC
	Motor power rating	400 W (0.536 hp) Motor: 48 V, 6.5 A
	Motor torque rating	8.6 N-m (76 in.-lb.)
	Gear reduction	7.5:1
	Motor communication methods	Via Touchscreen Console through communication ports
General	Ceiling height required for standard drive shaft loading	320 cm (126 in.)
	Ceiling height required for optional 2-piece drive shaft loading	275.6 cm (108.5 in.)
	Electrical power rating	100–120 VAC, 50/60 Hz, single, 15 A 220–240 VAC, 50/60 Hz, single, 10.4 A
	pH and dissolved oxygen (DO) probe—autoclavable type (Applisens, Broadley James, Mettler Toledo)	12 mm diameter x 215–235 mm insertion length x 13.5 PG (pipe) thread
	Noise level	<70 dB at 1.5 m
	Storage temperature	−25°C to 65°C
	Relative humidity	20–80%, noncondensing
Recommended operating parameters	Operating temperature range	S.U.M.: 2–40 ± 0.1°C (36–104 ± 0.2°F) DC motor: 0–40°C (32–104°F)
	Motor speed	30–356 rpm
	Volume range	100–500 L
	Maximum static BPC pressure	0.03 bar (0.5 psi)
	Maximum BPC pressure during operation	0.007 bar (0.1 psi)
	Continuous operating time	21 days mixing at nominal volume only

Standard 500 L S.U.M. hardware (cont.)

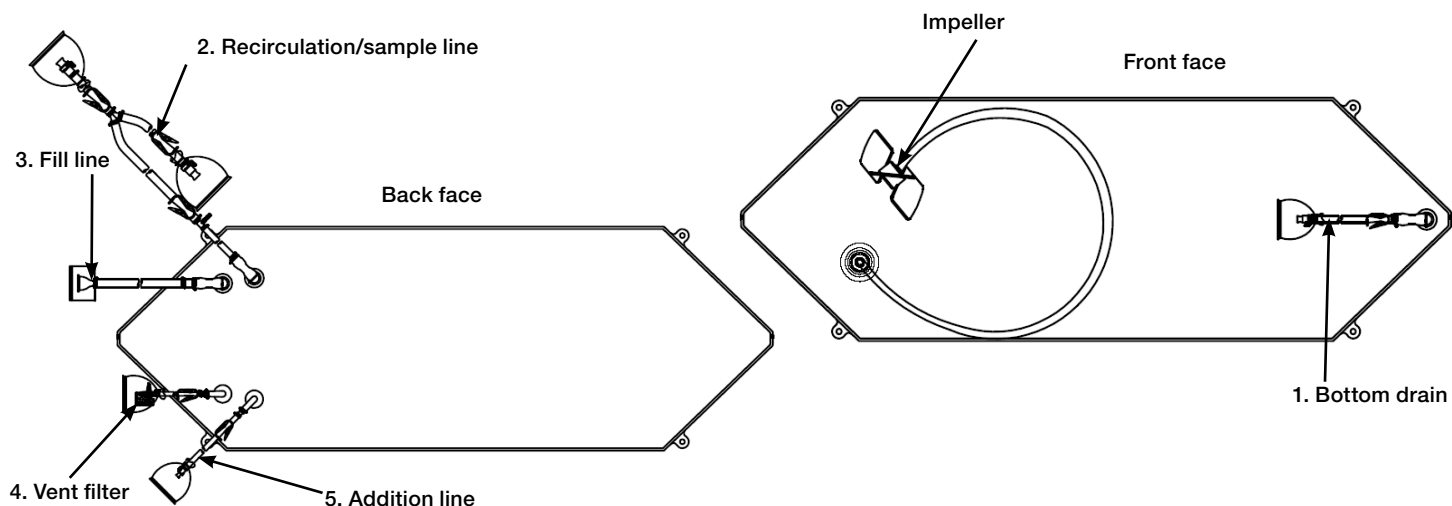| 500 L S.U.M. specifications (cont.)			
		Jacketed	**Non-jacketed**
Fluid jacket	Jacket area: full/half volume	2.2 m^2/1.4 m^2 (23.9 ft^2/14.8 ft^2)	–
	Jacket volume	11 L (2.9 gal)	–
	Jacket flow rate at 3.4 bar (50 psi)	96.8 L/min (25.5 gal/min)	–
	Process connection	1 in. sanitary tri-clamp	–
Temperature control	TCU model: maximum heating/cooling	TF10000: 6,100/10,000 W	–
	Approximate liquid heat-up time (5–37°C)	2.6 hr	–
	Approximate liquid cool-down time (37–5°C)	3.7 hr	–
	RTD or thermocouple, 3.18 mm (1/8 in.) OD	Pt-100 (standard)	Pt-100 (standard)
Support container (without shelves/ basket)	Overall width	118 cm (26 in.)	118 cm (26 in.)
	Overall length	132 cm (51.8 in.)	132 cm (51.8 in.)
	Overall height (without Powdertainer arm)	197 cm (77.7 in.)	197 cm (77.7 in.)
	Dry skid weight (mass)	424.1 kg (935.8 lb.)	326.1 kg (718.8 lb.)
	Wet skid weight—rated working volume (mass)	924.1 kg (2,037.8 lb.)	826.1 kg (1,820.8 lb.)
Touchscreen Console	Dimensions (W x H x D)	25 x 52 x 23 cm (9.9 x 20.5 x 9.3 in.)	
	Construction material	AISI 304 (stainless steel)	
	Pumps	Supports various pumps with 4–20 mA signal control	
	Load cells	Mettler Toledo MTB	
	pH sensors supported	Thermo Scientific, Mettler Toledo, and Broadley James	
	Conductivity sensors	JUMO, Mettler Toledo	
	Pinch valves	Bimba ACRO 935 pinch valve, 3/4 in. (19 mm) OD x 1/8 in. (3.175 mm) wall tubing	
	HMI	8.4 in. LCD panel with capacitive touchscreen	
	Alarms	Factory-set and user-defined	
	Communication ports	USB, Ethernet, Profibus, Modbus RTU	
	E-stop	Integrated safety circuit for entire system; external E-stop also available	
	Data recording	User-defined data record transfer via Ethernet, Profibus, or Modbus RTU. 72-hour data storage exportable via USB	
	File format	CSV	
	Data exporting	Local via USB flash drive Remote via PC and network with Ethernet, Profibus, or Modbus RTU	

HyPerforma S.U.M. BPCs

Open-top or closed-top Thermo Scientific™ BPC designs are available with Thermo Scientific™ CX5-14 and Aegis™ 5-14 film options.
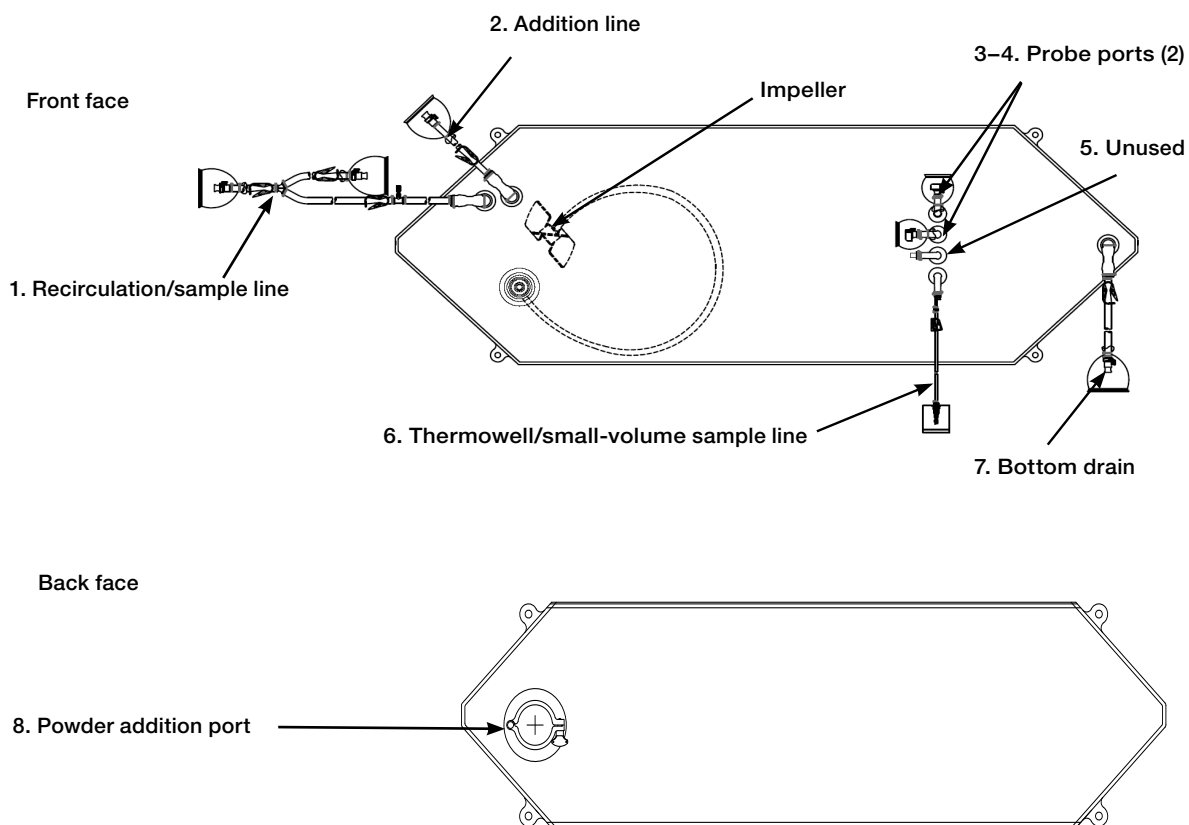

Standard 500 L BPC for powder-to-liquid applications without probe ports

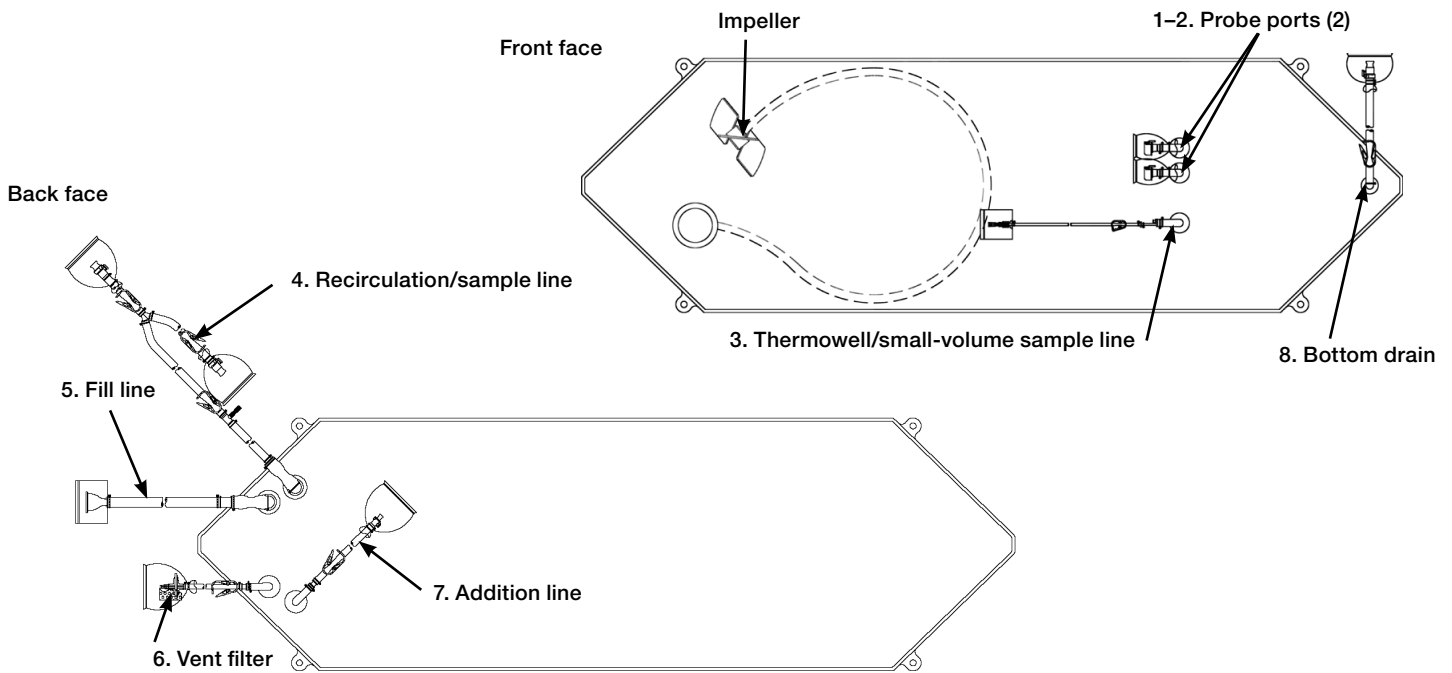| Line	Description	Tubing set (inner diameter x outer diameter x length)	End treatment
1	Addition line	12.7 mm (1/2 in.) x 15.9 mm (5/8 in.) C-Flex™ x 152 cm (60 in.)	Plugged 12.7 mm (1/2 in.) MPX body
2	Recirculation/sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert Plugged 12.7 mm (1/2 in.) MPX body
3	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
4	Powder addition port	76 mm (3 in.) sanitary fitting, tri-clamp tube ports	Capped with gasket

Standard 500 L BPC for liquid-to-liquid applications without probe ports

Line	Description	Tubing set (inner diameter x outer diameter x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 168 cm (66 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert Plugged 12.7 mm (1/2 in.) MPX body
3	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex x 152 cm (60 in.)	38.1 mm (1 1/2 in.) tri-clamp (SterilEnz™)
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 µm PVDF, Acro™ 50)
5	Addition line	9.5 mm (3/8 in.) x 15.9 mm (3/4 in.) C-Flex x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX body

Front face

2. Addition line

Impeller

3–4. Probe ports (2)

5. Unused

1. Recirculation/sample line

6. Thermowell/small-volume sample line

7. Bottom drain

Back face

8. Powder addition port

Standard 500 L BPC for powder-to-liquid applications with probe ports

Line	Description	Tubing set (inner diameter x outer diameter x length)	End treatment
1	Recirculation line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 168 cm (66 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert Plugged 12.7 mm (1/2 in.) MPX body
2	Addition line	12.7 mm (1/2 in.) x 15.9 mm (5/8 in.) C-Flex x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3–4	Probe ports (2)	None	Kleenpak™ aseptic connector KPCHT series (female)
5	Unused	None	Plug
6	Thermowell/ small-volume sample line	Thermowell adapter for 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex x 30 cm (12 in.)	Luer and SmartSite™ valve port
7	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
8	Powder addition port	76 mm (3 in.) sanitary fitting, tri-clamp	Cap with gasket

Front face

Impeller

1–2. Probe ports (2)

Back face

4. Recirculation/sample line

5. Fill line

3. Thermowell/small-volume sample line

8. Bottom drain

7. Addition line

6. Vent filter

Standard 500 L BPC for liquid-to-liquid applications with probe ports

Line	Description	Tubing set (inner diameter x outer diameter x length)	End treatment
1–2	Probe ports (2)	None	Kleenpak aseptic connector KPCHT series (female)
3	Thermowell/ small-volume sample line	Thermowell adapter for 3.2 mm (1/8 in.) x 6.4 cm (1/4 in.) C-Flex x 30 cm (1/2 in.)	Luer and SmartSite valve port
4	Recirculation line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 168 cm (66 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert Plugged 12.7 mm (1/2 in.) MPX body
5	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex x 152 cm (60 in.)	38.1 mm (1 1/2 in.) tri-clamp (SterilEnz)
6	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 μm PVDF, Acro 50)
7	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex x 61 cm (24 in.)	Plugged 12.7 mm (1/2 in.) MPX body
8	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX insert

Bottom drain

Quick-connect fitting

Impeller

Sleeve (3/4 in. inner diameter tubing)
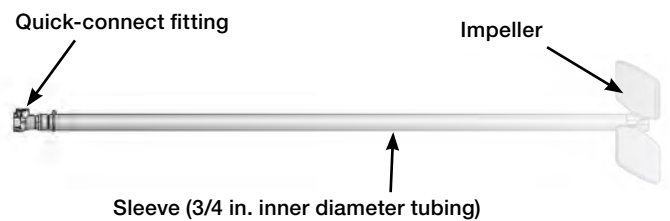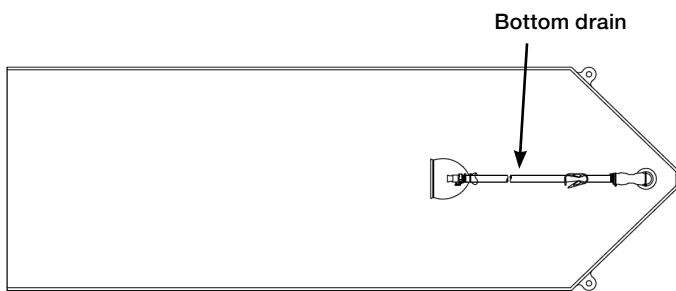
Standard open-top liner

Description	Cat. No.
500 L standard open-top liner, 0 probes, CX3-9 film	SH30762.06

Standard impeller sleeve

Description	Cat. No.
500 L impeller sleeve for open-top mixing*	SH30749.10

* The bearing hub needed for open-top mixing is automatically supplied with the tank hardware.

Custom BPC products

Category	Options/capability	Notes
Tubing type	C-Flex™, platinum-cured silicone, PVC, PharMed™, PharmaPure™	More information is available in the tubing selection guide
Tubing size	Ranges from 3.18 mm (1/8 in.) to 25.4 mm (1 in.) inner diameter in various lengths	More information is available in the tubing selection guide
Connectors	Luer, Colder Products Company™ (CPC™) quick connects, SIP connectors, tri-clamp, Kleenpak, SmartSite, Clave™, Lynx™ steam-thru, CPC steam-thru, Gore™ steam valve, Gore™ Mini TC, BioQuate™, SterilEnz, end plug	More information is available in the connection system selection guide. Note: the only option for probe port connections is Kleenpak connectors
Probe ports/ line addition ports	Ports may be added if they are compatible with the hardware	The reusable probe port connection uses a Kleenpak connector
Disposable sensors	Pressure sensor: PendoTECH™ and Finesse Solutions (PendoTECH comes standard on 500 L and 1,000 L S.U.M.); DO and pH sensor: Finesse Solutions and PreSens™; pH sensor: Mettler Toledo	Choice of qualified vendors available
Port sizes	Limited engineer-to-order customization only	Dependent on location in BPC and fit with hardware (e.g., 1 in. ID port on harvest line)
Rearrangement of lines on existing ports	Limited customization possible, such as moving sample/thermowell port to a probe tube port, or swapping exhaust outlet line with liquid lines	Dependent on location in BPC and fit with hardware
Dip tube lines	Limited customization possible	Length cannot interfere with impeller and shaft
Filters on media and supplement inlets	Limited engineer-to-order customization only. Choice of filters used to sterilize incoming media or supplements are available	NA

Note: Not all options are available for all ports. It is not possible to customize port type, port location, chamber dimensions, or mixing assembly.
For additional information, please see the selection guides in the product catalog.

BPC packaging

Description	Details
Outer packaging	Supplied flat-packed with two polyethylene outer layers
Label	Description, product code, lot number, and expirataion date on outer packaging and shipping container
Sterilization	Irradiation (25 to 40 kGy) inside outer packaging
Shipping container	Durable cardboard carton
Documentation	Certificate of Analysis provided with each lot for each delivery

thermo scientific

Ordering information

500 L S.U.M. hardware	Cat. No.
Non-jacketed, DC motor, Touchscreen Console, with load cells	SUM0500.9001
Jacketed, DC motor, Touchscreen Console, with load cells	SUM0500.9002

Models without water jackets may have slightly different dimensions than the water-jacketed model shown in this data sheet. See the drawings provided with your unit for exact dimensions for non-jacketed models. Non-jacketed models do not have the capability to heat or cool the liquid inside the tank.

500 L S.U.M. BPC	Size	Probe ports*	Film type	Cat. No.
Standard powder-to-liquid BPC	500 L	0	CX5-14	SH30751.01
	500 L	0	Aegis 5-14	SH30973.03
Standard liquid-to-liquid BPC	500 L	0	CX5-14	SH30754.01
	500 L	0	Aegis 5-14	SH30983.03
Standard powder-to-liquid BPC*	500 L	3	CX5-14	SH30751.02
	500 L	3	Aegis 5-14	SH30974.03
Standard liquid-to-liquid BPC*	500 L	3	CX5-14	SH30754.02
	500 L	3	Aegis 5-14	SH30982.03

* All 500 L BPCs with probe ports are designed to allow probes to work properly at 5:1 turndown levels. These BPCs are only compatible with the HyPerforma hardware shown in this document. If you are using an older version of the S.U.M. hardware, do not use these items; instead refer to the legacy S.U.M. user manual or data sheets.

Find out more at **thermofisher.com/sum**

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