thermo scientific

HyPerforma Single-Use Mixer (S.U.M.) with Touchscreen Console User's Guide

DOC0042 • Revision E

October 2021

ThermoFisher SCIENTIFIC

Contents

Warnings, safety, and warranty information

Thank you for purchasing this high-quality Thermo Scientific™ equipment. We have included safety information in this guide, based on our knowledge and experience. It is important, however, for you to work with your safety management personnel to ensure that this equipment is integrated into your safety practices. Please take some time to perform your own job safety analysis in order to identify and control each potential hazard.

WARNING: Read and understand this user's guide before using this equipment.

The Thermo Scientific™ HyPerforma™ Single-Use Mixer (S.U.M.) is designed to be operated under traditional pharmaceutical conditions. A general understanding of mixing systems and their operation is important prior to using the system for the first time. Read and understand the user's guide before operating; failure to do so could result in injury and potential loss of product.

WARNING: Hazardous voltage inside.

The mixer motor, motor controller, and Touchscreen Console all have electrical components. There is a risk of electrical shock and injury. Disconnect power before opening electrical components. Service should be performed only by Thermo Fisher Scientific service personnel. Thermo Fisher Scientific recommends using standard lockout procedures when working on electrical components. The main breaker on the Touchscreen Console may be locked out.

WARNING: Static electricity may build up in BPCs.

- BioProcess Containers (BPCs) may act as insulators for electrostatic charge. If electrostatic charge is transferred to a BPC, the charge may be stored in the BPC and/or the product inside. This phenomena varies by product and use; therefore, it is the sole responsibility of the end user to ensure a hazard assessment is conducted and the risk of electrostatic shock is eliminated.
- Where applicable, a product contact stainless steel coupler may be grounded to the frame to dissipate electrostatic build up from the material within a BPC. It is good practice to dissipate electrostatic buildup by grounding all BPCs prior to coming in contact with them. When working with BPCs, the use of nonconductive materials, such as nonconductive gloves, is recommended.

WARNING: Rotating parts—entanglement hazard.
Rotating and moving parts can cause injury. Keep hands away from moving parts during operation.

- Do not operate this equipment unless the supplied guarding is in place and properly functioning.
- It is the responsibility of the end user to assess this equipment and ensure that equipment and safeguards are in good working condition, and that all operators are trained and aware of entanglement hazards and associated protective devices, such as hazard signs and guarding.

WARNING: Use ladders and elevated platforms with caution.
A few operations, such as loading a BPC into a large S.U.M., may require the use of a ladder or platform. Before use, ensure the ladder has been inspected and weight-rated for its user. When using a ladder or platform, be sure it is stable, maintain three points of contact, and make sure the steps are clean.

WARNING: Follow lockout/tagout procedures.
To prevent injury, when servicing equipment, use your company's lockout/tagout procedures to isolate electrical, mechanical, pneumatic, hydraulic, chemical, thermal, gravitational, or any other potential energy and protect workers from the release of hazardous energy.

WARNING: Use caution with hazardous chemicals or materials.
Personnel servicing equipment need to know the hazards of any chemicals or materials that may be present on or in the equipment. Use general hazard communication techniques such as Safety Data Sheets, labels, and pictograms to communicate any hazards.

WARNING: Potential confined space.
Operators may enter larger S.U.M. systems. Evaluate this equipment against your confined space standards and procedures.

WARNING: Burst hazard—air under pressure.
The S.U.M. BPC chamber is under slight pressure under normal operating conditions. Normal passive venting prevents any excess of pressure building up within the chamber. Chamber pressure and inlet line pressure should be monitored for proper settings.

- Contents under pressure
- Do not exceed 0.5 psi (0.03 bar) BPC pressure
- Do not exceed 5 psi (0.34 bar) inlet pressure
- Ensure vent filter is properly positioned and working properly

WARNING: Hot surface—do not touch.
The heating jacket is designed to heat the inner vessel wall. Normal operating conditions generate heat and could create hot surfaces.

- Hot surface inside
- Contact with surfaces may cause burns
- Do not touch while in operation

WARNING: Pinch hazard.
The Powdertainer hanger on the S.U.M. can be manually raised and lowered. Caution should be used to avoid pinching an operator or causing damage to the equipment or the BPC.

WARNING: Pinch hazard.
To avoid pinching and injuring an operator, use caution when opening or closing the pinch valves.

WARNING: The Thermo Scientific HyPerforma Single-Use Mixer may not be installed in a potentially explosive atmosphere as set forth in the applicable EU ATEX Directive. It is the responsibility of the end user to review and understand the potential dangers listed in the ATEX 2014/34/EU guidelines.

Protective earth grounding

Protective earth grounding must be verified prior to plugging the S.U.M. into any electrical outlet. Ensure the receptacle is properly earth grounded.

Environmental conditions

- Operating: 17 to 27°C; 20 to 80% relative humidity, non-condensing
- Storage: –25 to 65°C
- Installation category II (over voltage) in accordance with IEC 664
- Altitude limit: 2,000 meters

Electrical connections

Power should be supplied by a non-GFCI 15 amp circuit. Ground faults occur when a current is leaking somewhere—in effect, electricity is escaping to the ground. **Electrocution can occur when the human body serves as the path for this leakage to the ground.** A Ground Fault Circuit Interrupter (GFCI) senses the current flowing to the ground and switches off the power (trips the GFCI) in a fraction of a second at currents well below those that are considered dangerous.

Due to the sensitivity of GFCIs to electrical leakage (a few mA), it is recommended that the Single-Use Mixer NOT be plugged into a GFCI outlet.

Water jacket vessel information

The S.U.M. hardware unit with water jacket has been designed to be operated with water as the heat transfer medium, with temperatures not exceeding 50°C (122°F) under less than 150 psig (1 MPa) operating pressure. For the utmost safety it is recommended that the S.U.M. be operated at 75 psig or less.

Note: The S.U.M. BPC operating limits for temperature are 5 to 40°C. The internal pressure should not exceed 0.5 psi. The water jacket is not required to be registered, inspected and stamped with the Code U symbol per section U-1(c)2(f) of the ASME Boiler and Pressure Vessel Code and/or European Pressure Equipment Directive (PED) 97/23/EC. Upon request, a Declaration of Conformity, PED Sound Engineering Practices can be made available.

Warranty information

Any warranties, if applicable, covering this equipment exclude: (a) normal wear and tear; (b) accident, disaster or event of force majeure; (c) your misuse, fault or negligence; (d) use of the equipment in a manner for which it was not designed; (e) causes external to the equipment such as, but not limited to, external puncturing, power failure or electrical power surges; (f) improper storage and handling of the equipment; (g) use of the equipment in combination with equipment or software that we did not supply; (h) equipment sold to you as ‘used’ products; (i) contact with improperly used or unapproved chemicals or samples; (j) installation, removal, use, maintenance, storage, or handling in an improper, inadequate, or unapproved manner, such as, but not limited to, failure to follow the documentation or instructions in the deliverables or related to the equipment, operation outside of stated environmental or other operational specifications, or operation with unapproved software, materials or other products; (k) manufacture in accordance with requirements you gave us; (l) installation of software or interfacing or use of the equipment in combination with software or products we have not approved; (m) use of the deliverables or any documentation to support regulatory approvals; (n) the performance, efficacy or compatibility of specified components; and (o) the performance of custom equipment or products or specified components or achievement of any results from the equipment, specified components or services within ranges desired by you

even if those ranges are communicated to us and are described in specifications, a quote, or a statement of work. **ADDITIONALLY, ANY INSTALLATION, MAINTENANCE, REPAIR, SERVICE, RELOCATION OR ALTERATION TO OR OF, OR OTHER TAMPERING WITH, THE EQUIPMENT PERFORMED BY ANY PERSON OR ENTITY OTHER THAN US WITHOUT OUR PRIOR WRITTEN APPROVAL, OR ANY USE OF REPLACEMENT PARTS WE HAVE NOT SUPPLIED, WILL IMMEDIATELY VOID AND CANCEL ALL WARRANTIES WITH RESPECT TO THE AFFECTED EQUIPMENT. IF THE EQUIPMENT IS TO BE USED IN THE UNITED STATES, WE MAY VOID YOUR WARRANTY IF YOU SHIP THE EQUIPMENT OUTSIDE OF THE UNITED STATES.**

Use restrictions

You must use this equipment in accordance with our documentation and if applicable, with our other associated instructions, including without limitation, a “research use only” product label or “limited use” label license. This equipment is intended for research use or further manufacturing in bioprocessing applications and not for diagnostic use or direct administration into humans or animals, we do not submit the equipment for regulatory review by any governmental body or other organization, and we do not validate the equipment for clinical or diagnostic use, for safety and effectiveness, or for any other specific use or application.

Seismic guidance

The buyer of the equipment is responsible for ensuring that country-specific codes and seismic values are assessed for suitability of equipment installation and safety at the designated site. In addition, it is the buyer’s responsibility to assess the building structure for the designated equipment to ensure correct seismic anchoring and tethering designs for both the equipment and facility. It is highly recommended that the buyer consult with a local, licensed third party architecture and engineering firm to provide the buyer with correct engineering analysis and stamped documentation prior to equipment installation at the facility. In addition, the buyer will be responsible for rigging and anchoring of the equipment to a specified, fixed location. Upon request, Thermo Fisher Scientific can assist with establishing compliant seismic anchoring and tethering designs for purchased equipment based on building and country codes, at an agreed upon fee.

It is also noted that movable equipment (i.e. non-fixed or caster mount) is exempt from seismic design requirements according to ASCE 7-16, Chapter 13, section 1.4. Although these units are exempt from the seismic design requirements of ASCE 7, it should be noted that such equipment is susceptible to overturning during a seismic event. Therefore, it is the responsibility of the buyer to address seismic safety for movable equipment at the designated facility.

How to use this guide

Scope of this publication

This user's guide contains information about the standard Thermo Scientific HyPerforma S.U.M. system, including hardware, components, product design verification methods, installation, operation, and specifications. It is intended for use by people who may or may not have experience with Thermo Scientific systems, but who have some knowledge of bioproduction processes and large-scale mixing systems.

Document change information

Rev.	Date	Section(s)	Change(s) made	Author
A	10/2018	--	Initial release	E. Hale
B	01/2019	8.2	Corrected "relative humidity" in specifications for all system sizes	E. Hale
B	01/2019	8.3	Added load cell sensor ranges for 200, 500, 1,000, and 2,000 L S.U.M.s to Table 8.19	E. Hale
B	01/2019	8.2	Corrected 500 L overall width in specifications to 46.2 in.	E. Hale
B	01/2019	8.2	Corrected 2,000 L mixing rate range in specifications to 30–350 rpm	E. Hale
B	01/2019	8.4	Corrected size in Table 8.48 to 2,000 L	E. Hale
B	01/2019	--	Made minor formatting changes	E. Hale
C	11/2019	8.2	Minor revisions and updated cart length dimension on Figure 8.8	T. Golightly
D	11/2020	8.2	Updated Tables 8.2 and 8.4 and Figures 8.7–8.10 with new cart dimensions	T. Golightly/ E. Hale
D	11/2020	1.6.2, 8.4.8, 8.5.4, and 8.6	Replaced Thermo Scientific-branded probes and sensors with Hamilton-branded probes and sensors in Tables 1.2, 8.54, and 8.60 and Figure 8.34	T. Golightly
D	11/2020	--	Minor formatting changes	E. Hale
D	01/2021	8.2	Changed minimum rpm specifications from 20 to 30 in Tables 8.2, 8.4, 8.5, 8.7, 8.8, 8.10, 8.11, 8.13, 8.14, and 8.20	T. Golightly
E	10/2021	--	Changed any mention of the "reset" button to "restart"	T. Golightly
E	10/2021	4.5	Removed reference to 1-point calibration as a standard operation	T. Golightly

Questions about this publication

If you have any questions or concerns about the content of this publication, please contact **technicaldocumentation@thermofisher.com** and your Thermo Fisher Scientific sales team.

Related publications

Please contact your local sales representative for information about the related publications listed below.

Publication	Description
HyPerforma S.U.M. with Touchscreen Console Validation Guide (DOC0067)	Information about validation procedures
HyPerforma S.U.M. Data Sheets	Product descriptions and ordering information
Touchscreen Console Integrator's Guide (DOC0069)	Information about integrating the Touchscreen Console with third-party controllers
HyPerforma S.U.M. with Touchscreen Console Unpacking Guide (DOC0061)	Instructions for unpacking the S.U.M. system

Abbreviations/acronyms

See the list below for definitions of abbreviations used in this publication.

BPC	BioProcess Container
DO	Dissolved oxygen
E-Stop	Emergency stop button
ETP	Equipment Turnover Package
GFCI	Ground fault circuit interrupter
ID	Inner diameter
IEC	International Electrical Code
OD	Outer diameter
PED	Pressure Equipment Directive
P&ID	Process and Instrument Diagram
RTD	Resistance temperature detector
S.U.M.	Single-Use Mixer
TCU	Temperature control unit
VFD	Variable frequency drive

1

S.U.M. overview

Chapter contents

1.1 Introduction

The Thermo Scientific HyPerforma Single-Use Mixer (S.U.M.) offers a single-use alternative to traditional stirred-tank mixing. It is based on the same mixing principle as the Thermo Scientific™ HyPerforma™ Single-Use Bioreactor (S.U.B.). Both systems use an impeller linked to an overhead mixing motor via a sealed bearing assembly, which allows the impeller to turn while maintaining the integrity of the system. The S.U.M. is designed for powder-to-liquid and liquid-to-liquid closed system mixing with single-use contact surfaces, as well as open-top mixing.

Each S.U.M. system consists of the following:

1. **Stainless steel outer support container**, available with or without a water jacket heating system.
2. **Touchscreen Console**, for monitoring and controlling multiple sensors and functions.
3. **BioProcess Container (BPC)**, which is supplied gamma irradiated.

Figure 1.1. 100 L S.U.M. system with all available options.

The **outer support container** is a stainless steel vessel that holds and supports the BPC. It is engineered and fabricated to fully support each BPC while allowing easy access for operation. The drive shaft is detachable and reusable within stated operating parameters, and is inserted into closed-top BPCs through the mixing assembly and into the bearing port. Load cells are available for all systems to facilitate weighing.

The **Touchscreen Console** provides direct control of various functions during operation, such as temperature, pH, conductivity, agitation speed, filling, and harvesting. Flexibility in design allows users to enable alarms with assigned interlocks, connect and control external devices (such as pumps), and customize the home screen with only the functionality needed.

The **BPC** provides ready-to-use single-use contact surfaces, including an impeller, a sealed bearing assembly, and tubing for liquid transfer. Options include:

- Open-top liner for media/buffer preparation
- Closed BPCs with a powder port, designed to integrate with the Thermo Scientific Powdertainer, in order to provide ergonomic and contained media/buffer preparation
- Closed BPCs with monitoring probe capabilities
- Closed BPCs for liquid-to-liquid mixing of critical sterile solutions

This user's guide covers the setup, operation, maintenance, and troubleshooting of all S.U.M. systems in the following volumes: 50, 100, 200, 500, 1,000, and 2,000 liters.

1.2 Hardware characteristics

1.2.1 S.U.M. hardware components

Figures 1.2 and 1.3 below illustrate all available components of S.U.M. systems in 500 and 2,000 L sizes.

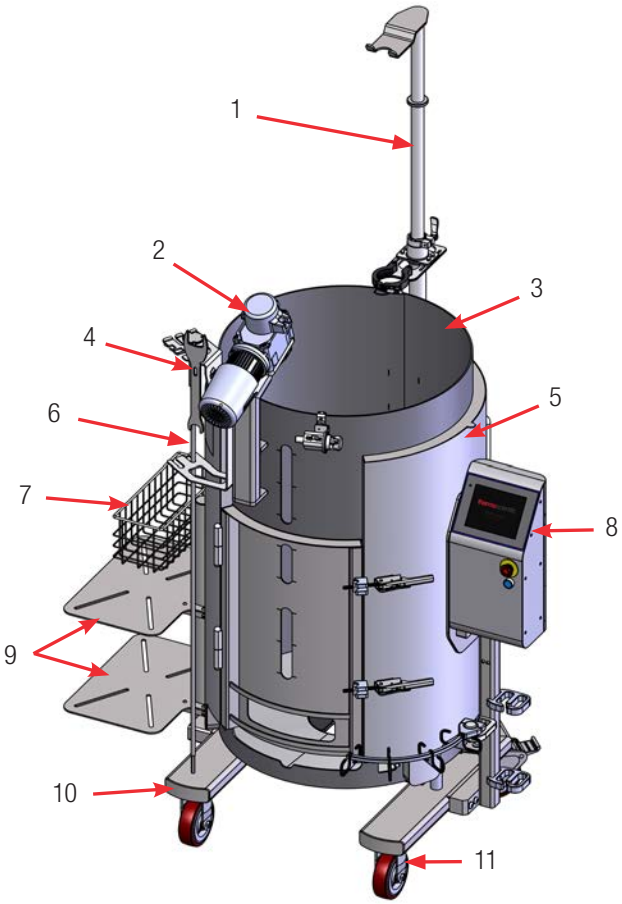


Figure 1.2. Front view of 500 L S.U.M.

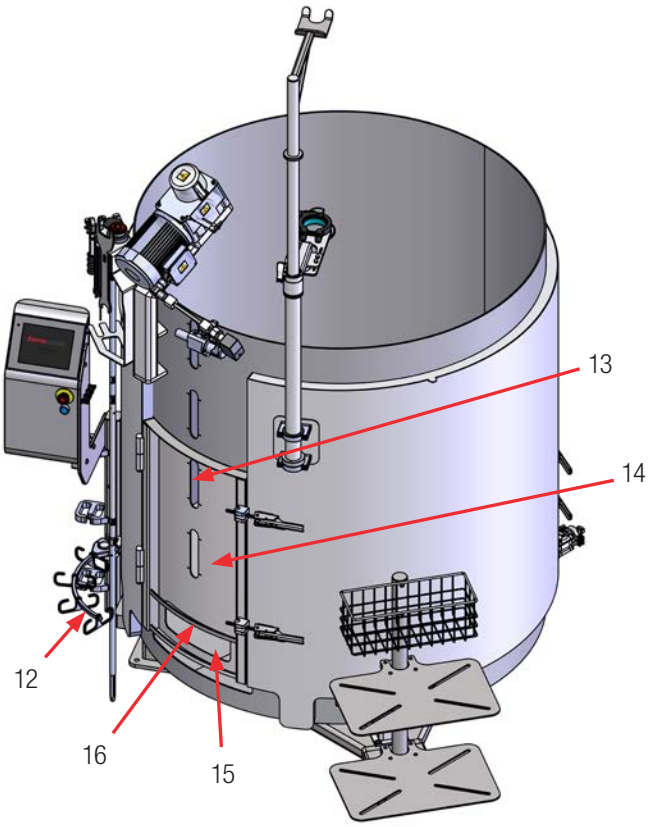


Figure 1.3. Front view of 2,000 L S.U.M.

1. Powdertainer arm (optional)
2. Mixer motor with safety cover
3. 0.95 cm (3/8 in.) Dimpled jacket
4. 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
5. Stainless steel outer support container
6. Drive shaft, stored
7. Basket (optional)
8. Touchscreen Console
9. Shelves (optional)
10. Cart assembly
11. Casters (2 swiveling, 2 fixed for 50–1,000 L S.U.M.s)
12. Cable management system hooks (optional)
13. Liquid sight windows
14. Door for BPC loading
15. Probe access window
16. Probe clip hanger

1.2.2 S.U.M. system features

The S.U.M. is designed for mobility, operation simplicity, and easy disposable integration. **Note:** 2,000 L systems are not designed to be portable and do not have wheels. Hardware drawings and specification tables for all S.U.M. sizes can be found in Chapter 8—Specifications and parts information.

Agitation

The mixing speed of the S.U.M. is adjusted using the Touchscreen Console. The interface indicates stirring speed in units of revolutions per minute (rpm).

Temperature control

The water-jacketed S.U.M. is designed to be operated with water/glycol as the heat transfer medium with a temperature range of 2–50°C. Under certain conditions, higher temperatures may be possible. Consult your Thermo Scientific representative if higher temperatures are needed. The process temperature may be monitored using the Touchscreen Console's Temperature module, with a temperature sensor inserted into the thermowell of a BPC equipped with probe ports.

Load cells

Load cells are available on all stainless steel S.U.M. hardware. Load cells can be installed at the factory or added later by a certified service technician. Load cells arrive uncalibrated; the load cell manufacturer or a qualified technician should calibrate these systems on site.

1.3 Touchscreen Console characteristics

1.3.1 Touchscreen Console hardware components

Figure 1.4 on the following page shows the components of the Touchscreen Console hardware.

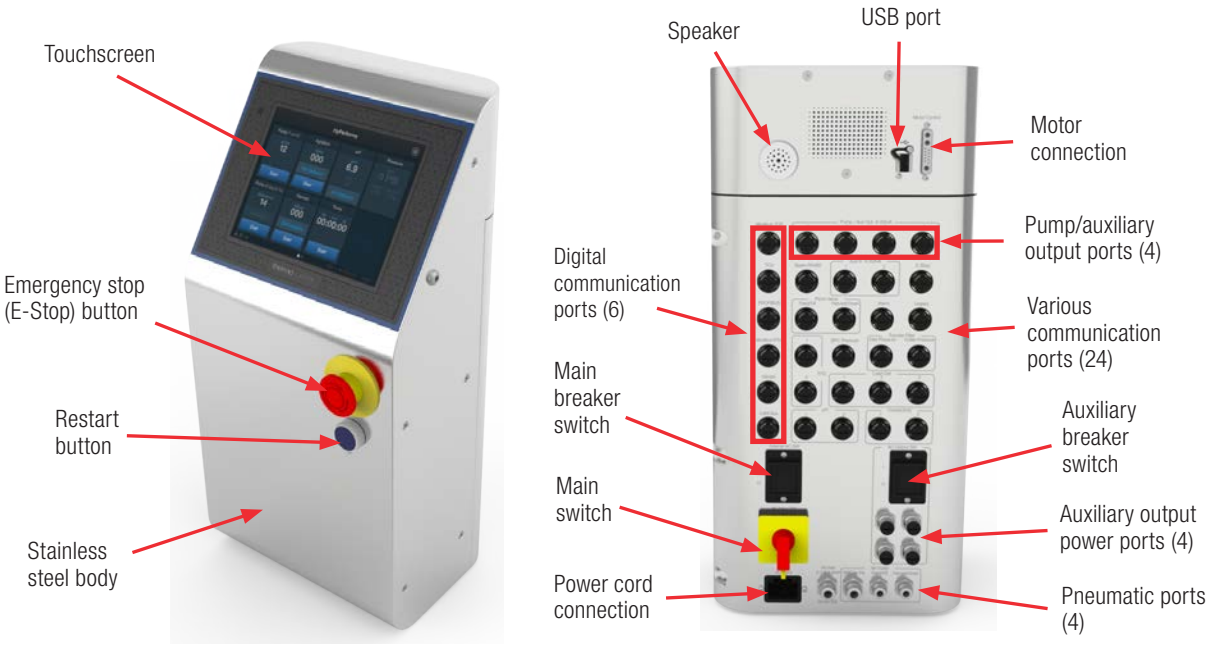


Figure 1.4. Touchscreen Console front and back views.

1.3.2 Touchscreen Console features

The Touchscreen Console enables users to monitor and control multiple functions, such as agitation, pH, conductivity, temperature, and mass. A customizable home screen allows users to add only the functionality needed for their operations. For more information, see Chapter 3—Touchscreen Console setup.

1.4 Third-party controllers

Standard HyPerforma S.U.M.s have a complete, integrated Touchscreen Console to control various functionality. However, third-party controllers can be connected via the Modbus and Profibus ports on the back of the Touchscreen Console. In this configuration, the Touchscreen Console will be used to send data packets from the third-party controller to various other devices. See the Touchscreen Console Integrator's Guide (DOC0069) for more information. Controllers made by the following manufacturers can be adapted for S.U.M. use:

- Thermo Scientific
- ABEC
- Bellco
- Broadley-James
- Dasgip
- Emerson
- Honeywell
- New Brunswick Scientific
- Pendotech
- Sartorius Stedim Biotech

1.5 BPC characteristics

1.5.1 S.U.M. BPC features

The S.U.M. BPC (either a closed BioProcess Container or an open-top liner) contains the mixing process. The BPC chamber is manufactured from either CX5-14 film or Aegis5-14 film. The open-top liner is manufactured from CX3-9 film. The BPC and liner are co-extruded structures specifically designed for use in biopharmaceutical processes. All materials are qualified for a range of physical, mechanical, biological, and chemical compatibility requirements. The mixer BPC is gamma irradiated at a minimum threshold of more than 25 kGy. This results in electron disruption, which destroys microorganisms, or makes them incapable of reproduction throughout a packaged BPC. However, it does not create residuals or radioactivity in the BPC. Two standard BPC configurations are available for powder-to-liquid applications and liquid-to-liquid applications, each available with or without probe ports. The open-top liner has a separate impeller and drive shaft sheath system for open-top mixing. For more information about BPCs, see section 8.4.

1.5.2 Operating pressure

CAUTION: The S.U.M. BPC is not rated as a pressure vessel. Gas pressure should not exceed 0.03 bar (0.5 psi) within a static BPC, or 0.007 bar (0.1 psi) when the motor is rotating during operation.
Note: The Touchscreen Console has a hard-coded air pressure setpoint of 0.004 bar (0.06 psi). The BPC should not be allowed to become tight during inflation. Conditions of over pressure may result in BPC damage or personal injury. Operating pressure can be monitored using the BPC Pressure module on the Touchscreen Console.
Note: BPC pressure monitoring requires a BPC with a pressure monitor.

1.5.3 Working volume

Each S.U.M. is designed for a specific working volume range. The minimum working volume and the rated working volume are listed in the specification tables provided in Chapter 8—Specifications and parts information. Actual working volumes should not exceed the indicated rated working volumes. However, if necessary, the BPC can accommodate a slight volume overage (68 L for 50 L S.U.M., 110 L for the 100 L S.U.M., 220 L for 200 L S.U.M., 550 L for 500 L S.U.M., 1,100 L for 1,000 L S.U.M., 2,100 L for 2,000 L S.U.M.).
CAUTION: Working volumes less than the stated minimums listed can result in hardware malfunction and damage to the BPC.

1.5.4 Draining

The S.U.M. is equipped with a bottom drain line that allows for liquid harvest by means of a peristaltic pump or gravity. Connection of the bottom drain line can be accomplished using the provided 12.7 mm (1/2 in.) quick-connect fitting. Manipulation of the S.U.M. BPC as the last few liters of fluid are removed can minimize liquid hold-up.

1.5.5 Aseptic connections

Multiple aseptic connection options exist for S.U.M. users. The standard BPC includes tubing welder sections, quick-connects for use under a laminar flow hood, and steamable sanitary connections for liquid-to-liquid BPCs. The S.U.M. BPC is designed with various lengths and dimensions of thermoplastic tubing for the purpose of addition and dispensing from the S.U.M. BPC. Refer to custom BPC options in Chapter 8 of this publication for custom end-treatment options.

1.5.6 Sampling

During operation of the S.U.M., samples may need to be taken for monitoring of various parameters established by the user, such as pH, spectrophotometric analysis, and osmolality. Samples can be taken from the S.U.M. in various ways depending on the BPC configuration. Samples are easily taken, utilizing the recirculation loop and the SmartSite port on all standard BPC configurations. In full volume applications where the recirculation loop is not being utilized, samples can be taken directly through the powder port, using one of the line sets on the top of the BPC, or through the drain line.

For BPC configurations that utilize probe ports, the S.U.M. can be equipped with a small volume sample port that is part of the BPC thermowell. This small diameter silicone dip tube of 15.24 cm (6 in.) length allows low void volume samples to be taken. The dip tube is supplied with an aseptic luer lock connector (SmartSite™) that allows for direct sampling or attachment of various sampling manifolds, using the standard luer lock connection. Alternatively, manifolds can be welded onto the C-Flex sample line using a tubing welder.

1.6 Additional/optional system components

1.6.1 Probe integration

The probe assembly is an innovative disposable design that packages user-supplied pH probes and connects them to the S.U.M. BPC. The probe assembly (Figure 1.5) includes the following components:

1. Molded bellows cover
2. Threaded probe adapter
3. Pall™ Kleenpak™ connector (KPCHT series, for high temperature)
4. Cable ties

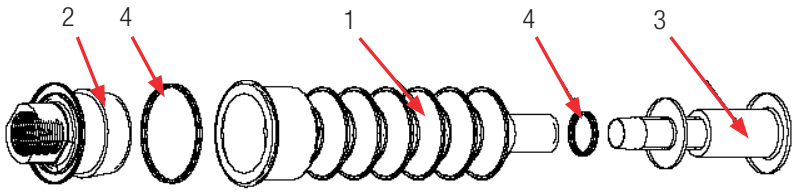


Figure 1.5. Probe assembly.

Note: Figure 1.5 (above) shows a probe assembly with a Kleenpak aseptic connector. Your S.U.M. BPC may use CPC™ AseptiQuik™ aseptic connectors or non-aseptic quick-connects, instead.

1.6.2 Required and optional accessories

To assist in the operation of the S.U.M., the following additional accessories are available. See Chapter 8 for more information about hardware accessories.

Thermo Scientific Powdertainer hanger and holding arm

The Powdertainer™ hanger and holding arm (Figure 1.6, at right) is an optional accessory that is used to hang and position powder bags. It is for S.U.M. systems using powder-to-liquid mixing.

Figure 1.6. 50 L S.U.M. Powdertainer arm.

Heavy-duty tubing clamps

Tubing clamps (Figure 1.7) are required for manually pinching off line sets that are not in use in order to prevent process fluids from moving into the line sets. S.U.M. systems with the Touchscreen Console may use pinch valves instead, which are automatically controlled. **Note:** Prior to sterile probe insertion, manual tubing clamps must be in place to close off probe ports. Users should have one tubing clamp for each connection port used.

Figure 1.7. Heavy-duty tubing clamp.

Pinch valves

Pinch valves (Figure 1.8) are connected to the Touchscreen Console, and are used to automatically control the flow of fluids through the BPC tubing during filling or harvesting. The following range of tubing sizes can be used with S.U.M. pinch valves:

- Maximum: 3/4 in. OD tubing with 1/8 in. wall
- Minimum: 1/2 in. OD tubing with 1/8 in. wall

Figure 1.8. Pinch valve.

Probe clips

Probe clips (Figure 1.9) are required to hold probes in place during operation of the S.U.M.

Figure 1.9. Plastic probe clip.

Autoclave tray for probe kits

The stainless steel autoclave tray (Figure 1.10) is designed for aseptic applications and required during the sterilization process. The support tray provides an inclined fixture for two probes during autoclaving to minimize stress on the probes, and to prevent collapse of the silicone bellows. **Note:** Figure 1.10 shows the autoclave tray used with Kleenpak aseptic connectors. Systems with AseptiQuik connectors require the use of a different autoclave tray. For more information, see section 8.5—Accessories and options specifications.

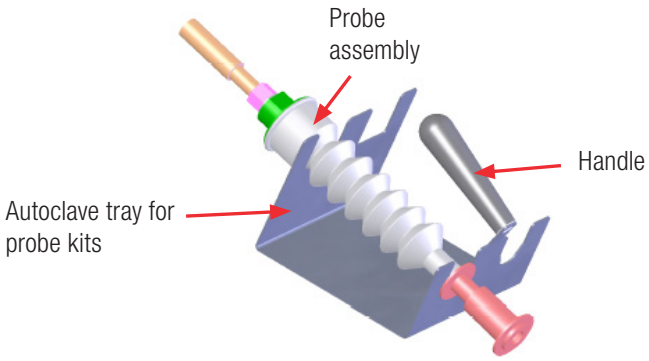


Figure 1.10. Autoclave tray.

Conductivity and pH probes

Tables 1.1 and 1.2 show the length, diameter, process connection type, signal type, and part numbers for conductivity and pH probes integrated into the S.U.M. The length and diameter requirements are based on the necessary insertion depth of the probe when used with the probe port.

Table 1.1. Recommended conductivity probes for use with the S.U.M.

Probe	Thermo Scientific part number	Manufacturer part number	Diameter	Process connection type	Length	Signal type
Jumo conductivity	SV51148.01	00682581	12 mm (0.47 in.)	13.5 PG	225 mm (8.85 in.)	M12
Mettler Toledo conductivity	SV51148.02	52001998	12 mm (0.47 in.)	13.5 PG	225 mm (8.85 in.)	VarioPin

Table 1.2. Recommended pH probes for use with the S.U.M.

Probe	Thermo Scientific part number	Manufacturer part number	Diameter	Process connection type	Length	Signal type
Mettler Toledo pH	SV51147.01	59903228	12 mm (0.47 in.)	13.5 PG	225 mm (8.85 in.)	S8
Broadley James pH	SV51147.03	F-635-B225-DH	12 mm (0.47 in.)	13.5 PG	225 mm (8.85 in.)	S8
Hamilton pH	SV51147.02	238633-1243	12 mm (0.47 in.)	13.5 PG	225 mm (8.85 in.)	S8

Pumps

Pumps are optional for S.U.M. systems. If used with the Touchscreen Console functionality, pumps enable users to automatically fill and harvest liquid, as well as deliver boluses of acid, base, or other buffer solutions during mixing. Different sizes of pumps are available to accommodate varying user needs.

Load cells

Load cells are used to determine the weight of the contents of a S.U.M. Although load cells are optional for all systems, they are required when using the Fill, Harvest, and Mass modules on the Touchscreen Console.

Cable management system

The cable management system is optional for all S.U.M. systems. Multiple clips attached to the outer support container are used to organize cables from the Touchscreen Console.

Drive shafts

The drive shaft is inserted into closed-top BPCs through the mixing assembly and into the bearing port. 50 and 100 L S.U.M. units only use one-piece drive shafts, and 200, 1,000, and 2,000 L units only use two-piece drive shafts. Both types of shafts are available for 500 L units.

AC and DC motors

S.U.M. systems in 50 L, 100 L, 200 L, 500 L, and 1,000 L sizes are only available with DC motors. 2,000 L S.U.M.s are only available with AC motors.

Miscellaneous optional items

- S.U.M. thermowell or sample port—port for temperature sensor calibration and validation
- Pressure sensors
- Communications cables
- Probes
- Temperature sensor
- P&ID tags
- Water jacket pressure relief valve—for water-jacketed S.U.M. systems only
- Shelves and basket—for storing pumps and bottles

For more information about hardware accessories, see section 8.5—Accessories and options specifications.

2

Hardware assembly and setup

Chapter contents

2.1 Site preparation

2.1.1 Electrical connections

The power cable for the Touchscreen Console can be ordered with a country-specific plug to connect to facility power. For some countries, including the United States, the plug is amperage-specific. Verify that your facility power matches the power requirements of the Touchscreen Console power cable before use. The 2,000 L Single-Use Mixer (S.U.M.) hardware cannot be used on circuits equipped with ground fault circuit interrupter (GFCI) circuit protection, due to the potential for nuisance tripping.

2.1.2 Hardware preparation

The hardware is shipped directly from the manufacturer and arrives with various safety mechanisms in place. Please follow the guidelines below to set up the S.U.M. upon arrival.

CAUTION: Any procedures that require the Touchscreen Console to be open must be performed with the main electrical disconnect in the locked out position, and all power sources removed from the Touchscreen Console. For operator safety, secure the location of the S.U.M. hardware by disabling the swivel casters before servicing.

2.2 Hardware assembly

2.2.1 Hardware uncrating

The S.U.M. hardware is shipped directly from the manufacturer and will arrive crated. Be sure to follow the unpacking instructions provided and retain all packaging for possible future use. **If you discover that any damage has occurred during shipping, contact your sales representative immediately.**

The S.U.M. hardware will arrive with the following items:

- Outer support container, including platform, tank, probe door plates, and Touchscreen Console (attached)
- Powdertainer arm assembly (optional)
- Drive shaft
- Torque and spanner wrenches
- Pump shelves (optional)
- Basket (optional)

- Cable management tree (optional)
- Cable management arm (optional)
- Communication cables, with tool for connecting cables to the Touchscreen Console (Figure 2.1)
- Equipment Turnover Package (ETP), located on a USB drive (shipped separately)

Figure 2.1. Tool for connecting cables to Touchscreen Console.

For more information about unpacking the S.U.M., please refer to the HyPerforma S.U.M. with Touchscreen Console Unpacking Guide (DOC0061).

2.2.2 2,000 L S.U.M. motor assembly

Due to the size of the 2,000 L S.U.M. unit, the mixing motor must be removed for shipping. For 2,000 L S.U.M. units only, follow the steps below to mount the mixing motor onto the outer support container.
Note: For safety, assembly of the motor onto the tank requires two people.

1. Remove the motor from its box.

2. Remove the attached safety cap mounting plate from the top of the motor.

3. Place the motor on the motor block portion of the support arm (Figure 2.2).

Figure 2.2. 2,000 L S.U.M. motor support arm assembly.

4. While one operator holds the motor in place, the second operator should place the safety cap mounting plate on top of the motor.

5. Close the motor safety cap and use the pin (attached to a cable) to secure it.

6. Insert the four 0.95 x 15.8 cm (3/8 x 6.25 in.) bolts through the plate, motor, and into the motor block portion of the support arm.

7. Tighten all four bolts.

8. Route the safety cap sensor wire to the AC motor module located behind the Touchscreen Console. Plug the M12 plug into the empty receptacle on the bottom of the AC motor module.

9. Route the motor power cable to the AC motor module located behind the Touchscreen Console. Plug the rectangular six pin plug into the empty receptacle on the bottom of the AC motor module, and secure the connection with the lever clamp.

2.2.3 Load cell preparation

When S.U.M. units are purchased with factory-installed load cells, the load cells are shipped in the locked position (threaded up) for equipment protection (Figure 2.3).

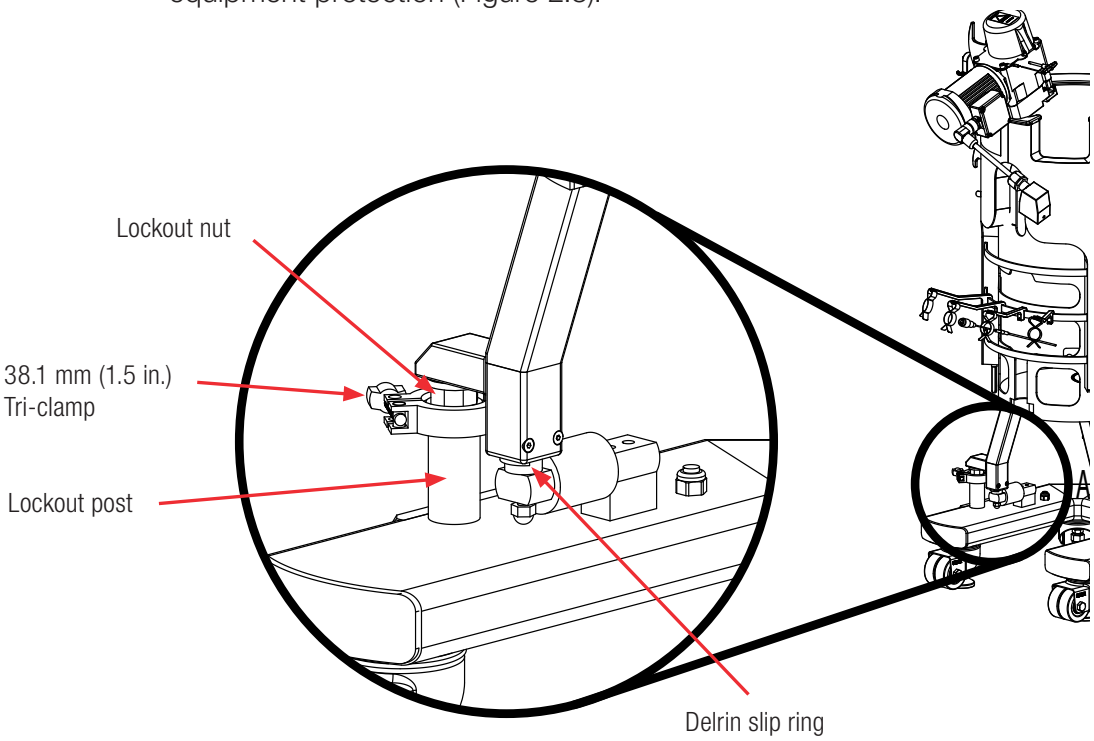


Figure 2.3. Load cell detail.

After the equipment is in place, use the instructions below to unlock the load cells.

1. Remove and discard the Delrin slip ring, if present.
2. Remove the tri-clamp.
3. Loosen the lockout nut, using the small end of the supplied tool, until the nut is tight against the base or leg of the tank.
4. Repeat this process for each load cell until all lockout nuts are disengaged from the lockout posts.
5. Do not reinstall the tri-clamp.

6. Once unlocked, the load cells need to be calibrated in accordance with your company's policy. See section 4.5 for instructions on calibrating mass using the Touchscreen Console.

   CAUTION: Do not move the unit, especially while filled, when load cells are unlocked. This can damage the load cells.

To lock load cells that have been unlocked:

1. Hand-tighten the lockout nut onto the post.

2. Use the supplied tool to turn the nut an extra 1/4 turn.

   CAUTION: To avoid damaging the load cells, do not over-tighten the nut.

3. Assemble a standard stainless 38.1 mm (1.5 in.) tri-clamp around the flanges.

4. Complete this process for all load cells.

2.2.4 Additional items for assembly

1. If you will be using probes, and have ordered optional probe clips (Figure 2.4), attach the probe clips to the probe access cutout by snapping them onto the brace.

Figure 2.4. Plastic probe clip.

2. Insert the drive shaft, tools, and bearing hub into the brackets provided on the S.U.M. hardware unit (Figures 2.5 and 2.6).

Figure 2.5. Tools stored in bracket.

Figure 2.6. Drive shaft and bearing hub stored in bracket.

3. If your system is equipped with a water jacket, use the tri-clamp fitting to attach the water jacket inlet and outlet ports to the bottom of the outer support container (Figures 2.7 and 2.8).

Figure 2.7. Removing tri-clamp on water jacket outlet.

Figure 2.8. Attaching fitting to water jacket port.

4. If your unit is equipped with the optional Powdertainer arm, install it onto the outer support container as shown below (Figure 2.9).

Figure 2.9. Installing Powdertainer arm.

5. If your unit comes with (optional) pump shelves (Figure 2.10), use a wrench and four bolts per shelf to attach them to the post. The basket (optional) will be pre-attached.

Figure 2.10. Shelves and basket attached to the S.U.M.

2.3 Hardware setup

All movement of the S.U.M. hardware should be over smooth surfaces, with the S.U.M. empty and disconnected from all power and feed sources. If your system is equipped with load cells, they must be locked before moving the S.U.M. unit. Follow the steps below to set up the S.U.M. hardware for operation.

1. Move the S.U.M. into the desired location and lock the casters to immobilize the unit. Note that the 2,000 L S.U.M. does not have casters.

Note: It is the end user's responsibility to prevent the system from movement and tipping by assessing the building structure for the designated equipment, ensuring correct seismic anchoring and tethering designs for both the equipment and facility.

2. Verify that the electrical supplies in the facility are sufficient to support the power requirements of the S.U.M. and ancillary components, such as controllers or pumps.

3. If your unit has a water jacket, connect the inlet and outlet lines from the temperature control unit (TCU) to the S.U.M. water jacket ports (Figures 2.11 and 2.12). The inlet is typically on the left side when you are facing the connectors.

Figure 2.11. Connecting the TCU to the water jacket.

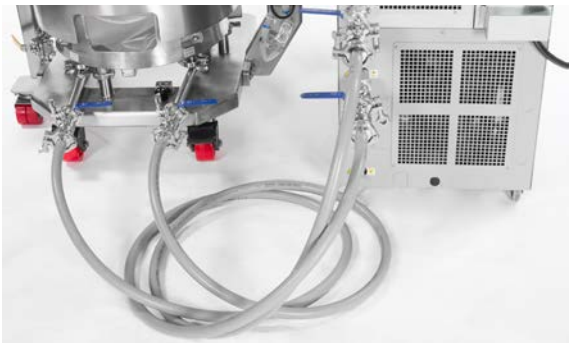


Figure 2.12. Connections between the S.U.M. and the TCU.

Note: Refer to the TCU manufacturer's guidelines for detailed TCU setup and operating instructions.

4. If you are using a third-party controller, locate the digital communication port you will be using on the back of the Touchscreen Console. Before connecting, verify that the proper T-plug and terminator are in place. A kit containing these components is available for order. Refer to section 8.5—Accessories and options specifications. You can also connect a controller using the legacy port on the back of the Touchscreen Console.

3

Touchscreen Console setup

Chapter contents

3.1 Setting up the Touchscreen Console hardware

Figure 3.1 illustrates the back panel of the Touchscreen Console. The various ports are labeled on the unit for your reference.

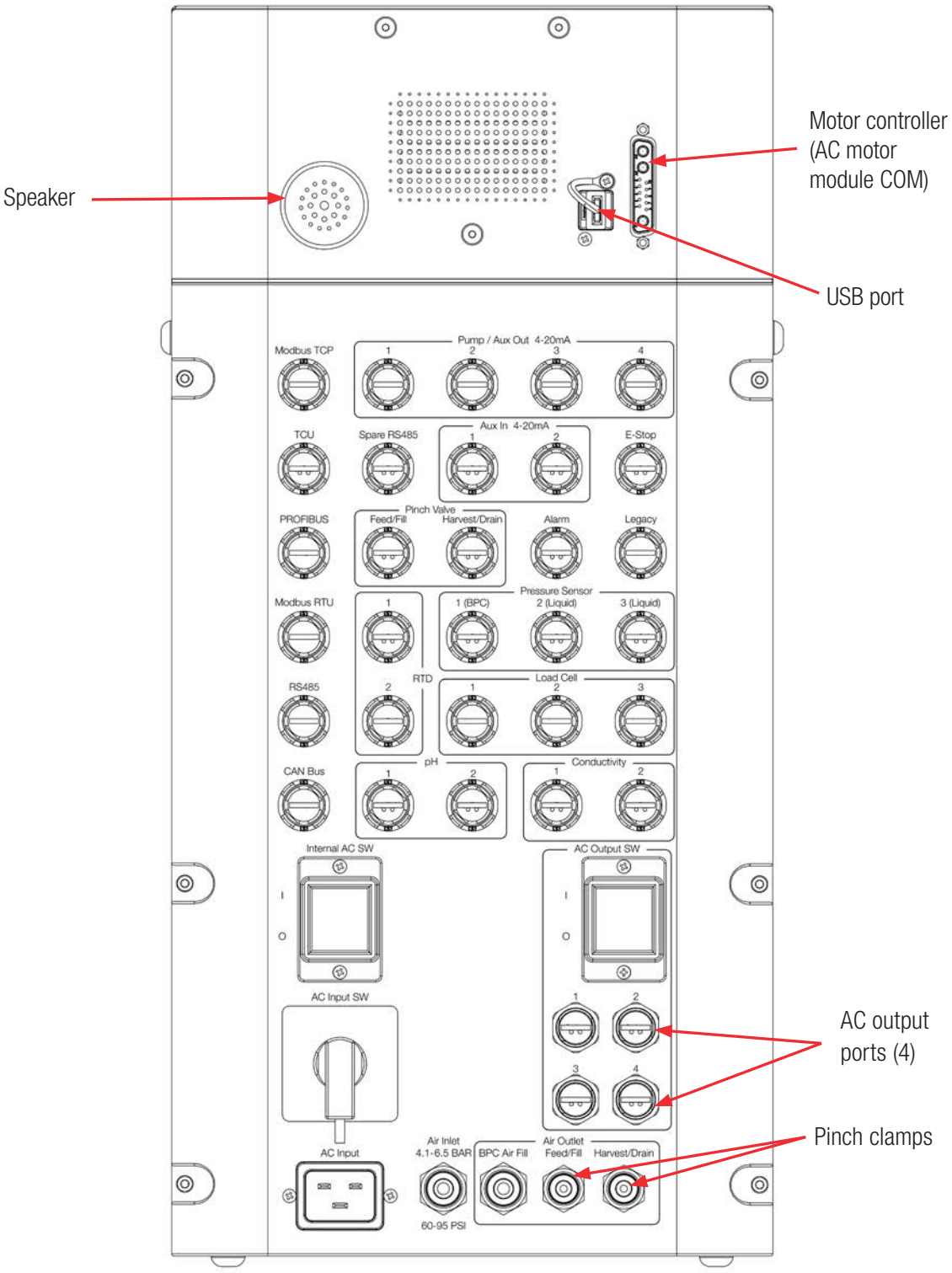


Figure 3.1. Ports and connections on the back of the Touchscreen Console.

1. Set any pumps that will be connected to the S.U.M. on the attached shelves, if present (Figure 3.2).

2. Plug the communication cables from the pump(s) into the pump/aux out ports on the back of the Touchscreen Console, and use the supplied tool to tighten (Figure 3.3).

Figure 3.2. Setting pumps on shelves.

Figure 3.3. Connecting pumps to the Touchscreen Console.

3. If you are using the optional cable management system, route the pump cables through the clips that are attached to the handles on the back of the S.U.M. Then plug the pumps into the proper power source. **Note:** To calibrate pumps after they have been set up, first become familiar with sections 3.2–3.5. Then see section 4.1—Calibrating pumps.

4. To connect air to the S.U.M. system, connect an 8 mm (5/16 in.) OD air line (Figure 3.4—not supplied) from the first pneumatic air port on the back of the Touchscreen Console (Figure 3.1) to the facility air supply. **CAUTION:** Air pressure to the Touchscreen Console should be between 4.14–6.55 bar (60–95 psi).

Figure 3.4. Air line connected to the back of the Touchscreen Console.

5. Verify that the main breaker and main power switch are in the “off” position. The selection switch should be pointing to the small circle to the left (Figure 3.5).

Figure 3.5. Main power switch shown in “off” position.

6. Verify that the emergency stop, referred to as the “E-Stop,” is disengaged (pulled out) by turning the knob clockwise (Figure 3.6). **Note:** The E-Stop disconnects all power to the system. An alarm buzzer will sound when the E-Stop is activated.

Figure 3.6. Turning knob on the E-Stop clockwise to disengage.

7. Ensure that the E-Stop jumper plug on the back of the Touchscreen Console is plugged in.

8. Connect the motor power cable to the motor (Figure 3.7).

Figure 3.7. Motor control connection.

9. Connect all electrical plugs to facility power. Refer to hardware/ electrical labels and schematics to ensure proper electrical voltage is connected to the S.U.M.

10. Use the supplied tool (Figure 3.8) to connect any communication cables you will be using (temperature sensor, pH sensor, pressure sensor, conductivity sensor, load cells, etc.) to the input ports on the back of the Touchscreen Console (Figure 3.9). **Note:** To allow visibility of the port labels while you are making connections, it is recommended to begin plugging cables into the Touchscreen Console ports starting at the bottom, and working your way upward.

Figure 3.8. Supplied tool for connecting communication cables.

Figure 3.9. Connecting communication cables to the Touchscreen Console.

11. Use the auxiliary power ports on the back of the Touchscreen Console as needed. **Note:** Auxiliary power is at the same line voltage as the Touchscreen Console, either 120 or 240 V, depending on your system. Verify that the auxiliary breaker on the back of the Touchscreen Console is in the “on” position before use.

    CAUTION: All four auxiliary power ports share the same breaker (8 amps (A) of power out of the Touchscreen Console). To avoid tripping the auxiliary breaker, do not use higher than 8 A power for all four of the auxiliary power ports combined.

12. When you are ready to operate the system, turn on the main breaker, followed by the main power switch. After the Touchscreen Console has booted up, verify that the E-Stop is disengaged, then press the blue “power-on restart” button (Figure 3.10).

Figure 3.10. Pressing the blue power-on restart button.

3.2 Configuring the Touchscreen Console home screen

3.2.1 Introduction to the Touchscreen Console

Figure 3.11 shows an example of the Touchscreen Console home screen. See Table 3.1 for more information about the items that have been numbered on the screen.

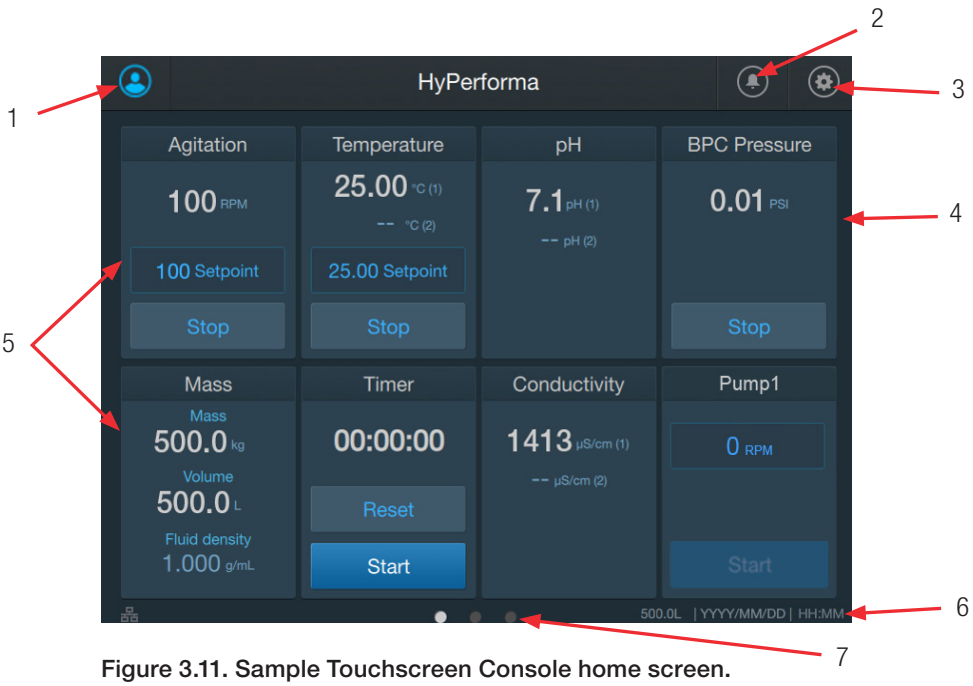


Figure 3.11. Sample Touchscreen Console home screen.

Table 3.1. Touchscreen Console home screen item descriptions.

Item	Name	Description
1	Administrator icon	If an Administrator profile has been created and is currently logged in, this icon will appear blue. If an Administrator is not logged in, the icon will appear gray.
2	Alarm icon	Directs the user to the Alarm Status screen, where alarms can be viewed/acknowledged.
3	Settings icon	Directs the user to the System Settings screen, where the user can adjust the date/time, set up an Administrator profile, check for software updates, and more.
4	Flyout menu bar	Shows active modules. Touching the module name in the menu will open the active module.
5	Configured modules	Shows modules that the user has added to the home screen and configured. See sections 3.2.2 and 3.2.3 for information about adding and configuring modules.
6	S.U.M. size, date, and time	Displays the size of the S.U.M. currently in use, and the current date and time.
7	Page navigation	The home screen has three pages, which are visible at the bottom of the screen as three dots. The dot for the active page will be white while the others are grayed out. The next available page can be accessed by swiping right-to-left across the home screen.

3.2.2 Adding modules to the Home screen

The Touchscreen Console uses “modules” to identify the functionality users are able to access. Section 3.2.3 provides overview information about each module. Follow the steps below to add the modules you would like to use to the Home screen.

1. First-time users will see the idle screen (Figure 3.12) after turning on the Touchscreen Console. **Note:** Before starting to add modules to the Home screen, ensure that the unit size, date, and time displayed in the bottom right corner of the idle screen are correct. If any of the values are incorrect, touch the **Settings icon** in the top right corner and select **Instrument Settings** to adjust the values.

Figure 3.12. Idle screen appears at initial setup.

2. After the unit size, date, and time are displayed correctly on the idle screen, touch **Home screen**.

3. The Select Auxiliary Outputs or Pumps screen that appears allows the user to select a combination of four pumps and/or auxiliary outputs (Figure 3.13). Touch the pumps and/or auxiliary outputs you would like to use to add them to your Home screen. To deselect a pump or auxiliary output, touch the button again. When you are finished, touch **Next**.

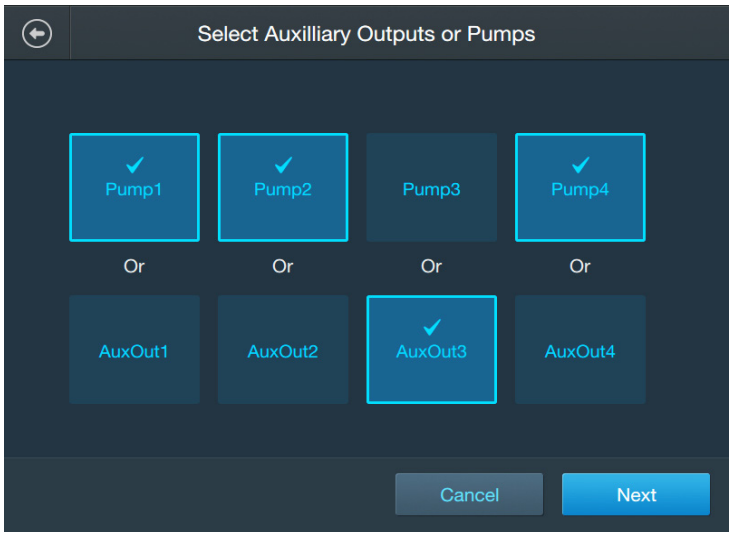


Figure 3.13. Selecting pumps and/or auxiliary outputs.

4. The Select Modules screen that appears allows the user to select any other modules (Figure 3.14). Touch the modules you would like to use to add them to the Home screen. To deselect a module, touch the button again. When you are finished, touch **Next**.

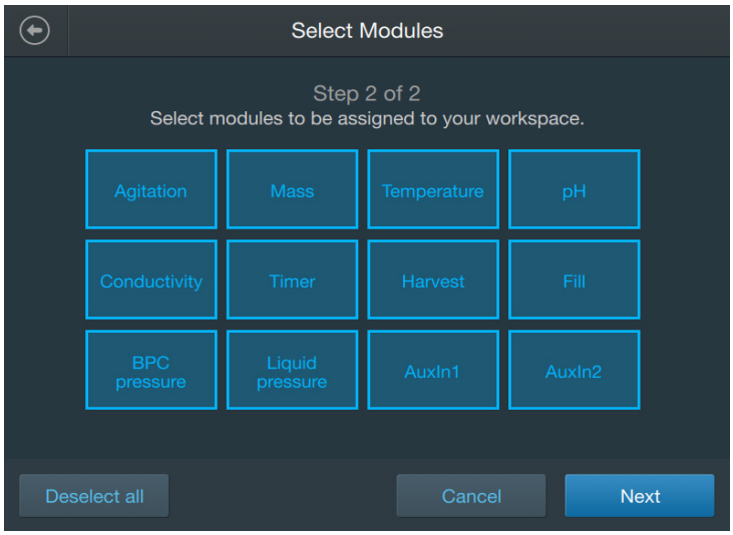


Figure 3.14. Selecting modules.

5. The Home Screen Confirmation screen that appears displays the pumps/auxiliary outputs and modules you have selected (Figure 3.15). Touch **Confirm** to add them to your Home screen. The next screen that appears will look similar, but it will list the modules that have been added to the Home screen. Touch **Open Home Screen**.

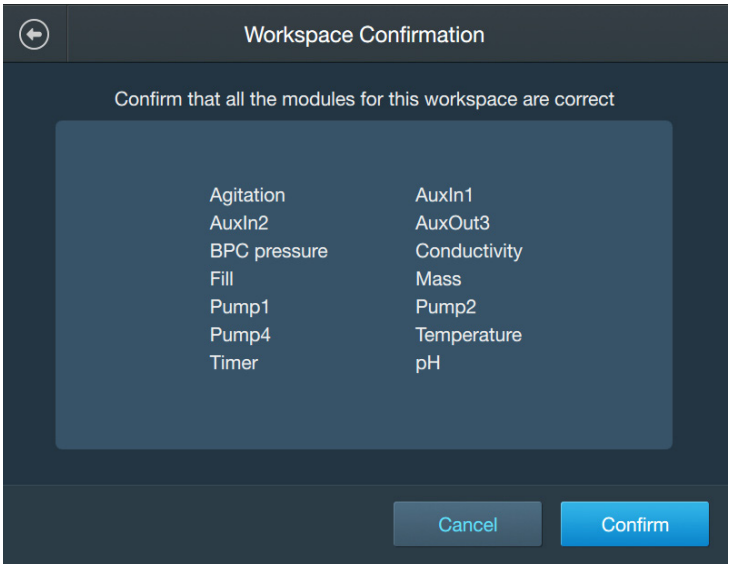


Figure 3.15. Home Screen Confirmation screen.

6. The configured Home screen will appear with the modules you selected. Depending on the number of modules added, your Home screen may be multiple pages. Swipe right-to-left to view other pages. See the following section, 3.3—Module overview, for general information about each module's functionality and instructions for configuring modules.

3.2.3 Creating and using an Administrator profile

An Administrator profile allows an administrator to limit other users' accessibility of certain Touchscreen Console settings and functionality. Table 3.2 shows the available functions for all users and administrators only.

Table 3.2. Accessibility of settings/functions for all users and administrators only.

Setting or function	All users	Administrators only
pH settings	Calibration, Temperature compensation, Select active sensor, Reset calibration, Module configuration, and Sensors available	High and Low alarms, High High and Low Low alarms, Alarm designation (pumps), and Diagnostics
System settings	Export sensor logs	About instrument, Maintenance and services, Instrument settings, Alarms and interlocks, and End User License Agreement (EULA)
BPC pressure settings	Units, Calibration	High and Low alarms, High High and Low Low alarms, Alarm designation (pumps), and Module Configuration
Agitation settings	N/A	High and Low alarms, High High and Low Low alarms, Set point limits, Calibration, and Module configuration
Temperature settings	Select active sensor, Calibration	High and Low alarms, High High and Low Low alarms, TCU set point limits, and Module configuration
Timer settings	Notes, Reset	N/A
Mass settings	Fluid density, Tare/zero, and Calibration	High and Low alarms, High High and Low Low alarms, Alarm designation (pumps), Alarm designation (agitation), Alarm designation (pinch valves), and Module configuration
Pump settings	Units and fluid density, Pump calibration, Add bolus, and Prime pump	Diagnostics, rpm scaling, rpm limits, and Module configuration
Liquid pressure settings	Units, Display options, and Calibration	High and Low alarms, High High and Low Low alarms, Alarm designation (pumps), Alarm designation (agitation), Alarm designation (pinch valves), and Module configuration

Use the following steps to set up an Administrator profile.

1. Open System Settings by touching the Settings icon in the top right corner of the Home screen. Touch **Administrator**.

2. On the screen that appears, enter the PIN you would like to use as the Administrator. Re-enter the PIN in the **Confirm PIN** field. **Note:** If you would like to view the PIN you have entered, touch the **Show PIN** box.

3. When you are finished, touch **Create profile**. A screen will appear confirming that the Administrator profile has been created. Touch **Done**.

4. After you have created the Administrator profile, you can use the Administrator option under **System settings** to sign in and out of the profile (Figure 3.16).

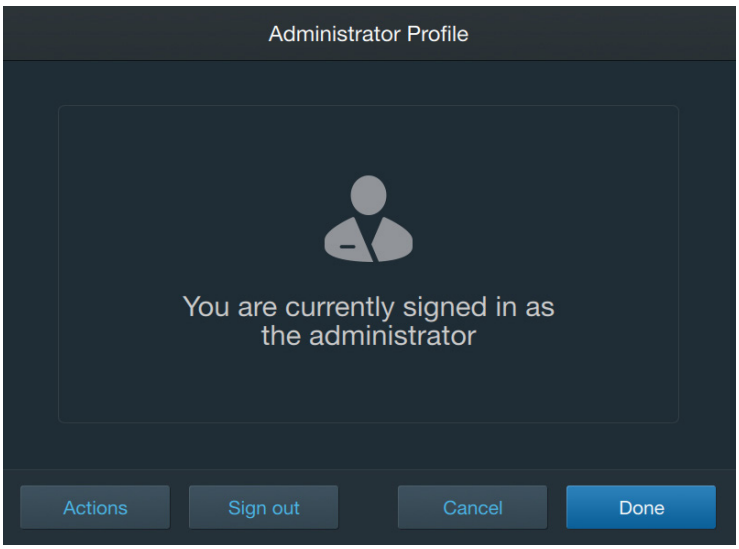


Figure 3.16. Administrator profile screen.

For more Administrator options, select **Actions**. The following options are available:

- **Reset PIN**—Change the PIN associated with the Administrator profile.
- **Enable auto sign out**—Allow the Touchscreen Console to automatically sign out the Administrator after a user-specified length of time.
- **Control admin PIN**—Enable or disable the Administrator profile. **Note:** Selecting **Disable** will remove the Administrator profile from the Touchscreen Console. If you would like to keep the profile but currently do not want to use it, sign out of the profile instead.

3.3 Module overview

Each of the Touchscreen Console modules listed below provide users with the ability to monitor and control various functions. Some of the modules either require or can be optionally used with ancillary components, such as sensors or pumps. Many modules are also optionally dependent on ancillary components or other modules. This means that, if desired, users may set up interlocks within modules that change their function based on certain conditions, such as stopping the pump when the BPC air pressure reaches a specified psi. See section 3.5.1 for more information on setting interlocks.

1. **Agitation**—This module is used to monitor and control the S.U.M. mixing speed, which is displayed in revolutions per minute (rpm).

The Agitation module is optionally dependent on the temperature control unit (TCU), if a TCU is being used. This means that the Touchscreen Console can pause or stop the TCU if the agitation speed reaches above or below specified set points.

2. **Mass**—This module requires load cells to read the total weight of the S.U.M. system. The Mass module is optionally dependent on the following:

   – Fill pinch valve: The pinch valve will close if the mass reading is above a specified set point, to prevent overflowing.
   – Harvest pinch valve: The pinch valve will close if the mass reading is below a specified set point, to prevent overharvesting.
   – Pumps: The pumps will turn off if the mass reading is above or below a specified set point, due to the Fill or Harvest pinch valves closing. This prevents BPC lines from becoming over pressured and bursting.
   – Agitation module: Agitation will stop if the mass reading is below a specified set point, to prevent potential damage caused by mixing in an empty BPC.

3. **BPC Pressure**—This module can only be used with closed-top BPCs that have pressure sensors, and in a facility with an available air source. BPC Pressure is used to fill the BPC with a specified amount of air, and to monitor the amount of pressure in the BPC headspace. It is optionally dependent on the Fill pinch valve and pumps: the pinch valve will close and the pump will stop if the psi reaches above a specified set point.

4. **Pumps**—This module can only be used if one or more pumps have been set up. The Pumps module can be used to fill the BPC with liquid, deliver acid, base, or buffer solutions, and harvest liquid. The use of pinch valves is optional, but without them, users must manually open and close BPC lines using pinch valves.

5. **Fill**—This module can only be used if your system has load cells, and one or more pumps have been set up. The Fill module is used to fill the BPC with liquid before mixing. The use of pinch valves is optional, but without them, users must manually fill the BPC by opening a pinch valve on a BPC line.

6. **Harvest**—This module can only be used if your system has load cells, and one or more pumps have been set up. The Harvest module is used to drain liquid from the BPC after the mixing process is complete. The use of pinch valves is optional, but without them, users must manually drain the BPC by opening a pinch valve on a BPC line.

7. **pH**—This module can only be used with one or two pH sensor(s). The pH module can be used to monitor and adjust pH levels during the mixing process. However, the ability to adjust pH levels is dependent on the use of pumps (e.g. one for delivering an acid solution, and one for delivering a base solution). The module is optionally dependent on pumps, as the pump can be paused or stopped if the pH reads above or below specified set points.

8. **Conductivity**—This module can only be used with one or two conductivity sensor(s). The Conductivity module can be used to monitor and adjust conductivity levels during the mixing process. However, the ability to adjust conductivity levels is dependent on the use of a pump to deliver a buffer solution. The module is optionally dependent on pumps, as the pump can be paused or stopped if the conductivity reads above or below specified set points.

9. **Temperature**—This module can only be used with one or two temperature sensor(s). The Temperature module can be used to monitor and adjust the temperature. However, the ability to adjust the temperature is dependent on the use of a TCU. The Temperature module is optionally dependent on the TCU, as the TCU can be put on standby if the temperature reads higher or lower than specified set points.

10. **Timer**—The Timer module consists of a timer that starts at zero and counts up to track how long a solution has been mixing. It has “Start” and “Stop” functions.

11. **Liquid Pressure**—This module can only be used with one or two liquid pressure sensors in the BPC tubing line set (located before and/or after the filter). The Liquid Pressure module is used to monitor the liquid pressure level during harvest to ensure that the filter is not clogged. The Liquid Pressure module is optionally dependent on both pumps and Harvest pinch valves, as the pinch valve will close and the pump will stop if the liquid pressure reads above a specified set point.

12. **Auxiliary Output**—This module can be used to duplicate another existing module, such as Temperature, if necessary. The Auxiliary Output module uses the same connection port (on the back of the Touchscreen Console) as pumps, which means users can have a maximum combination of four pumps and/or auxiliary outputs.

13. **Auxiliary Inputs**—This module can be used to monitor sensors and transmitters that use a 4-20 mA signal, such as external scales.

3.4 Required external components for modules

The flow chart provided below (Figure 3.17) illustrates the required external components for various modules.

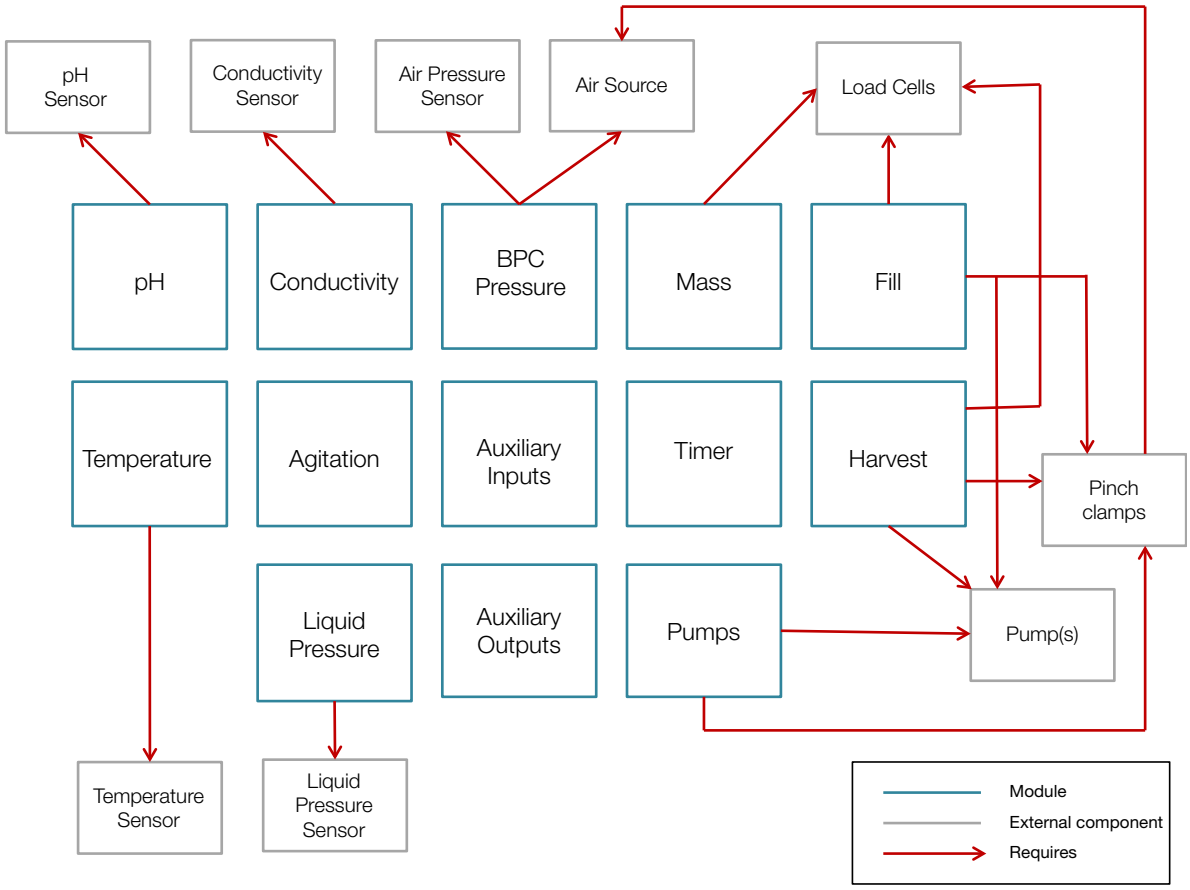


Figure 3.17. Flow chart depicting required external components for each module.

3.5 Configuring modules

Each module configuration requires the user to fill out certain fields (such as set points), and also provides optional fields (such as alarms) for customization. The following sections provide information about setting up interlocks and alarms, as well as individual modules.

3.5.1 Setting up interlocks and alarms

Users can customize the functionality of their Touchscreen Console by setting up interlocks and alarms on individual modules.

- Setting up interlocks within a module creates dependencies on other modules or ancillary components. For example, users might set interlocks in the Mass module that will turn off agitation if the mass of the S.U.M. reaches a certain weight. This interlock would prevent potential damage caused by mixing in an empty BPC or mixing at a rate outside the recommended specifications for safe operation of the drive shaft.
- Alarms are also optional on Touchscreen Console modules. Users can set “High” and “Low” alarms, or “High High” and “Low Low” alarms.
    - High and Low alarms only visually alert the user that specified set points have been reached. When High or Low alarms are triggered, the alarm icon and affected module on the home screen will turn yellow, but processes will continue.
    - High High and Low Low alarms visually and audibly alert the user that specified set points have been reached. When High High or Low Low alarms are triggered, the alarm icon and affected module on the home screen will turn red, a buzzer will sound, and processes will either pause or stop (depending on the user’s settings).

Interlocks and alarms settings for individual modules can be accessed by touching the module on the home screen. The Configuration screen for each module provides fields of entry for both options. See the instructions for configuring modules in the following sections for more information.

3.5.2 Configuring the Agitation module

Use the following information and steps to configure the Agitation module. Each of the items listed below is shown in Figure 3.18.
Note: You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Set point limits:** Enter the maximum and minimum speeds (in rpm) that you would like to use during the mixing process.

Optional fields

- **High and Low alarms:** Enter the rpm values that will trigger High and/or Low alarms. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low alarms. When triggered, these alarms will be accompanied by an audible buzzer, and will pause or stop operating processes, depending on user settings. The interlock equation provides the conditions that trigger the alarm, while the hysteresis section provides the conditions under which processes will resume. Touch each of the provided fields to enter or select the necessary values for High High and/or Low Low alarms.
- **Calibration (for systems with AC motors only):** Set up one-point agitation calibration to determine the accuracy of agitation readings. See Chapter 4 for more information on calibration procedures.

1. Locate the Agitation module on the Touchscreen Console Home screen, and touch **Configure**. The Agitation Configuration screen will appear (Figure 3.18). Touch the **Set point limits** field.

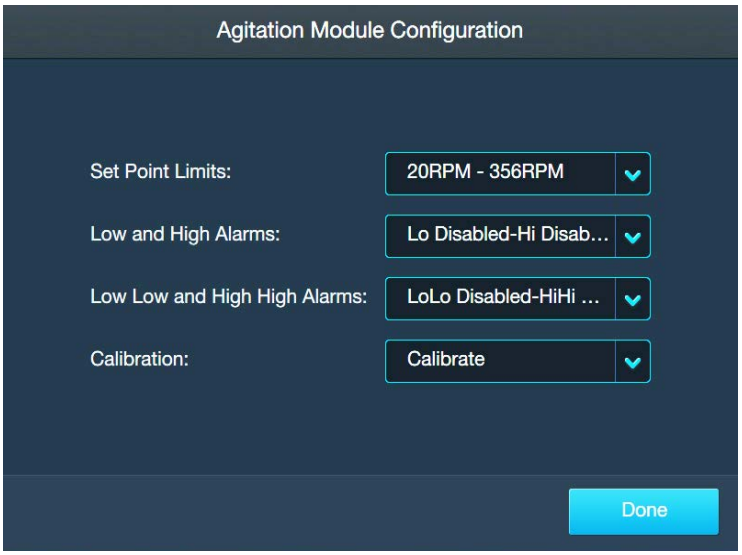


Figure 3.18. Agitation Configuration screen.

2. On the screen that appears, enter your desired maximum and minimum agitation set point limits (in rpm). Touch **Next**.

3. The Agitation Configuration screen should reappear. The “Max” and “Min” values you entered should be visible in the field next to “Set point limits.” If you would like to set High/Low alarms for agitation in relation to temperature, touch the **High and Low alarms** field.

4. On the screen that appears, there will be separate sections for both High and Low alarms (Figure 3.19). To set up the Low alarm, slide the Enable/Disable button to the “Enable” side. In the field under “High Alarm,” enter the temperature in degrees Celsius (°C) that will activate the High alarm.

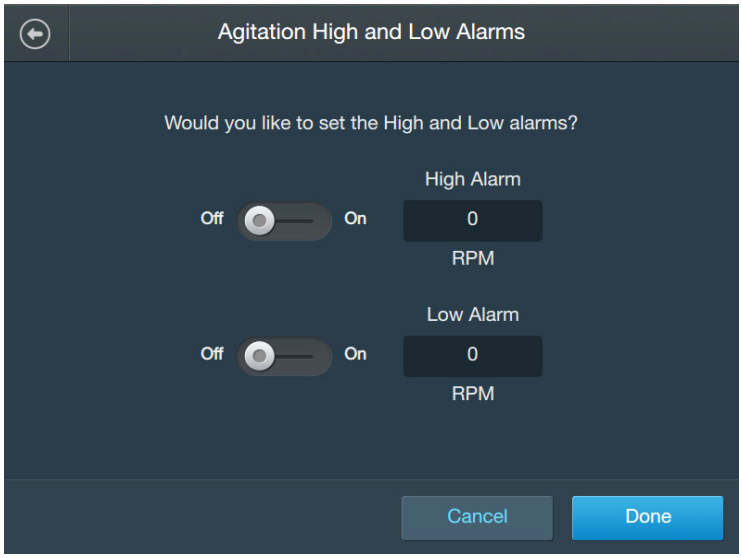


Figure 3.19. High and Low alarms screen.

5. To set up the Low alarm, slide the Enable/Disable button to the “Enable” side. In the field under “Low Alarm,” enter the temperature (in °C) that will activate the Low alarm.

6. After you have entered the High and Low alarm values, touch **Done**.

7. The Agitation Configuration screen should now show the High and Low alarm values you entered. If you would like to set High High/ Low Low alarms for agitation in relation to temperature, touch the **High High and Low Low alarms** field.

8. On the screen that appears (Figure 3.20), there will be separate sections for both High High and Low Low alarms. Slide the Enable/ Disable buttons on each section to the “Enable” side to enable the alarms.

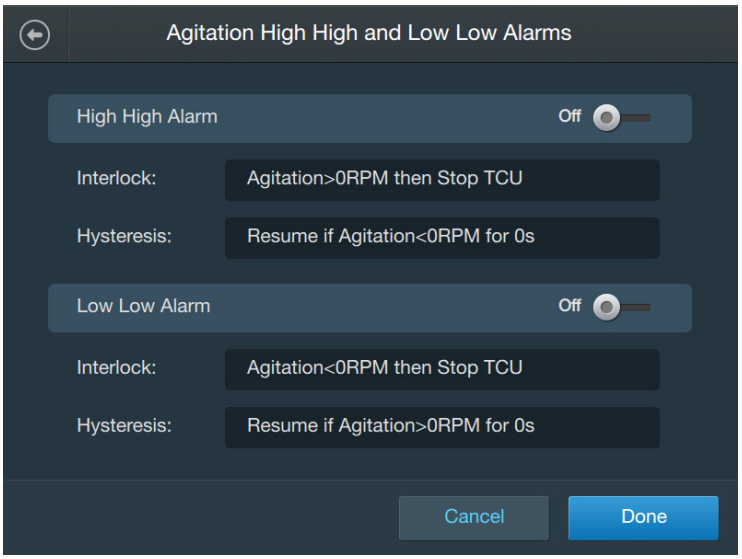


Figure 3.20. High High and Low Low alarms screen.

9. For both High High and Low Low alarms, there will be fields labeled “Interlock” and “Hysteresis.” Touch **Interlock** on one of the alarm fields to set the initial condition that will trigger the alarm, and the action that should be taken after it is triggered.

10. On the screen that appears, both interlock and hysteresis sections will be shown. In the “TCU Interlock Equation” section, enter the Control Set Point (in rpm) and select the Action Taken (either **Pause** or **Stop**).

11. The “Hysteresis” section (below the interlock section) dictates the rpm the S.U.M. should reach, and for how long that rpm should be held (in seconds), before the TCU resumes. Enter both the Set Point (in rpm) and the Seconds. When you are finished, touch **Done**.

12. After you have finished setting the interlock and hysteresis for the High High and/or Low Low alarm, touch **Done** on the Agitation High High and Low Low Alarms screen.

13. If you are using a system with an AC motor and would like to set up an agitation calibration, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

3.5.3 Configuring the Mass module

Use the following information and steps to configure the Mass module. Each of the items listed below is shown in Figure 3.21. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Units:** Enter the units you would like to use when weighing the S.U.M. (grams (g) or kilograms (kg)).

Optional fields

- **High and Low alarms:** Enter the mass values (g or kg) that will trigger High and/or Low alarms. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low alarms. When triggered, these alarms will be accompanied by an audible buzzer, and will pause or stop operating processes, depending on user settings. The interlock equation provides the conditions that trigger the alarm, while the hysteresis section provides the conditions under which processes will resume. Touch each of the provided fields to enter or select the necessary values for High High and/or Low Low alarms.
- **Alarm designation (pumps, pinch valves, and agitation):** After setting up High High and/or Low Low mass alarms, use these three fields to select which pumps you would like these alarms to apply to, e.g. for Pump 1, enable the Low Low alarm, and disable the High High alarm.
- **Calibration:** Set up one-point mass calibration to determine the accuracy of load cell mass readings. See Chapter 4 for more information on calibration procedures.

1. Locate the Mass module on the Touchscreen Console Home screen, and then touch **Configure**. The Mass Configuration screen will appear (Figure 3.21). Touch the **Units** field.

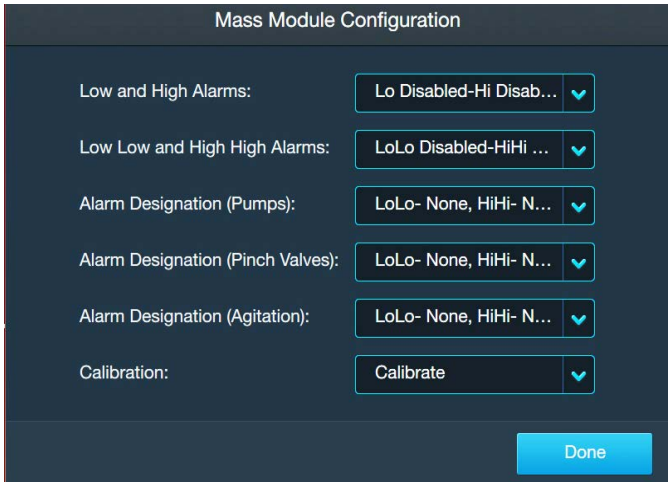


Figure 3.21. Mass Configuration screen.

2. On the screen that appears, select either grams or kilograms. Touch **Next**.

3. The Mass Configuration screen should reappear. The units you selected should be visible in the field next to "Units." If you would like to set High/Low alarms for mass, touch the **High and Low alarms** field.

4. On the screen that appears, there will be separate sections for both High and Low alarms (Figure 3.22). To set up the High alarm, slide the Enable/Disable button to the "Enable" side. In the field under "High Alarm," enter the mass value that will activate the High alarm.

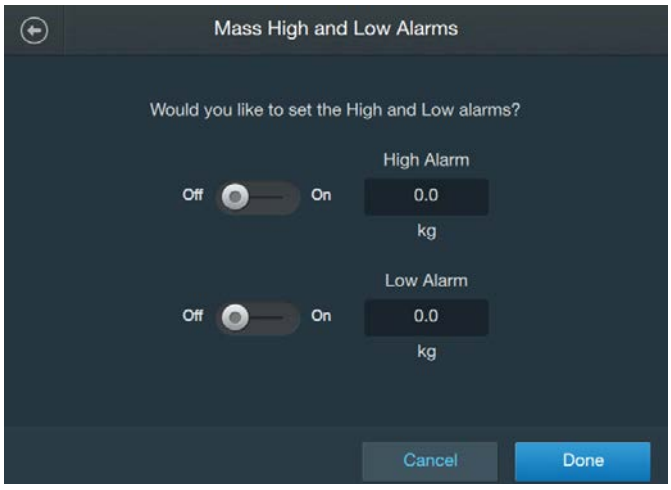


Figure 3.22. High and Low alarms screen.

5. To set up the Low alarm, slide the Enable/Disable button to the “Enable” side. In the field under “Low alarm,” enter the mass value that will activate the Low alarm.

6. After you have entered the High and Low alarm values, touch **Done**.

7. The Mass Configuration screen should now show the High and Low alarm values you entered. If you would like to set High High/Low Low alarms for mass (in relation to either pumps, pinch valves, or agitation), touch the **High High and Low Low alarms** field.

8. On the screen that appears (Figure 3.23), there will be separate sections for both High High and Low Low alarms. Slide the Enable/Disable buttons on each section to the “Enable” side to enable the alarms.

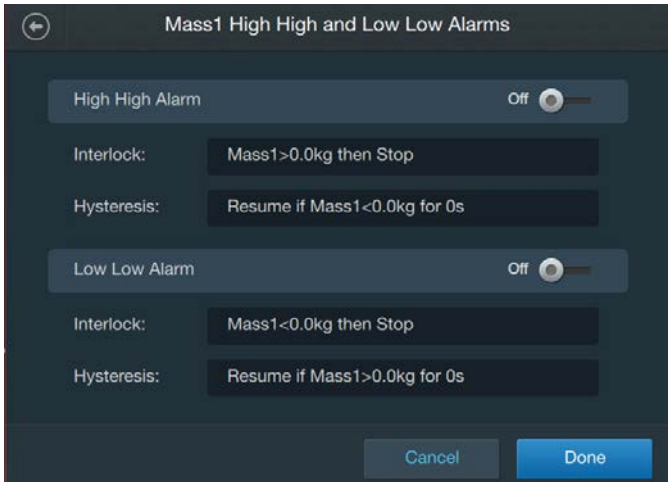


Figure 3.23. High High and Low Low alarms screen.

9. For both High High and Low Low alarms, there will be fields labeled “Interlock” and “Hysteresis.” Touch **Interlock** on one of the alarm fields to set the initial condition that will trigger the alarm, or **Hysteresis** to set the action that should be taken after it is triggered.

10. On the screen that appears, both interlock and hysteresis sections will be shown. In the “Agitation Interlock Equation” section, enter the Control Set Point (in g or kg) and select the Action Taken (either **Pause** or **Stop**).

11. The “Hysteresis” section (below the interlock section) dictates the mass the S.U.M. should reach, and for how long that mass should be held (in seconds), before either the agitation, pumps, or pinch valves resume. Enter both the Set Point (in either g or kg) and the Seconds. When you are finished, touch **Done**.

12. After you have finished setting the interlock and hysteresis parameters for the Low Low and/or High High alarm(s), touch **Done**. The Mass Configuration screen should reappear.

13. If you would like to designate alarms for agitation or specific pumps/pinch valves that have been set up, touch the correlated **Alarm Designation** field on the Mass Configuration screen.
Note: Enabling a pump or pinch valve allows it to adjust the mass after the alarm has been triggered. Enabling an alarm for agitation will shut agitation on or off after the alarm has been triggered.

14. On the screen that appears (Figure 3.24), you will see the interlock and hysteresis parameters you entered for the High High and/or Low Low alarm(s). Underneath, the agitation, pumps, or pinch valves that have been set up with the system will be shown, depending on the alarm designation field you selected on the Mass Configuration screen. Touch a **pump**, **pinch valve**, or **agitation** to enable or disable High High and Low Low alarms.
Note: Figure 3.24 shows options for the “Alarm Designation (pumps)” selection.

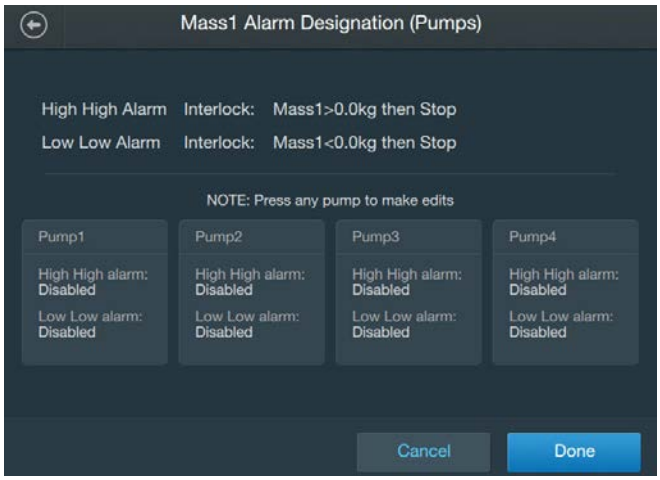


Figure 3.24. Mass Alarm Designation (Pumps) screen.

15. On the screen that appears, slide the Enable/Disable button to the enable side for the High High and/or Low Low alarms to turn on the alarm(s) for agitation, or the selected pump or pinch valve. When you are finished, touch **Done**.

16. If you would like to set up a mass calibration, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

3.5.4 Configuring the Timer module

Because the Timer module has only Start and Stop functionality, it does not require any configuration.

3.5.5 Configuring the BPC Pressure module

Use the following information and steps to configure the BPC Pressure module. Each of the fields below is shown in Figure 3.25. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Units:** Enter the units you would like to use when filling the BPC with air (millibar (mbar) or psi).

Optional fields

- **High and Low alarms:** Enter the BPC pressure values that will trigger High and/or Low alarms. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low BPC pressure alarms. When triggered, these alarms will be accompanied by an audible buzzer and will pause or stop operating processes, depending on user settings. Both High High and Low Low alarms require users to enter information in “Interlock” and “Hysteresis” fields, which dictate the conditions in which an alarm will trigger, the action that should be taken when the alarm is triggered, and when to resume functions.
- **Calibration:** Set up a new BPC Pressure calibration using one-point offset. See Chapter 4 for more information on calibration procedures.

1. Locate the BPC Pressure module on the Touchscreen Console Home screen, and touch **Configure**. The BPC Module Configuration screen will appear (Figure 3.25). Touch the **Units** field.

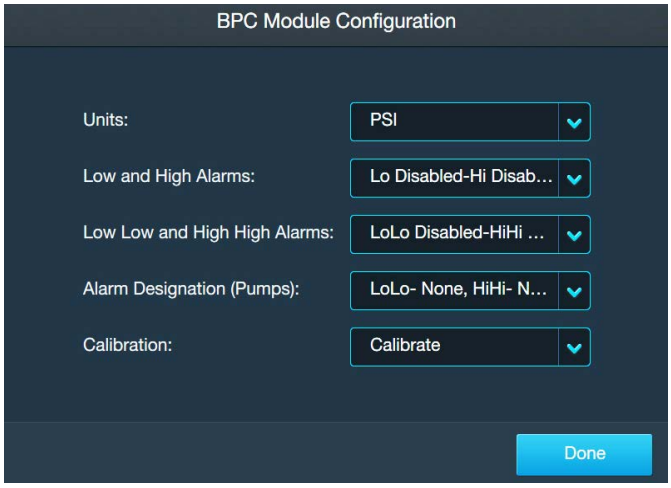


Figure 3.25. BPC Module Configuration screen.

2. On the screen that appears, select either mbar or psi units. Touch **Next**. The BPC Pressure Configuration screen should reappear. The units you selected should be visible in the field next to "Units." Next, touch the **Maximum air pressure value** field.

3. If you would like to set High/Low alarms for air pressure, touch the **High and Low alarms** field. On the screen that appears, there will be separate sections for both High and Low alarms (Figure 3.26). To set the High alarm, slide the Enable/Disable button to the "Enable" side. In the field under "High Alarm," enter the air pressure value that will activate the High alarm. Touch **Next**.

Figure 3.26. BPC Pressure High and Low Alarms screen.

4. To set the Low alarm, slide the Enable/Disable button to the "Enable" side. In the field under "Low Alarm," enter the mass value that will activate the Low alarm.

5. After you have entered the High and Low alarm values, touch **Done**. The BPC Pressure Configuration screen should now show the High and Low alarm values you entered.

6. If you would like to set High High/Low Low alarms for air pressure in relation to pumps, touch the **High High and Low Low alarms** field.

7. For both High High and Low Low alarms, there will be fields labeled "Interlock" and "Hysteresis." Touch **Interlock** on one of the alarm fields to set the initial condition that will trigger the alarm, or **Hysteresis** to set the action that should be taken after it is triggered.

8. On the screen that appears, both interlock and hysteresis sections will be shown (Figure 3.27). In the "Agitation Interlock Equation" section, enter the Control Set Point (in either mbar or psi) and select the Action Taken (either **Pause** or **Stop**).

Figure 3.27. BPC Pressure High High and Low Low Alarms screen.

9. The "Hysteresis" section (below the interlock section) dictates the air pressure the BPC should reach, and for how long that air pressure should be held (in seconds), before processes resume. Enter both the Set Point (in either mbar or psi) and the Seconds. When you are finished, touch **Done**.

10. After you have finished setting the interlock and hysteresis for the High High and/or Low Low alarm, touch **Done**. The BPC Pressure Configuration screen should reappear, showing the High High and/or Low Low alarm values you entered.

11. If you would like to set up a BPC Pressure calibration, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

3.5.6 Configuring the Pumps module

Use the following information and steps to configure the Pumps module. Each of the fields below is shown in Figure 3.28. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **rpm scaling:** Convert the output signal for the pump from milliamps (mA) to rpm.
- **rpm limits:** Set the maximum and minimum rpm values for the pump.

Optional fields

- **Pump name:** Each pump module (up to four total) can be given a distinct name to help specify the purpose of the pumps. For example, one pump might be named “P1 Acid” and another “P2 Harvest” to aid users in distinguishing between pumps. **Note:** All pump names will retain a “P#” prefix to specify which pump port is connected to the pump.
- **Calibration:** Set up a new pump calibration using four-point calibration, and either mass or volume units. See Chapter 4 for more information on calibration procedures.

1. Locate the Pump module on the Touchscreen Console Home screen, and touch **Configure**. The Pump Configuration screen will appear (Figure 3.28). Touch the **rpm Scaling** field.

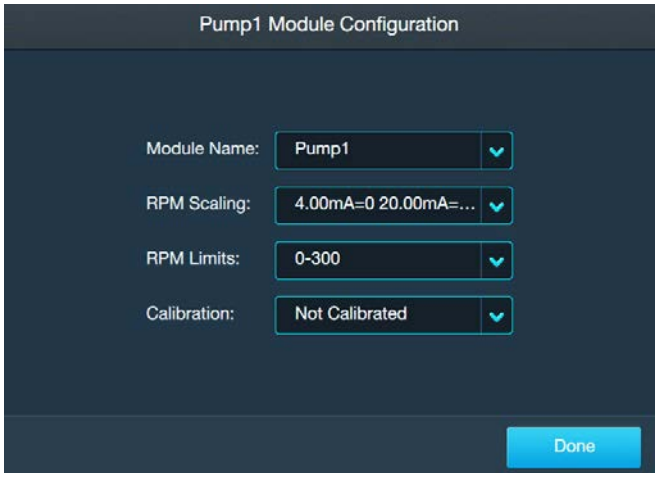


Figure 3.28. Pump Configuration screen.

2. On the screen that appears (Figure 3.29), you will be prompted to enter the rpm values you would like the Touchscreen Console to display after converting from the output signal (in mA). Touch **Done** when you are finished.

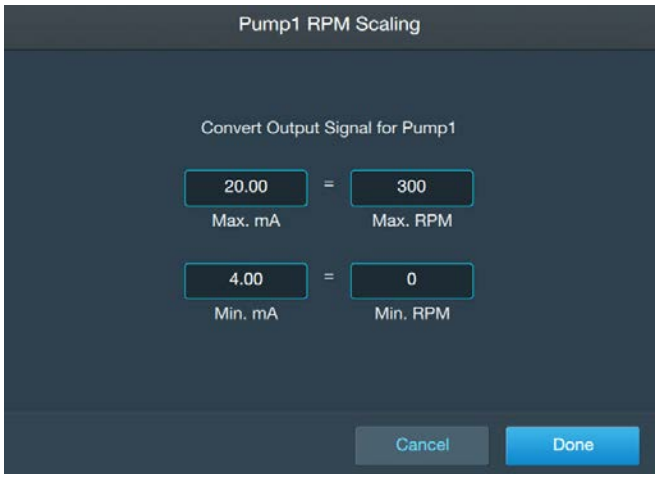


Figure 3.29. Pump rpm Scaling screen.

3. The Pump Configuration screen should reappear. The scaling values you entered should be visible in the field next to “rpm scaling.” Next, touch the **rpm Limits** field.

4. On the screen that appears, set the pump rpm limits by entering the maximum and minimum speeds (in rpm). Touch **Done**.

5. If you would like to name the Pump module, touch the **Pump name** field. Use the alphanumeric keypad that appears on the screen to enter a name for the pump. When you are finished, touch **Enter**. The Pump Configuration screen should reappear with the name you entered next to the “Pump Name” field.

6. If you would like to calibrate the pump, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

3.5.7 Configuring the Fill module

Use the following information and steps to configure the Fill module. Each of the fields below is shown in Figure 3.30. The Mass module must be configured prior to configuring the Fill module. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Pinch valve:** This field shows if the Touchscreen Console has or has not detected a pinch valve.
- **Units and liquid density:** Select the units you would like to use (either liters (L) or kilograms (kg)).
- **Fill pump selection:** Select a pump to assign to the Fill module. If you would like to wait to assign a pump, touch **Assign Pump Later**.
- **Fill control:** Set the parameters for the liquid fill process, including total fluid delivery, stage flow rates, transition between stages, and termination.

Optional fields

- None

1. Locate the Fill module on the Touchscreen Console Home screen, and touch **Configure**. The Fill Module Configuration screen will appear (Figure 3.30). Touch the **Units and Liquid Density** field.

Figure 3.30. Fill Module Configuration screen.

2. On the screen that appears, select the units you would like to use (either **Mass** (in kg), or **Volume** (in L)). Next, enter the fluid density (in g/mL). Touch **Done** when you are finished.

3. The Fill Module Configuration screen should reappear. The units and fluid density you selected should be visible in the field next to "Units and Liquid Density." Next, touch the **Fill Pump Selection** field.

4. On the screen that appears, you will be prompted to select a pump to assign to the Fill module. After touching the pump you would like to use for filling, touch **Done**. **Note:** At least one pump must be connected to the system in order to assign a pump to the Fill module.

5. The Fill Module Configuration screen should reappear, with the pump you selected next to the "Fill Pump Selection" field. Next, touch **Fill Control**.

6. The screen that appears will display fields for the steps of the filling process. Enter your desired values for the following fields:
   - **Total fluid delivery:** The total amount of liquid you would like to pump into the BPC.
   - **Stage 1 flow rate:** The rate you would like to use when initially filling the BPC (in L or kg per minute).
   - **Stage 1 to Stage 2 transition:** The percentage of liquid that should be pumped into the BPC before the pump moves to Stage 2.
   - **Stage 2 flow rate:** The rate you would like to use when finishing the filling process. The Stage 2 flow rate should be significantly slower than Stage 1 to prevent overfilling.
   - **Stage 2 termination:** The action the pumps should take after the filling process is complete (either Pause or Stop).

7. Touch **Done** to return to the Home screen.

3.5.8 Configuring the Harvest module

Use the following information and steps to configure the Harvest module. Each of the fields below is shown in Figure 3.31. The Mass module must be configured prior to configuring the Harvest module. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Pinch valve:** This field shows if the Touchscreen Console has or has not detected a pinch valve.
- **Units and liquid density:** Select the units you would like to use (either liters (L) or kilograms (kg)).
- **Harvest pump selection:** Select a pump to assign to the Harvest module. If you would like to wait to assign a pump, touch **Assign Pump Later**.
- **Harvest control:** Set the parameters for the harvesting process, including total fluid delivery, stage flow rates, transition between stages, and termination.

Optional fields

- None

1. Locate the Harvest module on the Touchscreen Console Home screen, and touch **Configure**. The Harvest Module Configuration screen will appear (Figure 3.31). Touch the **Units and Liquid Density** field.

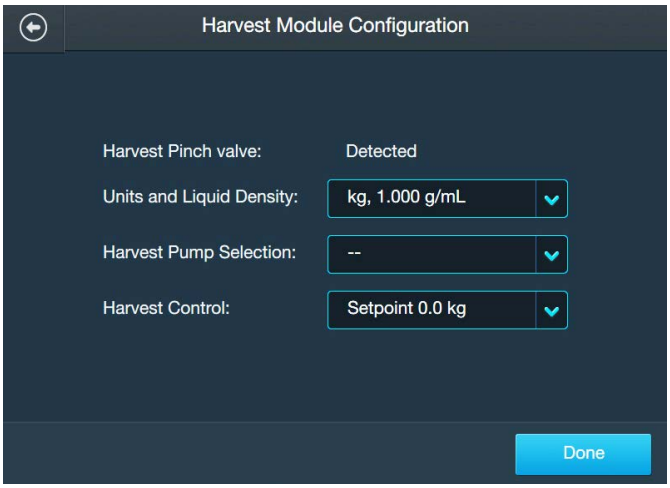


Figure 3.31. Harvest Module Configuration screen.

2. On the screen that appears, select the units you would like to use (either **Mass** (in kg), or **Volume** (in L)). Next, enter the fluid density (in g/mL). Touch **Done** when you are finished.

3. The Harvest Module Configuration screen should reappear. The units and fluid density you selected should be visible in the field next to “Units and Liquid Density.” Next, touch the **Harvest Pump Selection** field.

4. On the screen that appears, you will be prompted to select a pump to assign to the Harvest module. After touching the pump you would like to use for harvesting, touch **Done**. **Note:** At least one pump must be connected to the system in order to assign a pump to the Harvest module.

5. The Harvest Module Configuration screen should reappear, with the pump you selected next to the “Harvest Pump Selection” field. Next, touch **Harvest Control**.

6. The screen that appears will display fields for the steps of the harvesting process. Enter your desired values for the following fields:
   – **Total fluid delivery:** The total amount of liquid you would like to pump out of the BPC.
   – **Stage 1 flow rate:** The rate you would like to use when initially harvesting from the BPC (in L or kg per minute).
   – **Stage 1 to Stage 2 transition:** The percentage of liquid that should be pumped out of the BPC before the pump moves to Stage 2.
   – **Stage 2 flow rate:** The rate you would like to use when finishing the harvesting process. The Stage 2 flow rate should be significantly slower than Stage 1 to prevent overharvesting.
   – **Stage 2 termination:** The action the pumps should take after the harvesting process is complete (either Pause or Stop).

7. Touch **Done** to return to the Home screen.

3.5.9 Configuring the pH module

Use the following information and steps to configure the pH module. Each of the fields below is shown in Figure 3.32. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **pH sensors available:** Select which pH sensors you would like to make available for use. You may select **pH1**, **pH2**, or both.
- **Active pH sensor:** Select the pH sensor you would like to make active. You may select either **pH1** or **pH2**.

Optional fields

- **Temperature compensation:** If the Temperature module has been configured, the temperature sensor reading will be used for pH temperature compensation. If the Temperature module has

not been configured, enter the Expected Vessel Temperature, which will be used instead. You may also choose to configure the Temperature module before continuing pH configuration.

- **High and Low alarms:** Enter the pH values that will trigger High and/or Low pH alarms. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low pH alarms. When triggered, these alarms will be accompanied by an audible buzzer and will pause or stop operating processes, depending on user settings. Both High High and Low Low alarms require users to enter information in “Interlock” and “Hysteresis” fields, which dictate the conditions in which an alarm will trigger, the action that should be taken when the alarm is triggered, and when to resume functions.
- **Alarm designation:** After setting up High High and/or Low Low pH alarms, use this field to select which pumps you would like these alarms to apply to, e.g. for Pump 1 (Acid), enable the High High alarm, and disable the Low Low alarm.
- **Calibration:** Set up a new pH calibration using either direct entry, 2-point, or 3-point calibration. See Chapter 4 for more information on calibration procedures.

1. Locate the pH module on the Touchscreen Console Home screen, and touch **Configure**. The pH Module Configuration screen will appear (Figure 3.32). Touch the **pH Sensors Available** field.

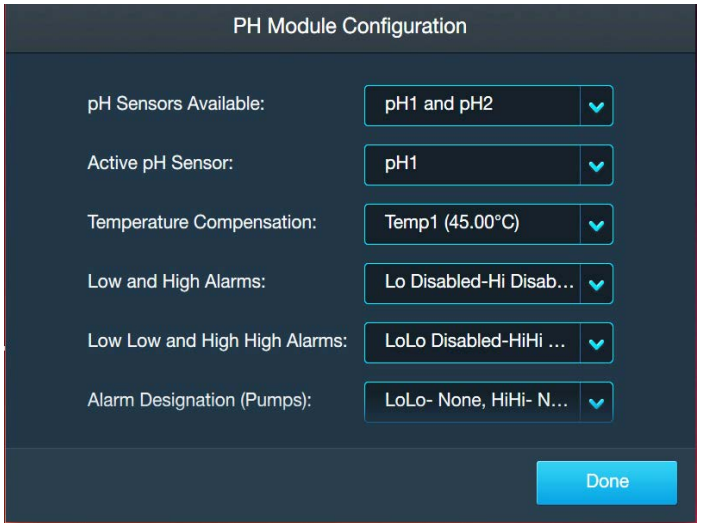


Figure 3.32. pH Module Configuration screen.

2. On the screen that appears, select the pH sensor(s) you would like to have available for use. You may select either **pH1**, **pH2**, or both. Touch **Done** when you are finished.

3. The pH Module Configuration screen should reappear. The sensor(s) you selected should be visible in the field next to "pH Sensors Available." Next, touch the **Active pH Sensor** field.

4. On the screen that appears, select the pH sensor you would like to make active. You may select either **pH1** or **pH2**. When you have selected the active sensor, touch **Done**. **Note:** You can change the active sensor at any time by returning to the pH Module Configuration screen and selecting **Active pH Sensor**.

5. The pH Module Configuration screen should reappear. Touch the **Temperature Compensation** field.
   - If the Temperature module has not been configured, a screen will appear with a prompt to either configure the Temperature module (in order to use the temperature sensor reading), or to manually enter the expected vessel temperature.
   - If the Temperature module has been configured, you can choose to either enable or disable the temperature sensor. If you choose to disable the sensor, you must manually enter the expected vessel temperature (Figure 3.33).

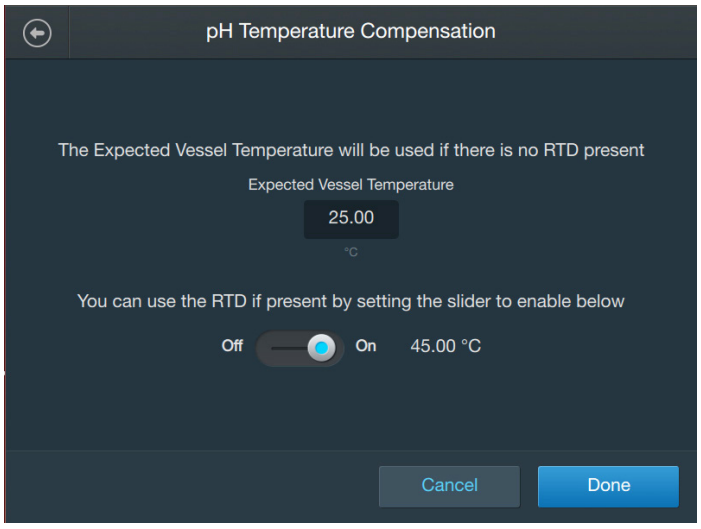


Figure 3.33. pH Temperature Compensation screen.

When you have configured and/or enabled the Temperature module, or entered the expected vessel temperature, touch **Done**.

6. The pH Module Configuration screen should reappear. If you would like to set High/Low alarms for pH, touch the **High and Low Alarms** field.

7. On the screen that appears, there will be separate sections for both High and Low alarms. To set up the High alarm, slide the Enable/Disable button to the “Enable” side. In the field under “High Alarm,” enter the pH that will activate the High alarm.

8. To set up the Low alarm, slide the Enable/Disable button to the “Enable” side. In the field under “Low Alarm,” enter the pH that will activate the Low alarm.

9. After you have entered the High and Low alarm values, touch **Done**.

10. The pH Configuration screen should now show the High and Low alarm values you entered. If you would like to set High High/Low Low alarms for pH, touch the **High High and Low Low Alarms** field.

11. On the screen that appears (Figure 3.34), there will be separate sections for both High High and Low Low alarms. Slide the Enable/Disable buttons on each section to the “Enable” side to enable the alarms.

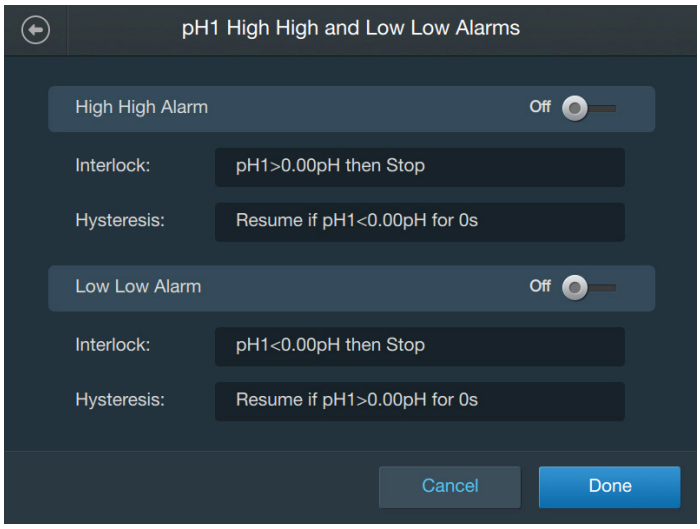


Figure 3.34. High High and Low Low Alarms screen.

12. For both High High and Low Low alarms, there will be fields labeled “Interlock” and “Hysteresis.” Touch **Interlock** on one of the

alarm fields to set the initial condition that will trigger the alarm, and **Hysteresis** to set the action that should be taken after it is triggered.

13. On the screen that appears, both interlock and hysteresis sections will be shown. In the “Interlock Equation” section, enter the Control Set Point (in pH) and select the Action Taken (either **Pause** or **Stop**).

14. The “Hysteresis” section (below the interlock section) dictates when processes should resume after the alarm is triggered. Enter both the tolerance, and the amount of time the control set point pH level (plus tolerance) should hold before resuming (in seconds). When you are finished, touch **Done**.

15. After you have finished setting the interlock and hysteresis for the High High and/or Low Low alarm, touch **Done** on the pH High High and Low Low Alarms screen.

16. If you would like to designate alarms for specific pumps that have been set up for the S.U.M., touch the **Alarm Designation** field on the pH Configuration screen. **Note:** Enabling a pump allows it to adjust the pH level by delivering a bolus after the alarm has been triggered.

17. On the screen that appears (Figure 3.35), you will see the interlock and hysteresis parameters you entered for the High High and/or Low Low alarm(s). Underneath, the pumps that have been set up with the system will be shown. Touch a pump to enable or disable High High and Low Low alarms.

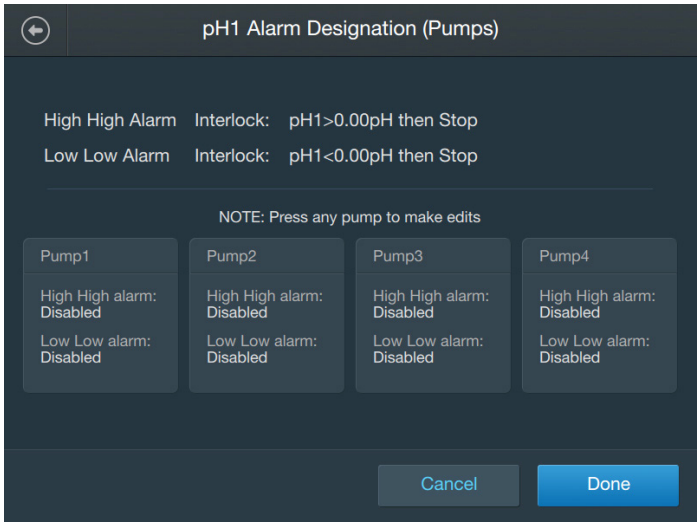


Figure 3.35. pH Pump Designation screen.

18. On the screen that appears, slide the Enable/Disable button to the enable side for the High High and/or Low Low alarms to turn on the alarm(s) for the selected pump. Repeat this step to assign alarms to any other pumps that have been set up. When you are finished, touch **Done**.

19. If you would like to calibrate the pH, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

3.5.10 Configuring the Conductivity module

Use the following information and steps to configure the Conductivity module. Each of the fields below is shown in Figure 3.36. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Units:** Select the units you would like to use (either µS/cm or mS/cm).
- **Active conductivity sensor:** Select the conductivity sensor you would like to make active. You may select either Conductivity1 or Conductivity2.

Optional fields

- **High and Low alarms:** Enter the conductivity values that will trigger High and/or Low conductivity alarms. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low conductivity alarms. When triggered, these alarms will be accompanied by an audible buzzer and will pause or stop operating processes, depending on user settings. Both High High and Low Low alarms require users to enter information in “Interlock” and “Hysteresis” fields, which dictate the conditions in which an alarm will trigger, the action that should be taken when the alarm is triggered, and when to resume functions.
- **Alarm designation:** After setting up High High and/or Low Low conductivity alarms, use this field to select which pumps you would like these alarms to apply to, e.g. for Pump 1, enable the Low Low alarm, and disable the High High alarm.

- **Calibration:** Set up a new conductivity calibration using either direct entry, 2-point, or 3-point calibration. See Chapter 4 for more information on calibration procedures.

1. Locate the Conductivity module on the Touchscreen Console Home screen, and touch **Configure**. The Conductivity Module Configuration screen will appear (Figure 3.36). Touch the **Units** field.

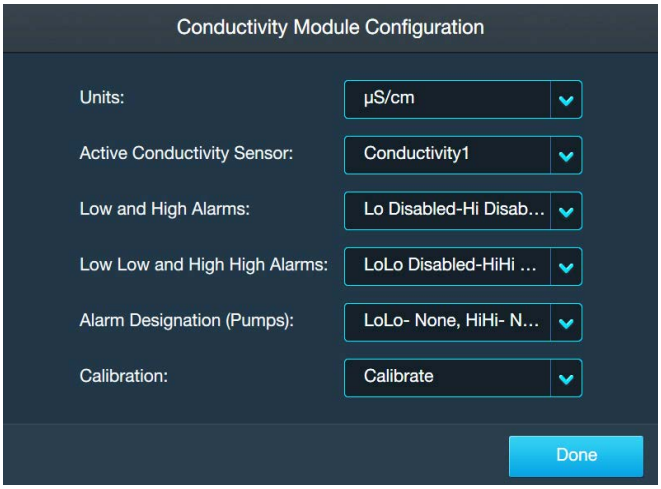


Figure 3.36. Conductivity Configuration screen.

2. On the screen that appears, select the units you would like the Touchscreen Console to use. You may select **µS/cm** or **mS/cm**. Touch **Next**.

3. The Conductivity Module Configuration screen should reappear. Touch **Active Conductivity Sensor**. The screen that appears will prompt users to select the conductivity sensor they would like to make active. You may select either **Conductivity1** or **Conductivity2**. Touch **Next**.

4. The Conductivity Module Configuration screen should reappear. If you would like to set High/Low alarms for conductivity, touch the **High and Low Alarms** field.

5. On the screen that appears, there will be separate sections for both High and Low alarms (Figure 3.37). To set up the High alarm, slide the Enable/Disable button to the “Enable” side. In the “High Alarm” field, enter the conductivity level that will activate the High alarm.

Figure 3.37. Conductivity High and Low Alarms.

6. To set up the Low alarm, slide the Enable/Disable button to the "Enable" side. In the "Low Alarm" field, enter the conductivity level that will activate the Low alarm.

7. After you have entered the High and Low alarm values, touch **Done**.

8. The Conductivity Module Configuration screen should now show the High and Low alarm values you entered. If you would like to set High High/Low Low alarms, touch the **High High and Low Low Alarms** field.

9. On the screen that appears (Figure 3.38), there will be separate sections for both High High and Low Low alarms. Slide the Enable/Disable buttons on each section to the "Enable" side to enable the alarms.

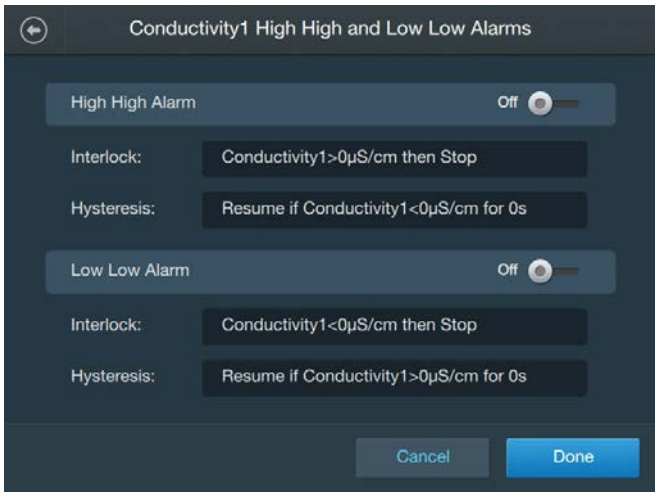


Figure 3.38. High High and Low Low Alarms screen.

10. For both High High and Low Low alarms, there will be fields labeled “Interlock” and “Hysteresis.” Touch **Interlock** on one of the alarm fields to set the initial condition that will trigger the alarm, and **Hysteresis** to set the action that should be taken after it is triggered.

11. On the screen that appears, both interlock and hysteresis sections will be shown. In the “Interlock Equation” section, enter the Control Set Point and select the Action Taken (either **Pause** or **Stop**).

12. The “Hysteresis” section (below the interlock section) dictates when processes should resume after the alarm is triggered. Enter both the tolerance, and the amount of time the control set point conductivity level (plus tolerance) should hold before resuming (in seconds). When you are finished, touch **Done**.

13. After you have finished setting the interlock and hysteresis for the High High and/or Low Low alarm, touch **Done**.

14. If you would like to designate alarms for specific pumps that have been set up, touch the **Alarm designation** field on the Conductivity Module Configuration screen. **Note:** Enabling a pump allows it to adjust the conductivity level by delivering a bolus after the alarm has been triggered.

15. On the screen that appears (Figure 3.39), you will see the interlock and hysteresis parameters you entered for the High High and/or Low Low alarm(s). Underneath, the pumps that have been set up with the system will be shown. Touch on a pump to enable or disable High High and Low Low alarms.

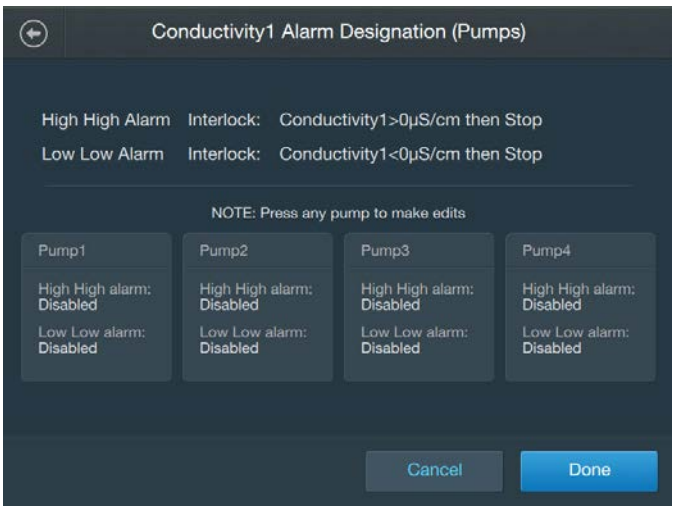


Figure 3.39. Alarm Designation screen.

16. On the screen that appears, slide the Enable/Disable button to the enable side for the High High and/or Low Low alarms to turn on the alarm(s) for the selected pump. Repeat this step to assign alarms to any other pumps that have been set up. When you are finished, touch **Done**.

17. If you would like to calibrate the conductivity, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

3.5.11 Configuring the Temperature module

Use the following information and steps to configure the Temperature module. Each of the fields below is shown in Figure 3.40. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Available temperature sensors:** Select which temperature sensors you would like to make available for use. You may select Temperature 1, Temperature 2, or both.
- **Active temperature sensor:** Select the conductivity sensor you would like to make active. You may select either Temperature1 or Temperature2.
- **TCU setpoint limits (for systems using a TCU):** Enter the maximum and minimum temperature values you would like to use (in °C).

Optional fields

- **High and Low alarms:** Enter the temperature values that will trigger High and/or Low temperature alarms. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low temperature alarms. When triggered, these alarms will be accompanied by an audible buzzer, and will pause or stop operating processes, depending on user settings. Both High High and Low Low alarms require users to enter information in “Interlock” and “Hysteresis” fields, which dictate the conditions in which an alarm will trigger, the action that should be taken when the alarm is triggered, and when to resume functions.

1. Locate the Temperature module on the Touchscreen Console Home screen, and touch **Configure**. The Temperature Module Configuration screen will appear (Figure 3.40). Touch the **Available Temperature Sensors** field.

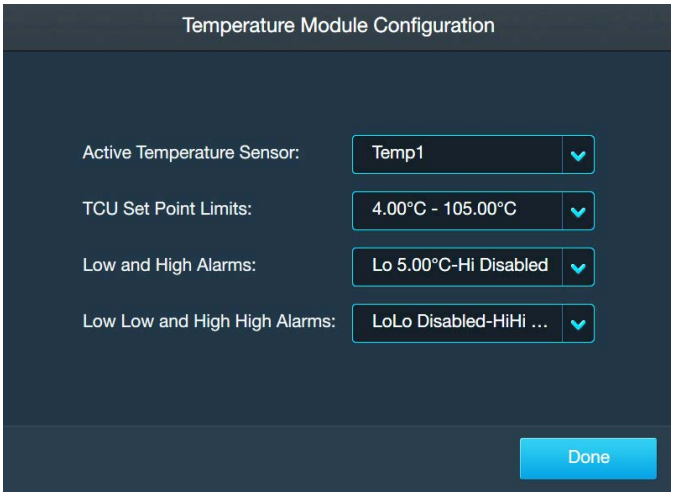


Figure 3.40. Temperature Module Configuration screen.

2. On the screen that appears, select the temperature sensor(s) you would like to make available for use. You may select either **Temperature1**, **Temperature2**, or both. Touch **Done** when you are finished.

3. The Temperature Module Configuration screen should reappear. The sensor(s) you selected should be visible in the field next to “Available Temperature Sensors.” Next, touch the **Active Temperature Sensor** field.

4. On the screen that appears, select the temperature sensor you would like to make active. You may select either **Temperature1** or **Temperature2**. When you have selected the active sensor, touch **Done**. **Note:** You can change the active sensor at any time by returning to the Temperature Module Configuration screen and selecting **Active Temperature Sensor**.

5. The Temperature Module Configuration screen should reappear. If you would like to set High/Low alarms for temperature, touch the **High and Low Alarms** field.

6. On the screen that appears (Figure 3.41), there will be separate sections for both High and Low alarms. To set up the High alarm, slide the Enable/Disable button to the “Enable” side. In the field under “High Alarm,” enter the temperature that will activate the High alarm.

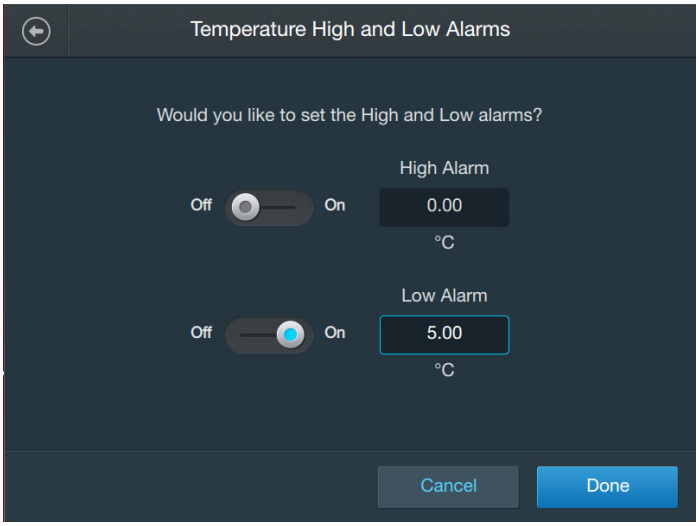


Figure 3.41. High and Low alarms screen.

7. To set up the Low alarm, slide the Enable/Disable button to the “Enable” side. In the field under “Low Alarm,” enter the temperature that will activate the Low alarm.

8. After you have entered the High and Low alarm values, touch **Done**.

9. The Temperature Module Configuration screen should now show the High and Low alarm values you entered. If you would like to set High High/Low Low alarms for temperature, touch the **High High and Low Low Alarms** field.

10. On the screen that appears, there will be separate sections for both High High and Low Low alarms. Slide the Enable/Disable buttons on each section to the “Enable” side to enable the alarms.

11. For both High High and Low Low alarms, there will be fields labeled “Interlock” and “Hysteresis.” Touch **Interlock** on one of the alarm fields to set the initial condition that will trigger the alarm, and **Hysteresis** to set the action that should be taken after it is triggered.

12. On the screen that appears (Figure 3.42), both “Interlock” and “Hysteresis” sections will be shown. In the “Interlock Equation” section, enter the Control Set Point and select the Action Taken (either **Pause** or **Stop**).

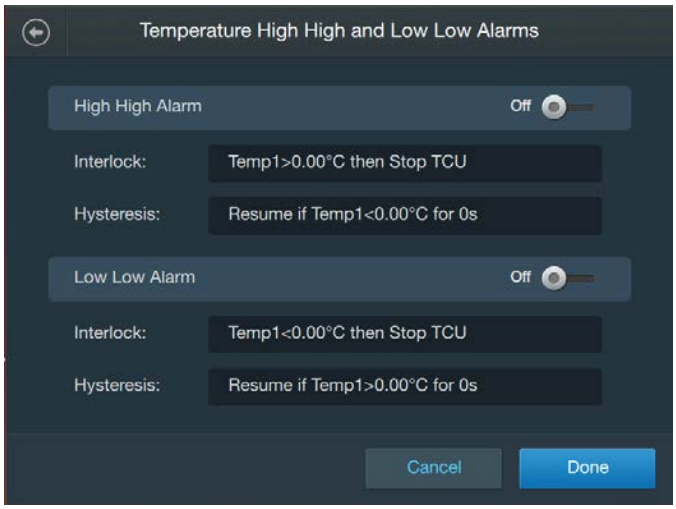


Figure 3.42. High High and Low Low Alarms screen.

13. The “Hysteresis” section (below the “Interlock” section) dictates when processes should resume after the alarm is triggered. Enter both the tolerance, and the amount of time the control set point temperature should hold before resuming (in seconds). When you are finished, touch **Done**.

14. After you have finished setting the interlock and hysteresis for the High High and/or Low Low alarm, touch **Done**. The Temperature Module Configuration screen should show the High High and/or Low Low values you entered in the “High High and Low Low Alarms” field.

15. If you would like to calibrate the temperature, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

16. If you are using a TCU, see the following section for TCU setup and calibration parameters.

TCU setup and calibration parameters

The following graphics illustrate the setup and calibration parameters for Lauda Integral T series, Lauda Varicool series, and Neslab TF series TCUs. Teal-colored boxes represent items from the Settings menu, and gray-colored boxes represent the required parameter inputs.

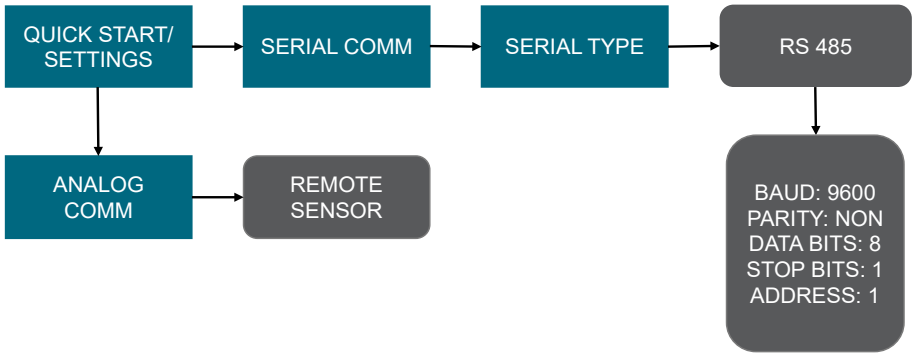


Figure 3.43. Setup parameters for Neslab TF series TCU.

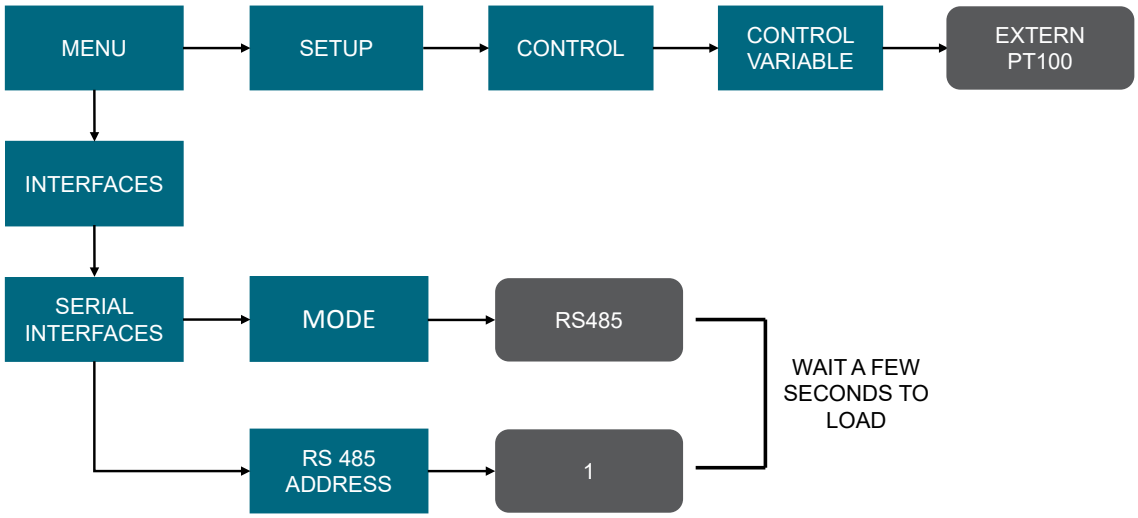


Figure 3.44. Setup parameters for Lauda Varicool series TCU.

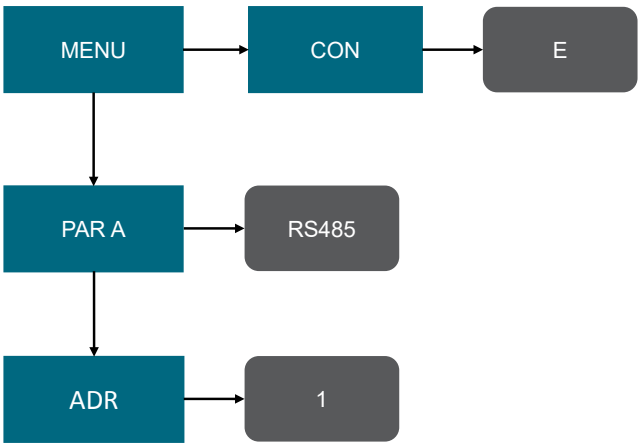


Figure 3.45. Setup parameters for Lauda Integral T series TCU.

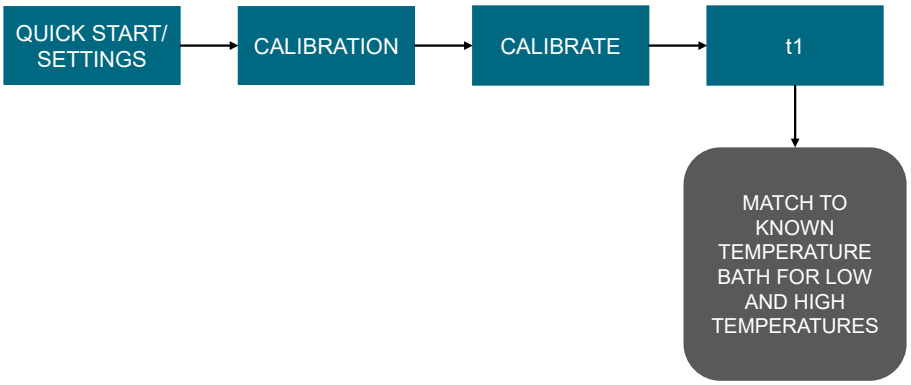


Figure 3.46. TCU calibration procedures for Neslab TF series.

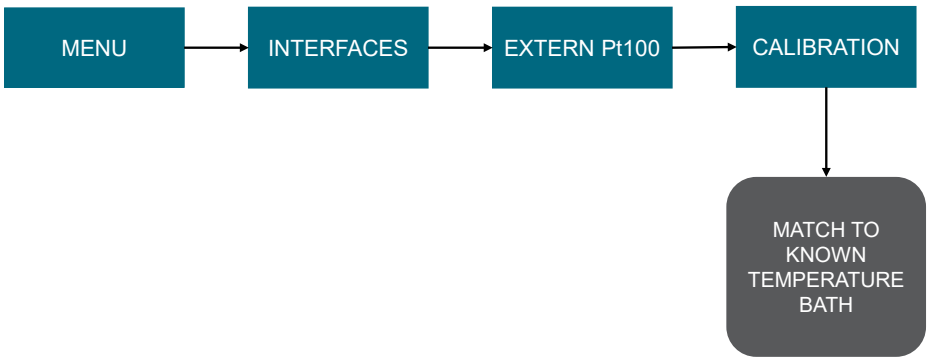


Figure 3.47. TCU calibration procedures for Lauda Varicool series.

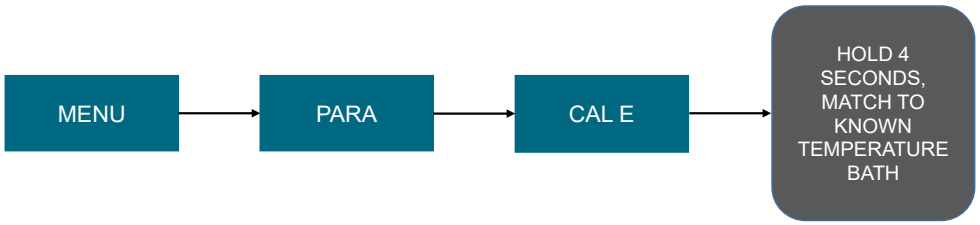


Figure 3.48. TCU calibration procedures for Lauda Integral T series.

3.5.12 Configuring the Liquid Pressure module

Use the following information and steps to configure the Liquid Pressure module. Each of the fields below is shown in Figure 3.49.
Note: You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Units:** Enter the units that you would like the Touchscreen Console to use when displaying the liquid pressure (either mbar or psi).

Optional fields

- **High and Low alarms:** Enter the liquid pressure values that will trigger High and/or Low liquid pressure alarms. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low liquid pressure alarms. When triggered, these alarms will be accompanied by an audible buzzer and will pause or stop operating processes, depending on user settings. Both High High and Low Low alarms require users to enter information in “Interlock” and “Hysteresis” fields, which dictate the conditions in which an alarm will trigger, the action that should be taken when the alarm is triggered, and when to resume functions.
- **Alarm designation:** After setting up High High and/or Low Low liquid pressure alarms, use this field to select which pumps you would like these alarms to apply to, e.g. for Pump 1, enable the High High alarm, and disable the Low Low alarm.
- **Calibration:** Set up a new liquid pressure calibration using one-point offset. See Chapter 4 for more information on calibration procedures.

1. Locate the Liquid Pressure module on the Touchscreen Console Home screen, and touch **Configure**. The Liquid Pressure Module Configuration screen will appear (Figure 3.49). Touch the **Units** field.

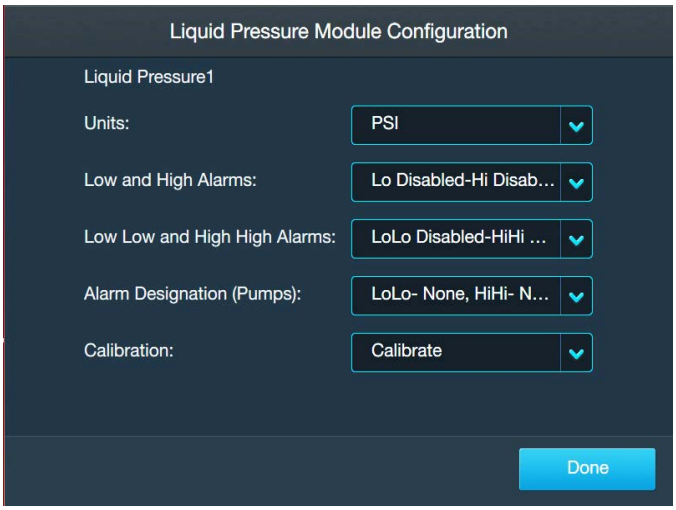


Figure 3.49. Liquid Pressure Module Configuration screen.

2. On the screen that appears, select either mbar or psi units. Touch **Next**. The Liquid Pressure Module Configuration screen should reappear. The units you selected should be visible in the field next to "Units."

3. If you would like to set High/Low alarms for liquid pressure, touch the **High and Low alarms** field. On the screen that appears, there will be separate sections for both High and Low alarms (Figure 3.50). To set up the High alarm, slide the Enable/Disable button to the "Enable" side. In the field under "High Alarm," enter the liquid pressure value that will activate the High alarm. Touch **Next**.

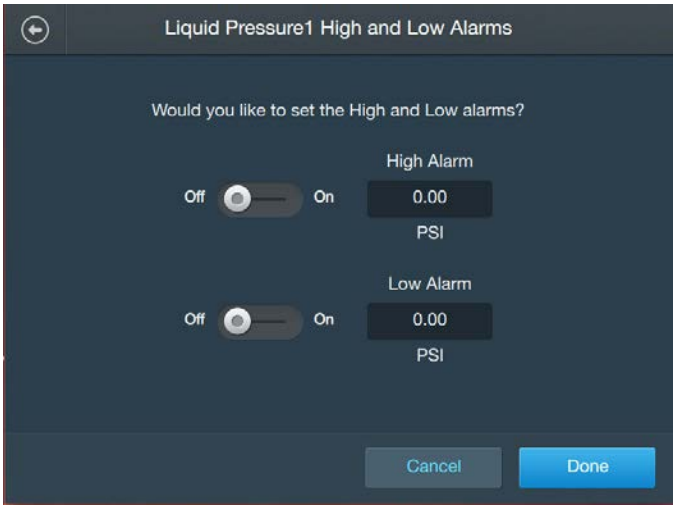


Figure 3.50. Liquid Pressure High and Low Alarms screen.

4. To set up the Low alarm, slide the Enable/Disable button to the “Enable” side. In the field under “Low Alarm,” enter the mass value that will activate the Low alarm.

5. After you have entered the High and Low alarm values, touch **Done**. The Liquid Pressure Module Configuration screen should now show the High and Low alarm values you entered.

6. If you would like to set High High/Low Low alarms for liquid pressure, touch the **High High and Low Low Alarms** field.

7. For both High High and Low Low alarms, there will be fields labeled “Interlock” and “Hysteresis.” Touch **Interlock** on one of the alarm fields to set the initial condition that will trigger the alarm, or **Hysteresis** to set the action that should be taken after it is triggered.

8. On the screen that appears, both interlock and hysteresis sections will be shown (Figure 3.51). In the “Agitation Interlock Equation” section, enter the Control Set Point (in either mbar or psi) and select the Action Taken (either **Pause** or **Stop**).

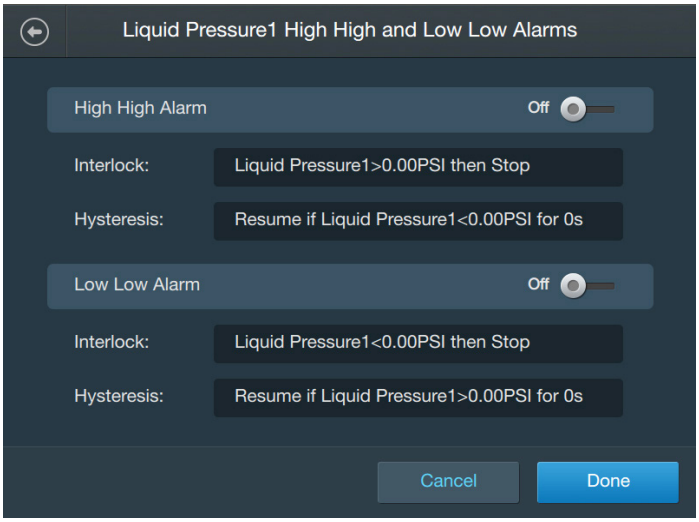


Figure 3.51. Liquid Pressure High High and Low Low Alarms screen.

9. The “Hysteresis” section (below the interlock section) dictates the liquid pressure that should be reached, and for how long that liquid pressure should be held (in seconds), before resuming. Enter both the Control Set Point (in either mbar or psi) and the Seconds. When you are finished, touch **Done**.

10. After you have finished setting the interlock and hysteresis for the High High and/or Low Low alarm, touch **Done**. The Liquid Pressure Module Configuration screen should reappear, showing the High High and/or Low Low alarm values you entered.

11. If you would like to set up a liquid pressure calibration, touch the **Calibration** field. Follow the calibration instructions that are detailed in Chapter 4—Calibration procedures. You may also skip calibration, and touch **Done** to return to the Home screen.

3.5.13 Configuring the Auxiliary Output module

Use the following information and steps to configure the Auxiliary Output module. Each of the fields below is shown in Figure 3.52.
Note: You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Sensor value to duplicate:** Select the type of sensor value you would like to duplicate. You may select any of the modules available on the Touchscreen Console, except Auxiliary Input.
- **Other required fields:** The required fields for Auxiliary Output modules will vary, depending on the module you have selected to duplicate. Before configuring an Auxiliary Output module, become familiar with the module you will be duplicating (sections 3.5.2 to 3.5.12). These sections provide information about each module's required and optional fields.

Optional fields

- **Module name:** Enter a name for the Auxiliary Ouput module. It is recommended to enter the name of the module you are duplicating, with a number to designate the Auxiliary Output module. For example, if you are duplicating the Conductivity module, we recommend naming the Auxiliary Output module "Conductivity 2" to differentiate between the modules.

1. Locate the Auxiliary Output module on the Touchscreen Console Home screen, and touch **Configure**. An Auxiliary Output Module Configuration screen will appear (see Figure 3.52). Touch the **Sensor value to duplicate** field.

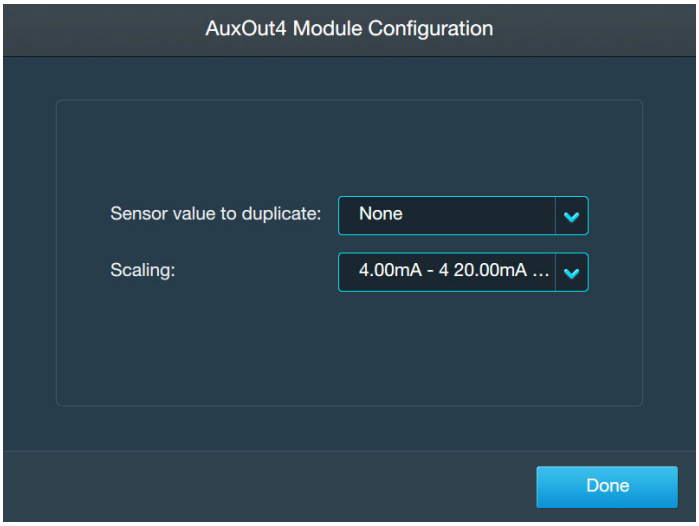


Figure 3.52. Auxiliary Output Module Configuration screen.

2. On the screen that appears (Figure 3.53), touch the module you would like to duplicate. Then, touch **Next**.

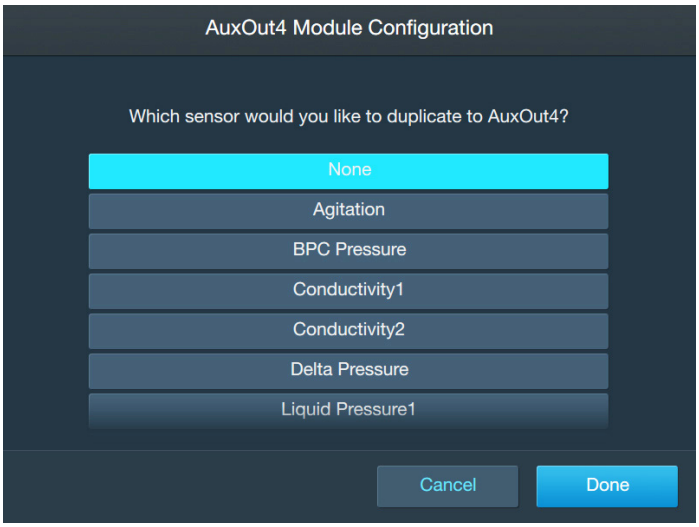


Figure 3.53. Selecting a module to duplicate.

3. The Auxiliary Output Configuration screen should reappear, with the required and optional fields of the module you are duplicating. See the module configuration section for the module you are duplicating (sections 3.5.2 to 3.5.12) for information about all of the associated fields.

4. To enter a name for the Auxiliary Output module, touch the **Module name** field on the Auxiliary Output Configuration screen. Use the alphanumeric keypad that appears to enter the new module name. Touch **Next** to return to the Auxiliary Output Module Configuration screen.

3.5.14 Configuring the Auxiliary Input module

Use the following information and steps to configure the Auxiliary Input module. Each of the fields below is shown in Figure 3.54. **Note:** You can touch **Done** at the bottom of the Configuration screen at any time during module configuration. Your input will be saved, and you can continue where you left off the next time you open the module configuration.

Required fields

- **Units:** Enter the units that you would like the Touchscreen Console to use for the auxiliary input module.
- **Scaling:** Enter the scaling you would like the Touchscreen Console to use between the mA signal and the units you have entered.

Optional fields

- **High and Low alarms:** Enter the values that will trigger High and/or Low alarms for the auxiliary input module. These alarms will not affect operating processes, but will alert users to conditions that are outside of specified operating parameters.
- **High High and Low Low alarms:** Fill out the interlock equation and hysteresis fields to set conditions that will trigger High High and/or Low Low auxiliary input alarms. When triggered, these alarms will be accompanied by an audible buzzer and will pause or stop operating processes, depending on user settings. Both High High and Low Low alarms require users to enter information in “Interlock” and “Hysteresis” fields, which dictate the conditions in which an alarm will trigger, the action that should be taken when the alarm is triggered, and when to resume functions.
- **Alarm designation:** After setting up High High and/or Low Low alarms, use this field to select which pumps you would like these alarms to apply to, e.g. for Pump 1, enable the High High alarm, and disable the Low Low alarm.

1. Locate the Auxiliary Input module on the Touchscreen Console Home screen, and touch **Configure**. An Auxiliary Output Module Configuration screen will appear (Figure 3.54). Touch the **Units** field.

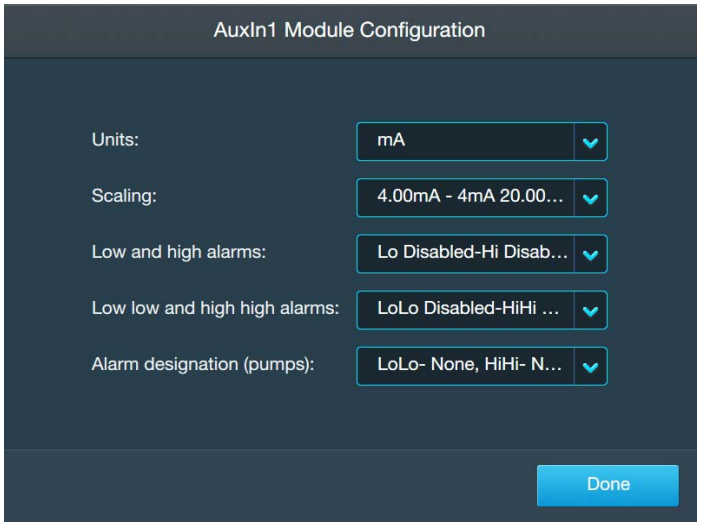


Figure 3.54. Auxiliary Input Module Configuration screen.

2. On the screen that appears, enter the units you would like to use. When you are finished, touch **Done**.

3. The Auxiliary Input Module Configuration screen should reappear. Touch the **Scaling** field.

4. On the screen that appears, enter the scaling you would like to use between the mA signal received by the Touchscreen Console, and the units you previously entered. When you are finished, touch **Done**.

5. The Auxililary Input Module Configuration screen should reappear. If you would like to set High/Low alarms for the Auxiliary Input module, touch the **Low and high alarms** field.

6. On the screen that appears, there will be separate sections for both High and Low alarms. To set up the High alarm, slide the Enable/Disable button to the “Enable” side. In the field under “High Alarm,” enter the value that will activate the High alarm. Touch **Next**.

7. To set up the Low alarm, slide the Enable/Disable button to the “Enable” side. In the field under “Low Alarm,” enter the value that will activate the Low alarm.

8. After you have entered the High and Low alarm values, touch **Done**. The Auxiliary Input Module Configuration screen should now show the High and Low alarm values you entered.

9. If you would like to set High High/Low Low alarms for the Auxiliary Input module, touch the **Low low and high high alarms** field.

10. For both High High and Low Low alarms, there will be fields labeled “Interlock” and “Hysteresis.” Touch **Interlock** on one of the alarm fields to set the initial condition that will trigger the alarm, or **Hysteresis** to set the action that should be taken after it is triggered.

11. On the screen that appears, both interlock and hysteresis sections will be shown. In the “Interlock Equation” section, enter the Control Set Point and select the Action Taken (either **Pause** or **Stop**).

12. The “Hysteresis” section (below the interlock section) dictates the value that should be reached (and for how long that value should be held, in seconds) before resuming. Enter both the Control Set Point and the Seconds. When you are finished, touch **Done**.

13. After you have finished setting the interlock and hysteresis for the High High and/or Low Low alarm, touch **Done**. The Auxiliary Input Module Configuration screen should reappear, showing the High High and/or Low Low alarm values you entered.

4

Calibration procedures

Chapter contents

4.1 Calibrating pumps

1. If you have not set up an active pump calibration, a screen will appear with a prompt to create a new calibration. Touch **Calibrate now**.

2. Fill in the fields for tubing type, tubing inner diameter, fluid type, units, and fluid density. You may also name the pump calibration and add notes, if desired. Touch **Next**.

3. Users can choose to use either mass or volume to calibrate pumps. For mass calibration, a beaker and scale are required. A graduated cylinder is required for volume calibration. The Volume option requires users to enter the units (mL or L), while the Mass option only uses grams. Both options require users to enter rpm limits (top and bottom speeds), and fluid density.

4. You can select either **Prime Set Up** or **Skip Prime** after you have filled in the necessary fields. If you select **Prime Set Up**, a screen will appear instructing you to set up either the beaker or graduated cylinder on a scale.
   a. After touching **Next**, a second screen will appear instructing you to load tubing into the pump, and then to place the tubing into the beaker or graduated cylinder.
   b. Touch **Next** again. Press and hold the **Prime** button until the prime set point is shown on the screen.
   c. Select **Next**. You will be taken to the Calibration Total Time Input screen with a prompt to enter the total time of the pump calibration (in seconds).

Note: If you choose **Skip Prime**, you will be taken directly to the Calibration Total Time Input screen. Enter the total time of the pump calibration in seconds.

5. There are four calibration points for both mass and volume options, and four steps for each calibration point. Repeat the steps below for each of the four calibration points:
   a. Choose to either empty the beaker/graduated cylinder and zero the scale after each calibration point, or fill the beaker/graduated cylinder and do not zero the scale after each calibration point.
   b. Set up an empty beaker/graduated cylinder and a scale. Tare the scale to ensure that only the weight of the fluid is being measured, and not the weight of the fluid and the beaker. Touch **Next**.

c. Touch **Deliver Bolus** to deliver a bolus into the beaker/ graduated cylinder. For each calibration point, the pump will run at a different percentage of the available rpm output range (from low to high limits) for a different length of time.
d. After the bolus is delivered, the screen will say “Delivery Complete.” Touch **Next**. Enter the total amount of fluid pumped during the calibration point (1, 2, 3, or 4), and touch “Calibrate.” The screen for the next calibration point will appear.

6. After all four calibration points have been completed, touch **Done** in the lower right corner of the screen to return to the Pump Settings screen.

4.2 Calibrating pH

1. If you have not set up an active pH calibration, a screen will appear with a prompt to create a new calibration. Touch **Create New Calibration**. If you have already created an active pH calibration, touch the pH module on the Touchscreen Console Home screen to open the pH Settings screen. Touch **Calibration**.

2. First, select the pH sensor you would like to calibrate. Then, choose the type of calibration you would like to use (**enter slope and offset**, **offset calibration**, **2-point**, or **3-point**).

3. Follow the steps below for slope and offset calibration:
   a. After touching **Enter slope and offset**, a screen will appear prompting users to enter the slope (pH/mV) and offset (mV).
   b. Touch **Done** in the lower right corner of the screen to return to the pH Settings screen.

4. Follow the steps below for offset calibration:
   a. After touching **Offset Calibration**, a screen will appear displaying the stabilizing pH sensor value for Calibration Point 1. Once the value has stabilized, the “Buffer Solution Value” field will automatically populate to match the exact buffer value. You may also change the value, if desired. Touch **Calibrate**.
   b. Touch **Done** in the lower right corner of the screen to return to the pH Settings screen.

5. Follow the steps below for 2-point calibration. **Note:** Three-point calibration uses the same steps, but will repeat steps “d” and “e” for the third calibration point.

a. After touching **2-Point Calibration**, a screen will appear prompting users to select a temperature compensation to use for the calibration. The expected buffer temperature will be used if there is no RTD present. You can also use the RTD, if present, by setting the slider to enable it. Touch **Next**.
b. The screen that appears will prompt the user to put the pH sensor (and RTD, if selected) into the first buffer solution for Calibration Point 1. Touch **Next**.
c. The following screen displays the stabilizing pH sensor value for Calibration Point 1. Once the value has stabilized, the "pH value" field will automatically populate to match the exact buffer value. You may change the value, if desired. Touch **Calibrate**.
d. The screen that appears will prompt the user to put the pH sensor (and RTD, if selected) into the second buffer solution for Calibration Point 2. Touch **Next**.
e. The following screen displays the stabilizing pH sensor value for Calibration Point 2. Once the value has stabilized, the "pH value" field will automatically populate to match the exact buffer value. You may change the value, if desired. Touch **Calibrate**.
f. The following screen states that the pH calibration is done, and prompts the user to update the desired temperature compensation in the next screen. Touch **Next**.
g. Set the temperature compensation to use when the sensor is set as active. The expected buffer temperature will be used if there is no RTD present. You can also use the RTD, if present, by setting the slider to enable it. Touch **Done**.
h. The pH Calibration Complete screen should appear. Touch **Done** in the lower right corner of the screen to return to the pH Settings screen.

4.3 Calibrating conductivity

1. If you have not set up an active conductivity calibration, a screen will appear with a prompt to create a new calibration. Touch **Create New Calibration**. If you have already created an active conductivity calibration, touch the Conductivity module on the Touchscreen Console Home screen to open the Conductivity Settings screen. Touch **Calibration**.

2. A screen will appear prompting the user to select a conductivity sensor to calibrate (Conductivity1 or Conductivity2). After selecting a conductivity sensor, you will be prompted to select the calibration method you would like to use (**1-point**, **2-point**, or **3-point calibration**).

3. Follow the steps below for 1-point calibration.

a. On the screen that appears, enter the conductivity sensor cell constant. Then touch **Next**.
b. The screen that appears will prompt you to put the conductivity sensor into a buffer solution. Touch **Next**.
c. The following screen displays the stabilizing conductivity sensor value for calibration point 1 of 1 (in µS/cm). Once the value has stabilized, the "Conductivity Value" field will automatically populate to match the exact buffer value. You may also change the value, if desired. Touch **Calibrate**.
d. After the Conductivity Calibration Complete screen appears, the calibration is complete. Touch **Done** in the lower right corner of the screen to return to the Conductivity Settings screen.

4. Follow the steps below for 2-point calibration. **Note:** 3-point calibration uses the same steps, but will repeat steps "d" and "e" for the third calibration point.
   a. On the screen that appears, enter the conductivity sensor cell constant. Then touch **Next**.
   b. The screen that appears will prompt you to put the conductivity sensor into the first buffer solution. Touch **Next**.
   c. The following screen displays the stabilizing conductivity sensor value for calibration point 1 (in µS/cm). Once the value has stabilized, the Conductivity Value field will automatically populate to match the exact buffer value. You may also change the value, if desired. Touch **Calibrate**.
   d. The screen that appears will prompt you to put the conductivity sensor into the next buffer solution. Touch **Next**.
   e. The following screen displays the stabilizing conductivity sensor value for the calibration point (in µS/cm). Once the value has stabilized, the Conductivity Value field will automatically populate to match the exact buffer value. You may also change the value, if desired. Touch **Calibrate**.
   f. After the Conductivity Calibration Complete screen appears, the calibration is complete. Touch **Done** in the lower right corner of the screen to return to the Conductivity Settings screen.

4.4 Calibrating agitation speed

1. Touch the Agitation module on the Touchscreen Console Home screen to open the Agitation Settings screen. Touch **Calibration**.

2. A screen will appear prompting you to measure the actual motor speed (in rpm) using a tachometer, and enter the speed in the field provided. After entering the actual motor speed, touch **Done**.

3. A 1-point offset adjustment complete screen should appear when calibration is complete. Touch **Done** in the lower right corner of the screen to return to the Agitation Settings screen.

4.5 Calibrating mass

1. Touch the Mass module on the Touchscreen Console home screen to open the Mass Settings screen. Touch **Calibration**.

2. Select the type of calibration you would like to use (**2-point** or **3-point**). **Note:** The steps below detail the process for 2-point calibration. 3-point calibration use the same steps and repeats step "b" for the third calibration point.

3. Follow the steps below for 2-point calibration:
   a. After touching **2-point calibration**, a screen will appear for "Calibration Point 1 of 2," prompting you to enter the first mass sensor value in kg. Place a weight in the vessel, enter the sensor value on the screen, and touch **Calibrate**.
   b. A screen will appear for "Calibration Point 2 of 2." Place a second weight, heavier than the weight from the previous step, into the vessel. Enter the total mass sensor value in kg, then touch **Calibrate**.
   c. After the Mass Calibration Complete screen appears, the calibration is complete. Touch **Done** in the lower right corner of the screen to return to the Mass Settings screen.

4.6 Calibrating BPC air pressure

1. If you have not set up an active BPC pressure calibration, a screen will appear with a prompt to create a new calibration. Touch **Create New Calibration**. If you have already created an active BPC Pressure calibration, touch the BPC Pressure module on the Touchscreen Console Home screen to open the BPC Pressure Settings screen. Touch **Calibration**.

2. A screen will appear prompting you to select a calibration method: **zero/tare**, **enter a 1-point offset value**, or **clear offset**. Select **Enter a 1-point offset value**.

3. The following screen will prompt you to enter the BPC sensor value in psi. After entering the BPC pressure in psi, touch **Calibrate**.

4. After the BPC Pressure Calibration Complete screen appears, the

calibration is complete. Touch **Done** in the lower right corner of the screen to return to the BPC Pressure Settings screen.

4.7 Calibrating liquid pressure

1. If you have not set up an active liquid pressure calibration, a screen will appear with a prompt to create a new calibration. Touch **Create New Calibration**. If you have already created on active liquid pressure calibration, touch the Liquid Pressure module on the Touchscreen Console Home screen to open the Liquid Pressure Settings screen. Touch **Calibration**.

2. A screen will appear prompting you to select a calibration method: **zero/tare Liquid Pressure1**, **zero/tare Liquid Pressure2**, **enter a 1-point offset value**, or **clear offset**. Select **Enter a 1-point offset value**.

3. On the following screen, select a liquid pressure sensor to use for calibration.

4. The following screen will prompt you to enter the liquid pressure sensor value in psi. After entering the liquid pressure in psi, touch **Calibrate**.

5. After the Liquid Pressure Calibration Complete screen appears, the calibration is complete. Touch **Done** in the lower right corner of the screen to return to the Liquid Pressure Settings screen.

4.8 Calibrating temperature

1. If you have not set up an active temperature calibration, a screen will appear with a prompt to create a new calibration. Touch **Create New Calibration**. If you have already created an active temperature calibration, touch the Temperature module on the Touchscreen Console Home screen to open the Temperature Settings screen. Touch **Calibration**.

2. A screen will appear prompting you to select a temperature sensor to calibrate.

3. The following screen will prompt you to select a calibration method. Select **1-Point Calibration**. **Note:** The calibration instructions provided here illustrate one-point calibration. Repeat the steps

below for 2-point and 3-point calibration.

4. The following screen will prompt you to enter the temperature sensor value (in °C). After entering the temperature sensor value, touch **Calibrate**.

5. After the Temperature Calibration Complete screen appears, the calibration is complete. Touch **Done** in the lower right corner of the screen to return to the Temperature Settings screen.

5

BPC loading and probe insertion

Chapter contents

5.1 General handling guidelines

5.1.1 BPC preparation and setup

Please familiarize yourself with the S.U.M. BPC and hardware before loading the BPC. For reference, the front of the BPC is designated as the panel containing the bearing port. The bearing port should face the bearing port receiver located under the motor mount as the BPC is loaded. In addition, confirm that the volume of the BPC being loaded corresponds to the volume of the S.U.M.

5.1.2 BPC handling instructions

Do not use scissors or any other sharp objects when opening the outer polybags on BPCs. When placing a BPC in the outer support container, do not drag the BPC over corners or sharp objects. Do not lift the BPC by the corners or top seams. For storage, carefully coil the tubing on top of the BPC to prevent the tubing being punctured with cable ties or clamps. Use cushioning between the tubing and the BPC for storage and transport.

5.1.3 Working volume

Each S.U.M. is designed for a specific working volume range. The minimum working volume and rated working volume are listed in Chapter 8—Specifications and parts information. For normal operation, the actual working volumes should not exceed the indicated rated working volumes.

5.1.4 Liquid transfer

The S.U.M. BPC is designed with thermoplastic tubing, quick-connects, and tri-clamps for adding to and dispensing from the BPC. For liquid-to-liquid applications, a sterile environment can be maintained as long as all connections are made in an aseptic manner. To maintain sterility of the mixing system, connection of additional lines (quick-connects and tri-clamp fittings) should be made under a laminar flow hood, or with a sterile tubing welder.

5.1.5 Dispensing

The agitator should not be operated when volumes are less than the stated minimum volume. The S.U.M. is equipped with a drain line that allows for liquid removal by means of peristaltic pump. The drain is located at the bottom of the S.U.M. BPC, allowing for minimal hold up volumes. Connection of the bottom drain line can be accomplished using the provided 12.7 mm (0.5 in.) quick-connect fitting. Turn off agitation during draining when approaching the minimum working volume.

5.2 Loading the BPC

Follow the steps below to load a BPC into the outer support container. **Note:** Adherence to these procedures is critical to the successful operation of the S.U.M. For larger systems (500 to 2,000 L), we recommend using two operators to load the BPC into the outer support container. Larger systems also require access to a ladder or other elevated platform.

1. If you are using a 500 L, 1,000 L, or 2,000 L S.U.M., first open the door of the outer support container (Figure 5.1).

Figure 5.1. Opening the door on a 500 L S.U.M.

2. Remove the BPC from the protective double polybags (Figure 5.2). Be careful not to cut the BPC when opening the polybag.

Figure 5.2. Opening the polybag.

3. After removing the BPC from the double polybag, visually inspect the BPC for any damage. **If the BPC is damaged, contact your sales representative immediately.**

4. Close all BPC line clamps (Figure 5.3). Make sure the drain line clamp is located as close as possible to the BPC port and is completely closed.

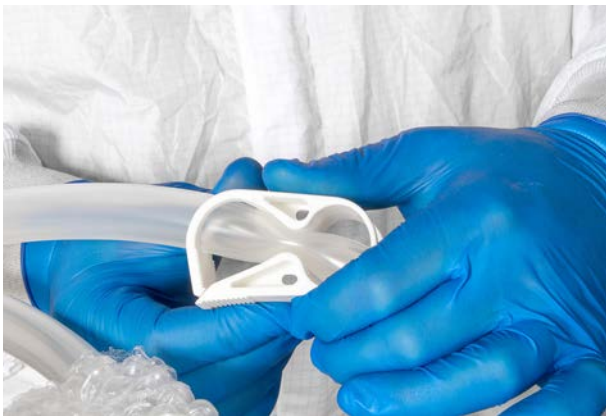


Figure 5.3. Closing line set clamp.

5. Orient the BPC with the bearing port facing up, toward the motor drive, and with the probe ports (if present) facing the bottom access cutout. For 500 L, 1,000 L, and 2,000 L S.U.M.s, load the BPC through the open door of the outer support container. For 50 L, 100 L, and 200 L S.U.M.s, load the BPC through the top of the outer support container.

6. Route the drain line through the bottom plate (Figure 5.4). The bottom plate may be removed to facilitate loading this lower line set. Then position the BPC inside the tank. For larger units, close the door on the outer support container.

Figure 5.4. Routing the drain line through the tank.

7. If you are using a BPC with probe ports, verify that all port clamps are closed on port connector lines, and are located as close as possible to the body of the BPC (Figure 5.5).

Figure 5.5. Verifying the location of port clamps.

8. Open the bearing port latch at the front of the motor block. Verify that the black bumpers are present at the back of the motor mount block and in the inside of the latch (Figure 5.6). Then, insert the bearing port into the receiver and close and clamp the latch (Figure 5.7).

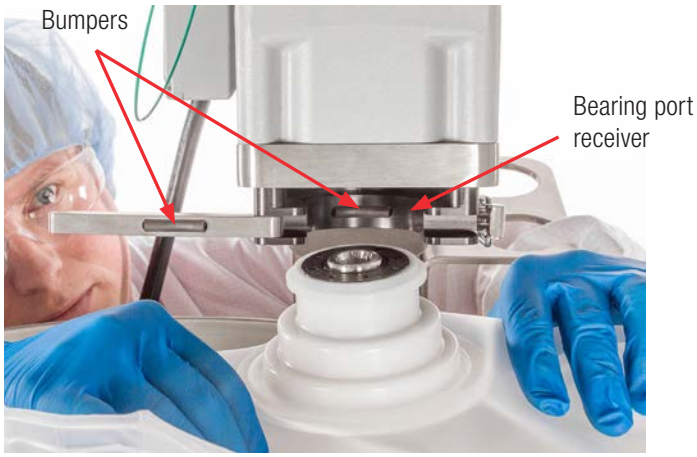


Figure 5.6. Inserting the bearing port into the receiver.

Figure 5.7. Closing and latching the bearing hub receiver.

9. Use the four bottom cutouts in the base of the outer support container to align the positioning tabs on the BPC with the pins on the hardware (Figure 5.8).

Figure 5.8. Aligning BPC positioning tabs with pins.

10. Attach the tabs on the BPC to each of the four bottom corner pins on the outer support container. Cutout windows in the back of the tank facilitate tab attachment. For 500 L and 1,000 L sizes, you can facilitate attachment of the tabs by lifting up on the brace across the cutout in the back of the tank and removing it. For 2,000 L units, a door is provided in the back of the tank to facilitate attachment of the positioning tabs to the pins.

11. Once the BPC is fully seated, make sure the drain line is fully extended through the bottom port, and that the bearing port on the BPC is in the proper position (facing the receiver port).

12. Once the bearing port is engaged, ensure that the film is not being pulled too tightly around the bearing port. The area affected is on the front BPC panel, below the bearing port (Figures 5.9 and 5.10). To ensure proper insertion of the drive shaft, and to reduce tension on the bearing port, pull up slightly on the front panel of the BPC to provide excess film in the affected area.

Figure 5.9. Properly loaded BPC.

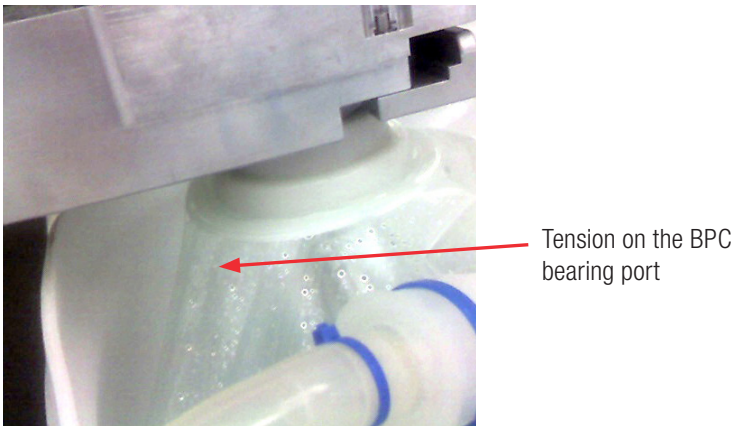


Figure 5.10. Improperly loaded BPC.

13. If the BPC you are using has probe ports, align the row of probe ports through the access window.

14. If your system uses pinch valves, put the tubing from the BPC through the pinch valves. Pinch valves may be stored on an optional hanger located on the outer support container.

5.3 Setting up the recirculation line

An optional recirculation or sampling loop may be set up, if needed. Follow the steps below to connect the recirculation line.

1. Run the drain line through a peristaltic pump (Figure 5.11).

Figure 5.11. Drain line in peristaltic pump.

2. For non-sterile applications, join the quick-connects of the recirculation or sampling line and the drain line to form the recirculation loop. To make this connection, first open the tamper-proof polybag covering the quick-connects on the recirculation/ sampling line and drain lines (Figure 5.12).

Figure 5.12. Removing polybag.

3. Remove the caps from the quick-connects. Line up the recirculation and drain quick-connects and make the connection (Figure 5.13). **Note:** For sterile applications, this connection must be made under a laminar flow hood or by utilizing a sterile tubing welder.

Figure 5.13. Line connection.

4. Be sure the clamps on the recirculation line are closed before filling the BPC.

5. When you are ready to use the recirculation loop, open all clamps on both of the line sets. Figure 5.14 shows a completed recirculation loop.

Figure 5.14. Complete recirculation loop.

5.4 Filling the BPC with air

Before you add air to the BPC, ensure that the BPC Pressure module is configured on the Touchscreen Console, and that the S.U.M. system is connected to facility air.

1. Touch the BPC Pressure module on the Touchscreen Console Home screen. Select **Calibration**.

2. Touch **Zero/Tare BPC Pressure Sensor** and enter 0 (zero) psi in the field.

3. Touch **Close** on the bottom of the BPC Pressure module screen to return to the Home screen.

4. Touch **Start** to begin filling with air. **Note:** The Touchscreen Console is hard-coded to a set point of 0.06 psi.

5.5 Inserting the drive shaft

Before inserting the drive shaft, familiarize yourself with the mixing assembly illustration below (Figure 5.15). **Note:** When inserting or removing the drive shaft, take care to keep the shaft from impacting the ceiling or ceiling fixtures. Refer to Chapter 8 for ceiling height requirements for drive shaft insertion.

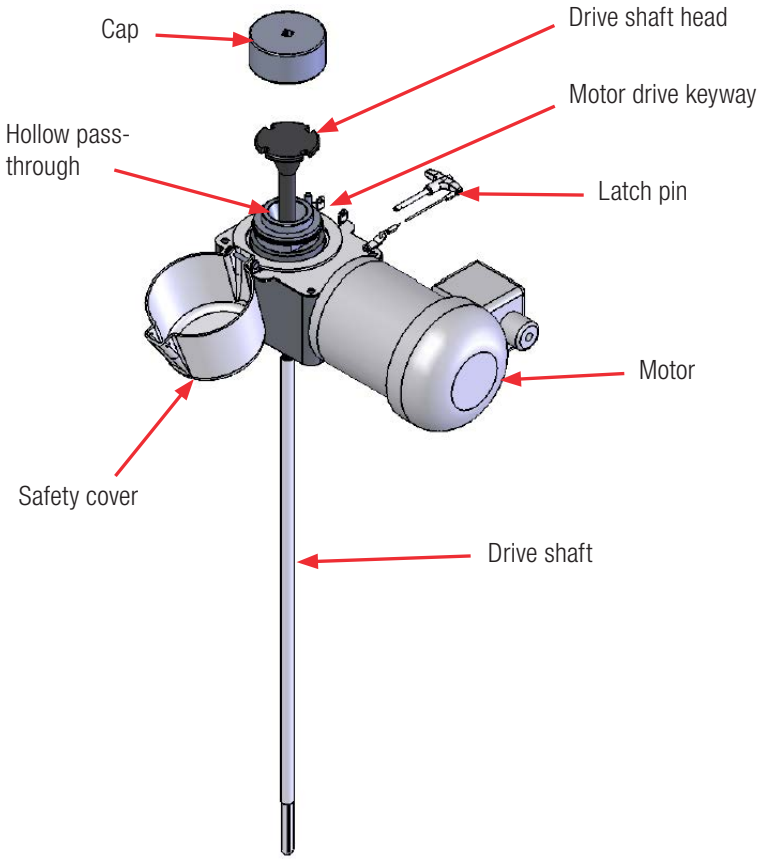


Figure 5.15. Mixing assembly.

1. Before loading the drive shaft, ensure that the BPC has been filled with air (section 5.4).

2. Remove the safety cap on the motor (Figure 5.16). Use the two supplied wrenches to loosen the threaded cap covering the hollow pass-through of the motor (Figure 5.17). Then unscrew and remove the cap.

Figure 5.16. Removing the safety cover.

Figure 5.17. Using wrenches to remove cap.

3. Insert the drive shaft through the hollow pass-through of the motor assembly, as described below. **Note:** Lubricate the threaded ends of multi-segment drive shafts with a light coat of food-grade anti-seize with each use. When installing a multi-segment drive shaft, reverse-thread the segments together and use the cap latch pin to hold the segment in place while threading.
   - Use two hands to load the drive shaft through the top of the mixing assembly (Figure 5.18); a slight back and forth twisting motion will aid in insertion.
   - When approximately 5.08 cm (2 in.) of the shaft remains, twist slightly to engage impeller.
   - When approximately 2.54 cm (1 in.) of the shaft remains, twist slightly to engage bearing assembly.
   - When approximately 0.64 cm (0.25 in.) of the shaft remains, twist to align the motor drive keyway with one of the four outer slots on the drive shaft head (Figure 5.19).

Figure 5.18. Inserting drive shaft.

Figure 5.19. Aligning with the keyway.

4. Directly couple the drive shaft to the motor drive.
   - Place the threaded cap on the hollow pass-through and hand-tighten clockwise (Figure 5.20).
   - Place the spanner wrench on the hollow pass-through and tighten the cap using the supplied torque wrench (Figure 5.21).
     Note: The torque wrench is a standard 10 mm (3/8 in.) square drive, and it is calibrated at the factory at 16.9 Nm (150 in.-lb).
   - Verify that the wrenches have been removed from the system and placed in storage holders.
   - Close the safety access cover. The magnetic closure keeps the safety cap closed.

Figure 5.20. Replacing the cap.

Figure 5.21. Tightening the cap.

5.6 Loading BPCs for open-top mixing

For open-top mixing applications, the S.U.M. includes a reusable bearing port (Figure 5.22), a single-use impeller and sleeve (Figure 5.23), and a single-use tank liner with a drain line.

Figure 5.22. Bearing hubs for 2,000 L tri-clamp connections (left) and quick-connections (right).

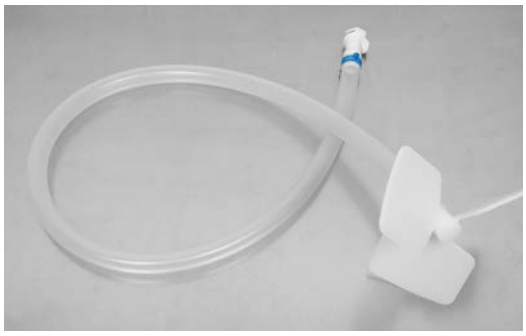


Figure 5.23. Impeller and sleeve.

To accomplish open-top mixing in all S.U.M. tanks, insert the reusable bearing port (for either tri-clamp or quick-connections) into the bearing port receiver of the motor. The 2,000 L S.U.M. uses the tri-clamp version of the reusable bearing port, while all other sizes use the quick-connect version (Figure 5.22). Similarly, there are two matching impeller and sleeve combinations: one with the tri-clamp fitting, and one with the quick-connect fitting.

Follow the steps below to set up your system for open-top mixing.

1. Load the BPC liner into the S.U.M. outer support container. Follow the loading instructions included in section 5.2—Loading the BPC, to secure the liner to the hardware unit.

2. Expand the top opening of the liner to stretch over the outer rim of the hardware and drape it over the sides (Figure 5.24).

Figure 5.24. Installing the liner.

3. Open the retention clamp for the bearing and insert the reusable bearing hub into the receiver (Figure 5.25). Then close and latch the clamp.

Figure 5.25. Inserting the reusable bearing hub.

4. Attach the impeller sleeve directly to the reusable bearing port using the quick-connect attachment on the plastic sheath. An audible click will confirm that the attachment has been successfully made (Figure 5.26). **Note:** The 2,000 L unit does not have a quick-connect fitting. For 2,000 L units, make the connection using a tri-clamp.

Figure 5.26. Attaching the impeller sleeve.

5. Insert the drive shaft into the motor as described in section 5.5—Inserting the drive shaft.

5.7 Making probe connections

The probe connection instructions provided in this section apply to Pall™ Kleenpak™ aseptic connectors. **Note:** Your S.U.M. system may use CPC™ AseptiQuik™ aseptic connectors, or non-aseptic quick-connects, instead of Kleenpak. Contact your sales representative for information on making these alternative probe connections.

5.7.1 Kleenpak specifications

The Kleenpak connector has a maximum working pressure of 3 bar (43.5 psi) at 40°C in compatible fluids.

WARNING: Operation outside the above specifications and/or with fluids incompatible with construction materials may cause personal injury and result in damage to the device.

5.7.2 Receipt of equipment

The male and female Kleenpak connectors are supplied in separate packages. There are several types of end fittings in order to match different tubing size requirements, and to allow for different attachment possibilities to flexible tubing.

Please note the following recommendations:

- Store the male and female Kleenpak connectors in clean, dry conditions and, wherever practical, in the external packaging as delivered.
- DO NOT remove Kleenpak connectors from the inner device bag packaging as delivered.
- Male and female Kleenpak connectors are supplied protected by an inner and outer bag. Ensure that the packaging is undamaged.
- The assembly aid is provided non-sterile, and can be reused multiple times. It needs to be stored in clean, dry conditions between each use. The assembly aid is supplied separately, and is available for purchase from your local Pall representative.

5.7.3 Installation

Before installation, it is essential to verify that the Kleenpak connector is suitable for the liquid that it will be in contact with for the application, and to follow the appropriate instructions listed below.

- Install the male and female Kleenpak connectors using compatible connections. Ensure that the tubing is attached firmly to the hose barb to prevent leakage during operation by using cable ties or other methods. During tubing assembly, premature actuation of the male plunger is prevented by the anti-actuation ring. The anti-actuation ring needs to remain in place until the actual connection takes place. The presence of valves before the connector on the tubing is recommended to prevent liquid contact with the Kleenpak connectors prior to use.
- If the connectors are to be autoclaved, position them with the peel strips facing upward to prevent peel strip blockage by condensate.

WARNING:

- The device must remain dry prior to connection of the male and female Kleenpak connectors. If there is fluid present in the line or around the devices, do not use.
- These disposable Kleenpak connectors must not be in-line steam sterilized. Material design limitations will be exceeded when these devices are exposed to pressurized steam, and they will rupture.

5.7.4 Gamma irradiation

1. Connect the male or female Kleenpak connector to the single-use system. A valve or clamp must be installed close to the connector to prevent accidental wetting after the system is filled with liquid.

2. Ensure that the protective cap is firmly in place. Autoclave paper or another radiation-resistant material can be used to ensure that the cap does not become dislodged during handling.

3. It is recommended that the entire assembly be placed in an inner and outer bag for protection prior to gamma irradiation.

4. Treat with gamma radiation. The maximum allowable radiation dose is 50 kGy (5 mrad).

Important note: Pall recommends that the efficiency of the gamma irradiation cycle is validated using an appropriate method. These connectors have not been validated for repeated gamma irradiation exposure.

5.7.5 Autoclave instructions

1. Install the male or female Kleenpak connector to the equipment to be autoclaved. If the Kleenpak connector is attached to a tank, the tank should be vented appropriately with a vent filter.

2. Ensure that the protective cap of the Kleenpak connector is firmly in place. Autoclave paper or another autoclavable and air/steam permeable material can be used to cover the cap loosely to ensure that the cap does not become dislodged during handling.

3. The Kleenpak connectors should be allowed to vent during autoclaving. The venting strip should be facing upward to prevent blockage by condensates.

WARNING: To avoid collection of condensate within the connectors, do not place the venting strip downwards during autoclaving. The connector should not be covered with heavy objects during the autoclave cycle. Pall recommends that the efficiency of the autoclave cycle is validated using an appropriate method.

Note: The maximum temperature is 121°C for ACD part numbers, and 130°C for KPCHT part numbers. The maximum exposure time is 75 minutes. Do not autoclave at a higher temperature or for a longer period of time. A slow exhaust cycle is recommended.

5.7.6 Making the connection

Figure 5.27 illustrates the male and female Kleenpak connector parts, as well as the complete actuated connector.

WARNING: Do not use if fluid is in contact with the connector. Do not use if the protective caps are loose or displaced.

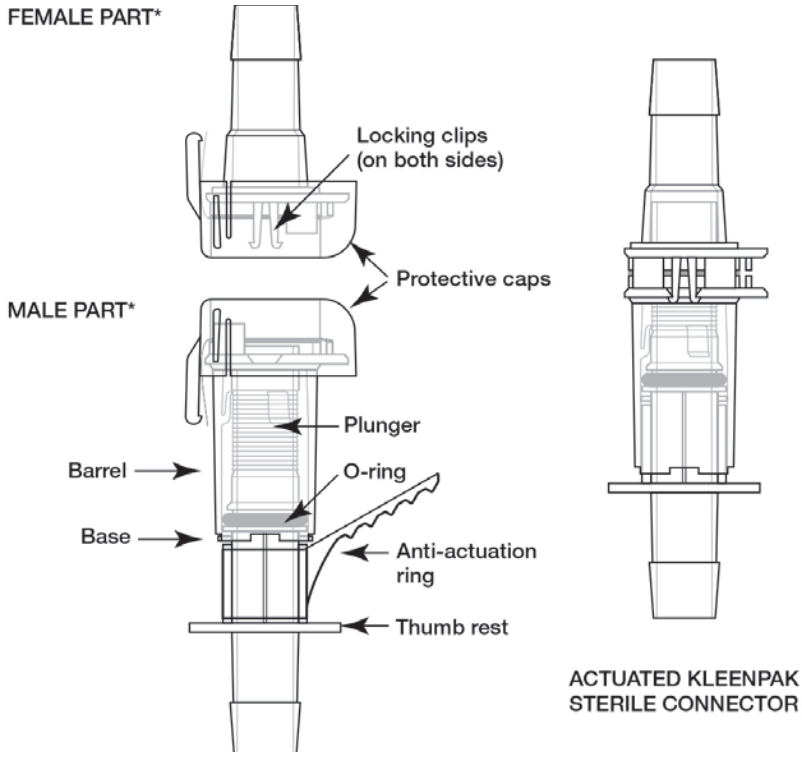


Figure 5.27. Kleenpak connector schematic.

Making the connection using the connector assembly aid

Follow the steps below to make the Kleenpak connection using the assembly aid.

1. Lift and pull the tab off of the protective caps to remove the caps from the Kleenpak connectors (Figure 5.28).

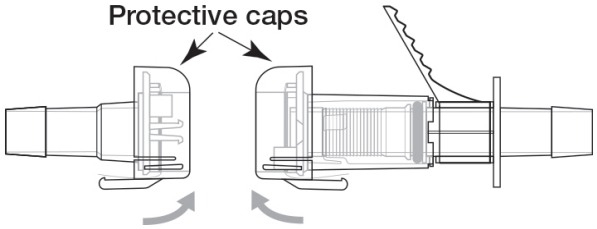


Figure 5.28. Protective caps on connectors.

2. Hold the barrel of the larger (male) Kleenpak connector above the base. Align the smaller (female) Kleenpak connector with the male connector. The flat sides should be aligned, and both peel-away strips should remain folded (Figure 5.29). **Note:** If the Kleenpak connectors are not aligned properly, the connection cannot be made.

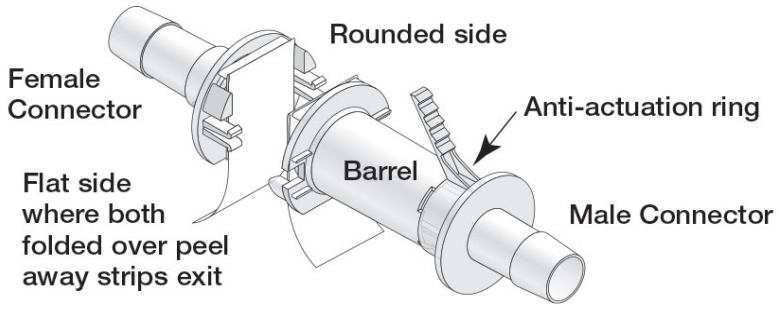


Figure 5.29. Flat sides of connectors aligned.

3. After they have been aligned correctly, firmly press the two connectors together until both locking clips snap together tightly (Figure 5.30).

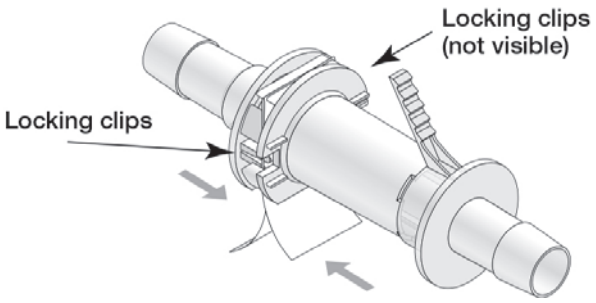


Figure 5.30. Pressing connectors together.

4. Support both the male and female Kleenpak connectors, and remove the anti-actuation ring from the male connector by pulling the tab toward the barbed end of the male Kleenpak connector (Figure 5.31).

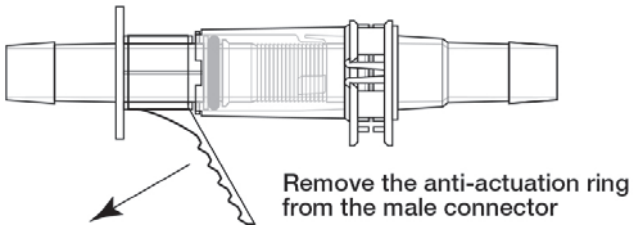


Figure 5.31. Removing the anti-actuation ring.

5. If you are using the Kleenpak connector assembly aid, place the connector inside the aid so that the peel-away strips protrude through the opening (Figure 5.32). If not, hold the connector firmly on each side, with the peel-away strips pointing away from your hand. The Kleenpak connector should stay securely in the assembly aid when properly installed.

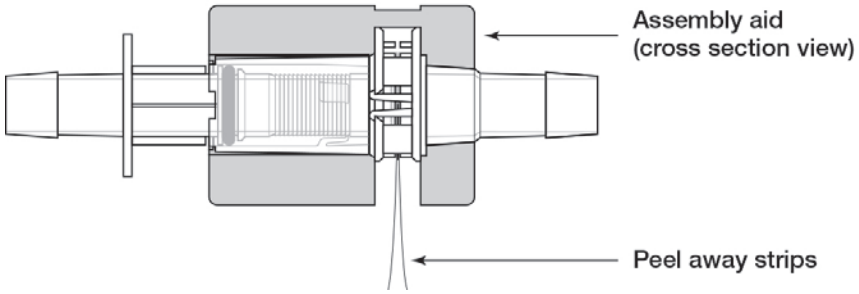


Figure 5.32. Peel-away strips protruding from assembly aid.

6. Hold the assembly aid in the palm of your hand with the Kleenpak connector facing outward, and your thumb supporting the Kleenpak connector in the assembly aid. Using your other hand, firmly grasp both peel-away strips as close as possible to the body of the assembly aid to ensure a secure grip, and pull both strips together in one continuous motion. Ensure that the Kleenpak connector is perpendicular to the peel-away strips (Figure 5.33).

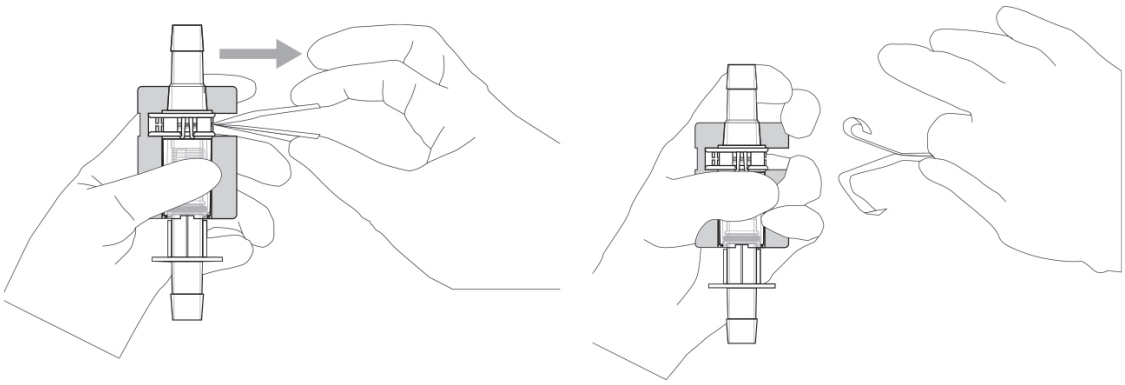


Figure 5.33. Removing the peel-away strips from the connector.

WARNING: Do not use the connector if only one peel-away strip is removed instead of both.

7. With the Kleenpak connector still secured in the assembly aid, push the thumb rest of the male Kleenpak connector toward the base of the barrel (Figure 5.34).

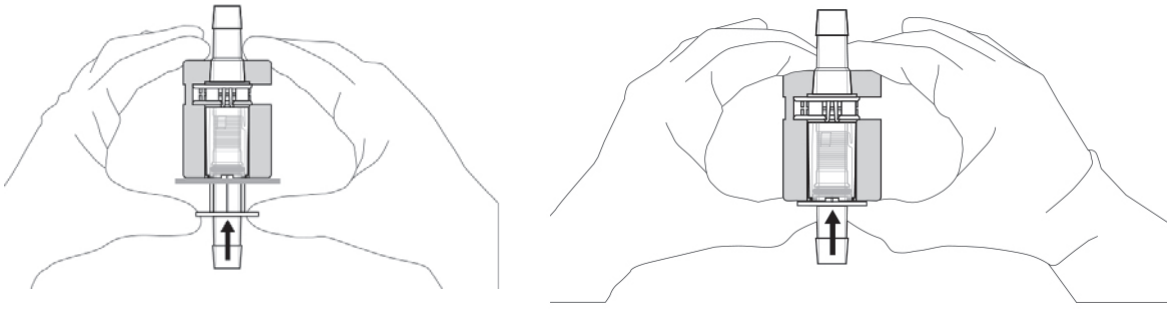


Figure 5.34. Pushing the thumb rest of the connector toward the base of the barrel.

Note that in order to establish a proper connection, the plunger inside the male Kleenpak connector must be fully inserted into the female Kleenpak connector. As a verification, repeat actuation until a hard stop is reached.

If necessary, the Kleenpak connector may be removed from the assembly aid to complete the plunger movement.

8. After the Kleenpak connector assembly is complete, the assembly aid may be removed. When the assembly aid is removed, verify actuation until a hard stop is reached. Then start the fluid transfer (Figure 5.35).

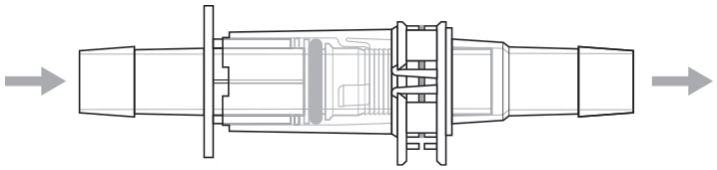


Figure 5.35. Beginning fluid transfer.

Making the connection without using the connector assembly aid

Follow the steps below to make the Kleenpak connection without using the assembly aid.

1. Lift and pull off the protective caps to remove the caps from the Kleenpak connectors (Figure 5.36).

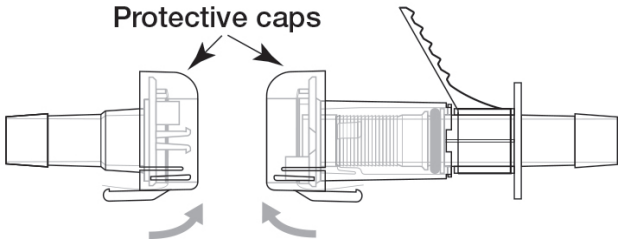


Figure 5.36. Removing protective caps.

2. Hold the barrel of the larger (male) connector above the base. Align the smalller (female) connector with the male connector. The flat sides should be aligned, and both peel-away strips must remain folded (Figure 5.37). **Note:** If the Kleenpak connectors are not aligned properly, the connection cannot be made.

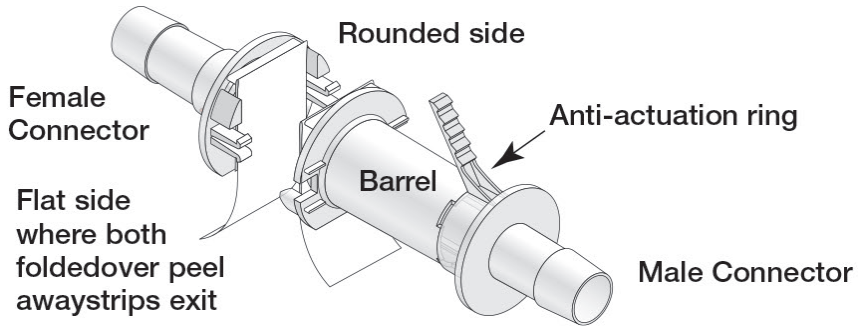


Figure 5.37. Aligning male and female connectors.

3. After the connectors have been aligned correctly, firmly press the two connectors together until both locking clips snap together tightly (Figure 5.38).

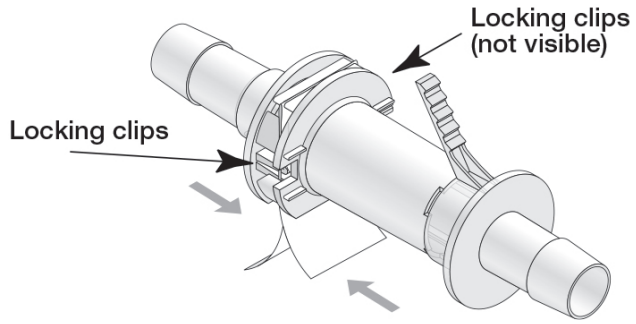


Figure 5.38. Pressing the connectors together.

4. Support both the male and female Kleenpak connectors. Remove the anti-actuation ring from the male connector by pulling the tab toward the barbed end of the male Kleenpak connector (Figure 5.39).

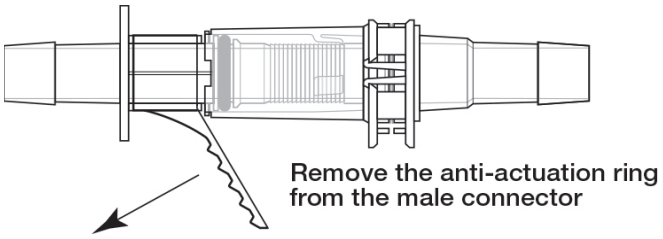


Figure 5.39. Removing the anti-actuation ring.

5. With one hand, support the male and female sides of the Kleenpak connector by wrapping your fingers around both sides of the connector, next to the flange. Using your other hand, grasp both of the peel-away strips as close as possible to the flat side of the connector to ensure a good grip, and pull them out together in one continuous motion. Ensure that the connector is perpendicular to the peel-away strips shown in Figure 5.40. The perpendicular orientation must be maintained while the two strips are pulled simultaneously. Do not use if only one of the peel-away strips is removed instead of both.

   Note: Do not impart perpendicular forces on the connector, as it can cause the connector to break. If a perpendicular force is present due to items attached to the Kleenpak connector, then the connector must be properly supported.

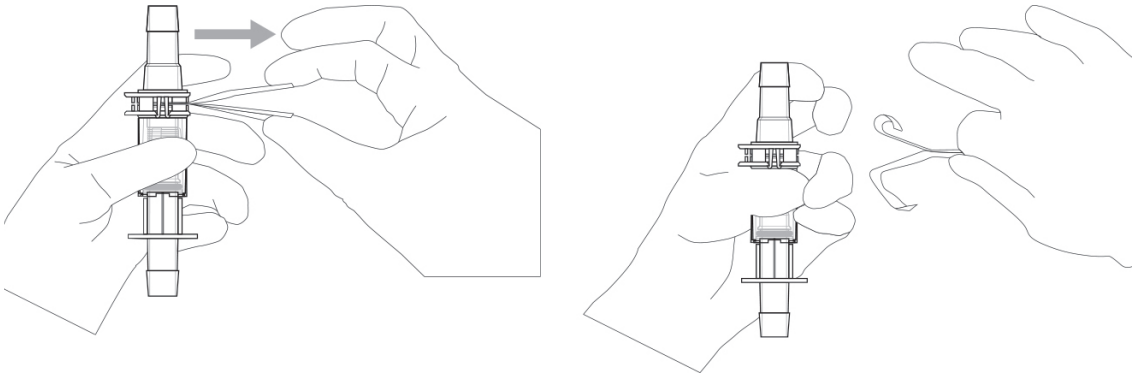


Figure 5.40. Removing the peel-away strips from the connector.

6. Push the thumb rest of the male Kleenpak connector toward the base of the barrel until they meet (Figure 5.41).

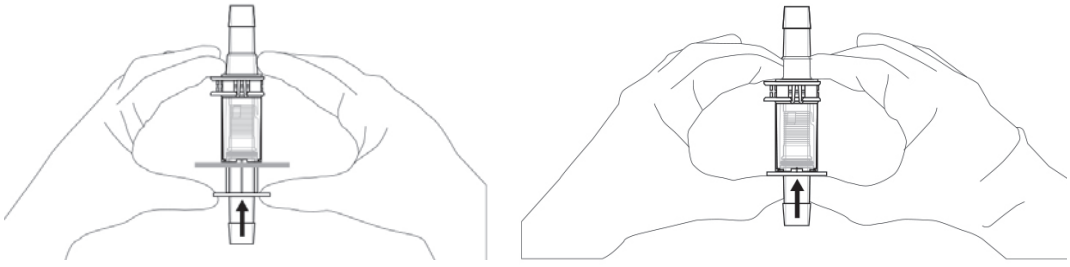


Figure 5.41. Pushing the thumb rest toward the barrel.

Note that in order to establish a proper connection, the plunger inside the male connector must be fully inserted into the female connector. As a verification, repeat actuation until a hard stop is reached. Then start the fluid transfer (Figure 5.42).

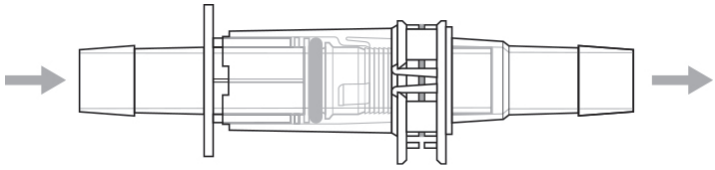


Figure 5.42. Beginning fluid transfer.

5.8 Inserting sensors and probes

5.8.1 Inserting temperature sensors

Follow the steps below to insert temperature sensors into the thermowell.

1. Remove the plastic insert located in the thermowell, if present.

2. Place a small amount of glycerol (0.5 mL) in the thermowell to aid in heat transfer. The glycerol also serves as a lubricant and aids insertion. Twist the temperature sensor slightly as you begin to insert it (Figure 5.43).

Figure 5.43. Inserting temperature sensor.

3. Insert the temperature sensor until the base of the probe meets the mouth of the thermowell.

4. Secure the sensor by twisting the luer lock collar (Figure 5.44). The thermowell will stretch slightly when the sensor is seated.

Figure 5.44. Twisting the temperature sensor to seat it properly.

5.8.2 Preparing pH and conductivity probes

1. Select the appropriate probe. Make sure a Teflon™ support ring and O-ring are on the probe, and visually inspect them for damage.

2. Perform any required probe maintenance and calibrate the pH or conductivity probe (Chapter 4—Calibration procedures).

3. Place a small amount (0.5–1 mL) of buffer or saline solution onto the threaded end of the probe adapter.

4. Insert the probe into the probe assembly through the threaded adapter.

5. Verify that the probe tip is not touching the membrane of the aseptic connector or quick-connect by leaving a gap greater than 6.35 mm (1/4 in.). Then thread the probe tip into the probe adapter.

6. Hand-tighten the adapter and verify that the probe tip is not touching the membrane.

7. Place the probe assembly with the probe into the autoclave tray for probe kits (Figure 5.45). **Note:** Figure 5.45 shows the autoclave tray used for probes with Kleenpak connectors. Probes with AseptiQuik aseptic connectors use a different autoclave tray.

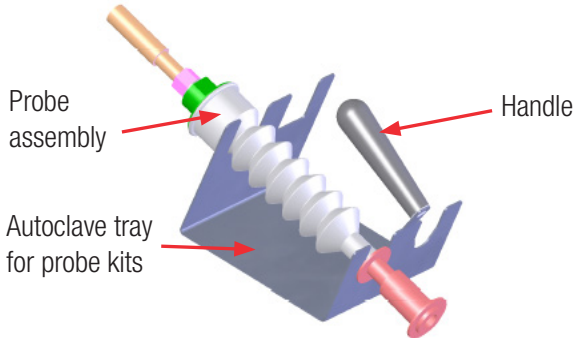


Figure 5.45. Kleenpak probe assembly in autoclave tray.

8. Autoclave the probe assembly using a validated sterilization cycle (approximately 30 minutes at 122°C). A 30-minute sterilization cycle is generally sufficient. Options for wet or dry parameters can be used. Slow exhaust cycles are preferred, as this minimizes stress on the probes during the temperature and pressure changes of autoclaving.

9. When stored properly, the autoclaved probe assemblies can be stored dry for short periods of time (less than 24 hours) without loss of sensor longevity, performance, or sterility.

Note: Before beginning probe insertion, please become familiar with the Kleenpak connector instructions in section 5.7.

5.8.3 Inserting pH and conductivity probes

Follow the steps below to insert pH and conductivity probes into the BPC using the probe assembly (autoclaved, if required). **Note:** Figures 5.47 and 5.48 show a plastic probe clip. Your system may use a metal probe clip, instead.

1. Place tubing clamps on all probe ports prior to attempting to connect probe assemblies (Figure 5.46). This will prevent sterility loss if errors are made during aseptic connection.

Figure 5.46. Placing tubing clamps.

2. Connect the aseptic connector to the pH or conductivity probe port. **Note:** If you are using Kleenpak aseptic connectors, follow the methods outlined in section 5.7.

3. Ensure that all four snaps click on each connector, and that the base and barrel are fully seated.

4. Remove the tubing clamp on the individual probe port.

5. Insert the pH/conductivity sensor probe by collapsing the bellows toward the S.U.M. (Figure 5.47). The probe is seated when the bellows are fully collapsed. A small amount of fluid may enter the bellow if the probe is loaded after liquid fill.

Figure 5.47. Compressing the probe bellows.

6. Attach a probe clip on the horizontal band at the bottom front of the outer support container to support the probe.

7. Place the entire collapsed probe assembly in the probe clip (Figure 5.48). If necessary, compress the probe bellows further to allow the probe assembly to be positioned and secured into the end of the probe clip.

Figure 5.48. Placing collapsed probe assembly into the probe clip.

8. Allow the probe bellows to relax.

Note: Probe ports that are not used prior to liquid fill must remain clamped. Probe ports not used can be accessed later for probe replacement or redundancy purposes, if required.

5.9 Taring the S.U.M.

In order to ensure accurate mass measurements, tare your S.U.M. system using the following steps before filling the BPC with liquid.
Note: If you are using load cells, the Mass module must be configured on the Touchscreen Console before you can tare the system. See section 3.5.3 for information about configuring the Mass module.

1. Verify that all parts of the mixer (drive shaft, BPC, probe door plates, probe clips, and tools) are located on the outer support container. The BPC should also be installed in the unit. The Powdertainer may also need to be installed, depending on your weighing processes.

2. If you are not using load cells, tare the skid on the scale with the BPC installed.

3. If you are using load cells, ensure that the Mass module on the Touchscreen Console has been configured. Touch the Mass module on the Home screen and select **Calibration**. Touch **1 Point Calibration**. Enter 0 (zero) in the field and touch **Next**. The S.U.M. will be tared when the **1 Point Calibration Complete** screen appears.

6

Operating information

Chapter contents

The instructions provided in this chapter represent a general outline of operating procedures. Because procedures can vary greatly from application to application, it is important to consult your internal formulation protocols for proper procedures.

Please note that the information provided below includes information for both sterile and non-sterile mixing applications. For sterile applications, all connections must be made aseptically.

6.1 Filling with liquid

If your system has load cells and pumps set up per section 3.1, follow the steps below to fill the system using the Fill module on the Touchscreen Console. **Note:** The Fill module must be configured before use. See section 3.5.7 for information about configuring the Fill module.

1. Locate the Fill module on the Home screen of the Touchscreen Console. Touch the module to open the Fill Settings screen, then select **Fill Control**.

2. On the Fill Control screen, you will be prompted to select a method of filling: either by pressure or by pump.
   - **If you select pressure:** Enter the fluid target. Then touch **Done**.
   - **If you select pump:** Enter the fluid target by entering the amount to add to the current value. Enter the Stage 1 flowrate, percentage filled before Stage 2, and the Stage 2 flowrate. Then touch **Done**.

3. If the system has pinch valves connected, the next screen that appears will prompt you to ensure that the Fill pinch valve is closed. If the pinch valve is open, move the slider from “Open” to “Closed.” Then touch **Start Fill**.

4. After you have selected **Start Fill**, the pumps will turn on and begin filling the system with the user-specified amount of liquid. The screen that appears (Figure 6.1) will show the amount of fluid remaining, the current mass, the BPC pressure, and liquid pressure readings (for Liquid Pressure1, Liquid Pressure2, and Delta).

5. You can select **Pause** at the bottom of the screen at any time to temporarily stop the filling process. A Fill Paused screen will appear, which allows you to either resume or cancel the liquid fill.

Figure 6.1. Fill Control screen.

6.2 Setting agitation

After the liquid has reached the minimum operating volume of the Single-Use Mixer (S.U.M.), agitation can be turned on using the Agitation module on the Touchscreen Console. Ensure that the BioProcess Container (BPC) is filled to an adequate volume level for your individual operating processes before you begin agitation.

CAUTION: Operating the S.U.M. outside of the mixing specifications provided in this publication can potentially result in damage to the drive shaft.

Note: The Agitation module must be configured before you start mixing. See section 3.5.2 for information about configuring the Agitation module. To turn on agitation, locate the Agitation module on the Touchscreen Console Home screen (Figure 6.2), and touch **Start**.

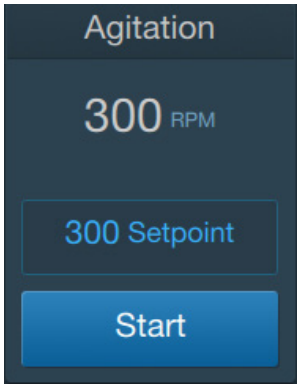


Figure 6.2. Agitation module.

6.3 Adding powder with the Powdertainer

The S.U.M. can be equipped with a Powdertainer support arm for the addition of solids, such as powder. See section 8.5.2 of this publication for Powdertainer specification information.

The following instructions describe the use of the Powdertainer BPC in conjunction with the S.U.M. when it is equipped with the Powdertainer arm. While other methods for solids addition can also use the BPC powder port, complete protocols are not included here, as individual protocols vary.

1. Ensure that the clamp on the Powdertainer bag is completely closed.

2. Suspend the Powdertainer from the support arm hanger by its handle (Figure 6.3).

Figure 6.3. Hanging the Powdertainer on the support arm.

3. If necessary, adjust the Powdertainer arm height by flipping the latch down, sliding the upper pole up or down, re-engaging the latch, and then turning the lever clockwise to tighten it.

4. Remove the tape and cap from the Powdertainer BPC opening (Figure 6.4).

Figure 6.4. Removing the cap from the Powdertainer.

5. Snap the powder port on the BPC into the bracket on the Powdertainer support arm. If necessary, adjust the bracket in or out to accommodate the position of the powder port on the BPC.

6. Remove the clamp and protective cap from the powder port on the BPC.

7. Align the Powdertainer opening and the powder port on the BPC (Figure 6.5).

Figure 6.5. BPC powder port in the clamp.

8. Use the tri-clamp provided on the Powdertainer arm to connect to two ports (Figure 6.6).

Figure 6.6. Connecting the Powdertainer to the BPC powder port.

9. To initiate the addition of solids, release the clamp on the bottom of the feed bag (Figure 6.7). Ensure the entire contents of the feed bag are added before detaching the Powdertainer from the BPC. The powder port cover, gasket, and clamp can be replaced if no other dry ingredients are to be added, or it may be left open for pipette sampling.

Figure 6.7. Releasing the Powdertainer feed clamp.

6.4 Using the timer

The Timer module on the Touchscreen Console allows users to set a timer to monitor the length of time that the S.U.M. has been mixing. To use the timer, locate the Timer module on the Home screen of the Touchscreen Console. Touch **Start**. The timer will begin counting up from zero, and will continue until you touch **Stop**.

6.5 Monitoring and controlling functions

6.5.1 Mixing

Users can monitor the mixing speed during operation by using the Agitation module on the Touchscreen Console. The Agitation module on the Home screen shows the current mixing speed, as well as the set points that were entered during module configuration. To calibrate the agitation speed, see section 4.4 in this publication.

6.5.2 Adding more powder or liquid

Depending on your operation procedures, it may be necessary to add more powder or liquid to the solution during the mixing process. Follow the steps below to add components to the S.U.M. during operation.

Adding powder to liquid

1. Suspend the Powdertainer BPC from the hanger on the S.U.M.
2. Remove the clamp, cover, and gasket from the powder port on the BPC.
3. Use the holding arm to hold the powder port of the BPC in place as the Powdertainer is positioned.
4. Remove the protective tape and cap from the port on the Powdertainer.
5. Attach the Powdertainer to the powder port on the BPC using the tri-clamp.
6. Verify that the mixer motor is operating at the desired speed using the Agitation module on the Touchscreen Console. See section 6.5.1 for more information about using the Agitation module.
7. Open the bag clip to release the contents of the Powdertainer into the S.U.M. BPC.
8. Continue mixing until all powder is solubilized before proceeding to the next ingredient.

Adding liquid to liquid without pumps

1. Verify that the mixer motor is operating at the desired speed using the Agitation module on the Touchscreen Console. See section 6.5.1 for more information about using the Agitation module.

2. Connect the liquid source line to an addition line set on the top of the BPC via the quick-connect or tri-clamp fittings.

3. To introduce the liquid, open the flow path by releasing any clamps on the line set. Continue mixing until all liquid has been introduced before proceeding to the next ingredient.

Adding liquid to liquid using pumps

1. Verify that the mixer motor is operating at the desired speed using the Agitation module on the Touchscreen Console. See section 6.5.1 for more information about using the Agitation module.

2. Ensure that the pump you are using is set up per the instructions in section 3.1, and that the correct pump has been assigned to the Fill module. Touch the Fill module on the Home screen of the Touchscreen Console to open the Fill Settings screen. Touch **Pump Selection** to review and/or edit pump assignments.

3. Return to the Fill Settings screen. Touch **Fill Control** to enter the amount of liquid you would like to deliver, as well as the stages, flow rates, and transition and termination parameters. Touch **Done**.

4. The next screen will appear with a prompt that asks if you are using pinch valves.
   - **If No:** Touch **No**. A screen will appear asking if you would like to start liquid fill. Touch **Cancel** to return to the previous screen, or touch **Start Fill** to begin filling.
   - **If Yes:** Touch **Yes**. A screen will appear for opening or closing the pinch valves. The pinch valve must be closed to begin liquid fill. Touch **Cancel** to return to the previous screen, or touch **Start Fill** to begin filling.

5. After you have selected **Start Fill**, the pumps will turn on and begin filling the system with the user-specified amount of liquid. The screen that appears will show the liquid pressure and delta values, the amount of fluid remaining, current mass, and BPC pressure value.

6. You can select **Pause Fill** at the bottom of the screen at any time to temporarily stop the filling process. A Fill Paused screen will appear, which allows you to either resume or cancel the liquid fill.

7. Continue mixing until all of the liquid has been introduced. Then proceed to the next ingredient, if necessary.

Repeat this process for all liquid components in the formulation.

6.5.3 Adjusting pH and conductivity

The Touchscreen Console allows users to monitor the pH and conductivity levels of the solution while it is mixing. On the Touchscreen Console Home screen, the pH and Conductivity modules show the current values read by the system. Adjusting these levels requires the use of pumps that have been set up for acid, base, or saline buffer solutions. Use the steps below to adjust the pH and conductivity levels.

1. Before adjusting pH or conductivity, ensure that the probe you are using has been properly calibrated and correctly inserted into the probe bellows. See sections 4.2 and 4.3 for pH and conductivity calibration information.

2. On the Touchscreen Console Home screen, touch the **Pump** module that has been assigned to the buffer you would like to deliver, such as acid, base, or saline.

3. Select **Add Bolus**. On the screen that appears, you will be prompted to enter the desired units, fluid amount for the pump to deliver, and the amount of time the delivery should take (bolus delivery duration). The “Set point flow rate” field should automatically populate after the fluid delivery and duration have been entered. **Note:** If a time or fluid amount is entered that is greater than the values to which the pump has been calibrated, the fields will automatically change these fields to the maximum value possible. If you are not using a control equation, touch **Next** to continue. If you would like to enter pH or conductivity parameters using a control equation, follow the steps below before touching **Next**.
   - Slide the on/off button for “Control Equation” and “Hysteresis” to the “On” position.
   - Touch the **Control Equation** field to enter the setpoints for pH or conductivity, and the action that should be taken (either **Pause** or **Stop**).
   - Touch the **Hysteresis** field to enter the pH or conductivity value that should be reached, and the length of time that value should be held, before the pump resumes. Touch **Next**.

4. On the screen that appears, the following will be displayed at the top of the screen: remaining amount of fluid to be delivered, current pH or conductivity reading, and the total amount of fluid to deliver. The time remaining will be visible in the center of the screen. If you have entered a control equation, the equation will be shown at the bottom of the screen. If a control equation has not been entered, “Control Equation Disabled” will be shown at the bottom of the screen, instead.

6.5.4 Adjusting temperature

The Touchscreen Console allows users to monitor the temperature of the solution while it is mixing. On the Touchscreen Console Home screen, the Temperature module shows the current temperature in degrees Celsius (°C) read by the system. To adjust the temperature of the S.U.M. using the Temperature module on the Touchscreen Console, your system must have an integrated temperature control unit (TCU) set up. Follow the instructions below to adjust the S.U.M. temperature.

1. Before adjusting the temperature, ensure that the probe you are using has been correctly inserted into the probe bellows.

2. On the Touchscreen Console Home screen, touch the Temperature module. Touch **Select Active Sensor** on the Temperature Settings screen.

3. The following screen will prompt you to select a temperature sensor to use. You may choose either **Temp1** or **Temp2**. After selecting a sensor, touch **Done**. Touch **Close** to return to the Touchscreen Console Home screen.

4. Touch **Setpoint** on the Temperature module. Enter the desired TCU setpoint (in °C) and touch **Enter**. Touch **Start** on the Temperature module. The TCU will now adjust the temperature based on the setpoint provided. The heating and cooling PID loop values are contained in the TCU.

6.5.5 Monitoring the BPC headspace pressure

The Touchscreen Console allows users to monitor the pressure in the headspace of the BPC during S.U.M. operation. The BPC Pressure module on the Touchscreen Console Home screen (Figure 6.8) shows the current BPC pressure in psi.

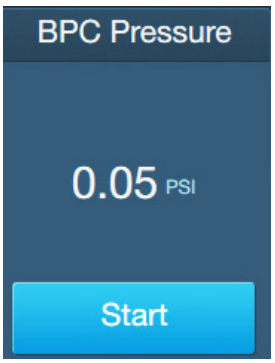


Figure 6.8. BPC Pressure module.

6.5.6 Monitoring alarms

Many of the modules on the Touchscreen Console allow you to set either High/Low or High High/Low Low alarms, which are triggered by user-specified conditions. These conditions are set up within individual modules.

High and Low alarms

If a High or Low alarm is triggered during operation:

- The affected module on the Home screen will turn yellow.
- The alarm will visually alert you to specified triggers, but will not pause or stop operation.

High High and Low Low alarms

If a High High or Low Low alarm is triggered during operation:

- The affected module on the Home screen will turn red.
- An audible buzzer will sound.
- Operation processes related to the affected module will either pause or stop, depending on the user-specified conditions.

Resolving triggered alarms

To resolve alarms that have been triggered, touch the **Alarm** icon on the Touchscreen Console Home screen to open the Alarm Status screen. Touch the alarm that has been triggered (or **Select All**, if you would like to acknowledge all of the alarms at once), and then touch **Acknowledge**. The buzzer should stop, and the alarm icon and affected module should change from red back to white.

6.5.7 Monitoring other functions

The Touchscreen Console can be used to monitor other functions outside of the provided modules. The Auxiliary Output and Auxiliary Input modules described below, allow you to customize functions you would like to monitor during the mixing process. In addition, Administrators can access a “Diagnostics” option on the Pump and pH module settings.

Auxiliary Outputs

The Auxiliary Output module allows you to duplicate an existing module, for extra sensors or further redundancy. To monitor any configured auxiliary outputs during operation, touch the Auxiliary Output module on the Home screen of the Touchscreen Console. After selecting a module to duplicate, you can select **Diagnostics**, change the module name, and adjust rpm scaling.

Auxiliary Inputs

The Auxiliary Input module allows you to monitor sensors and transmitters that use a 4-20 mA signal, and do not have a specified module on the Touchscreen Console.

Pump and pH diagnostics

Administrators can access the Diagnostics option for the Pump and pH modules. Pump Diagnostics allows the Administrator to manually set the output current of the Pump output. This can help determine the current to rpm values for rpm scaling. pH Diagnostics allow the Administrator to view the slope and offset calibration values currently applied to the pH sensor(s).

6.5.8 Sampling

Sampling with a recirculation loop

Samples can be taken from the SmartSite™ port on the recirculation loop by attaching a luer lock syringe and drawing a sample while the recirculation loop is operating. Samples can also be taken on BPCs equipped with a thermowell/sampling port located in one of the probe ports. The following instructions are for aseptic sampling via the SmartSite port. For these instructions, use the standard luer lock on a 60 mL syringe, or sterile manifold.

1. Remove the dust cover from the SmartSite (Figure 6.9).

2. Clean the SmartSite with a sanitary wipe. Then, connect the sanitary luer lock type syringe (Figure 6.10).

Figure 6.9. Removing cap.

Figure 6.10. Inserting sampling syringe.

3. Apply a small amount of vacuum pressure by pulling out the syringe plunger slightly and pull a sample (approx. 30–60 mL).

4. Remove the syringe. This will be considered a purge sample.

5. Clean the SmartSite with a sanitary wipe. Then, connect the sanitary luer lock type syringe.

6. Apply a small amount of vacuum pressure using the syringe, and pull the desired sample volume (approx. 10–20 mL).

7. Remove the syringe. This will be considered a representative sample.

8. Clean the SmartSite with a sanitary wipe. Then replace the dust cap.

Sampling without a recirculation loop

When the recirculation loop is not being used, a line set can be used for sampling instead. To use a line set for sampling, push the line set down to the liquid level. Use a pump to draw off liquid into a secondary container. A sample may also be pulled via the drain line in the same manner.

6.6 Harvesting

6.6.1 Using the Harvest module

If you have pumps set up per section 3.1, follow the steps below to drain the system using the Harvest module on the Touchscreen Console. **Note:** Before using the Harvest module, it must be configured. See section 3.5.8 for information about Harvest module configuration.

1. Locate the Harvest module on the Home screen of the Touchscreen Console. Touch the module to open the Harvest Settings screen, then select **Harvest Control**.

2. The screen that appears will prompt you to select a method of harvesting: either **by gravity** or **by pump**.
   - **If you select Gravity:** Enter the fluid target. Then touch **Done**.
   - **If you select Pump:** Enter the fluid target by entering the amount to take out from the current value. Enter the Stage 1 flowrate, the percentage harvested before Stage 2, and the Stage 2 flowrate. Then touch **Done**.

3. If the system has pinch valves connected, the next screen that appears will prompt you to ensure that the Harvest pinch valve is closed. If the pinch valve is open, move the slider from “Open” to “Closed.” Then touch **Start Harvest**.

4. After you have selected **Start Harvest**, the pumps will turn on and begin harvesting the user-specified amount of liquid from the system. The screen that appears (Figure 6.11) will show the current stage of the harvesting process, the amount of fluid remaining, the current mass, the BPC pressure, and the liquid pressure values (Liquid Pressure1, Liquid Pressure2, and Delta).

Figure 6.11. Harvest Control screen.

5. You can select **Pause** at the bottom of the screen at any time to temporarily stop the harvesting process. The Harvest Paused screen will appear, which allows you to either resume or cancel the harvest process.

6.6.2 Harvesting manually

If you are not using pumps per section 3.1, you must manually drain the S.U.M. Use the following instructions to harvest manually.

Harvesting manually with a recirculation loop

If you are using a recirculation loop, the drain line is located on the addition line “Y.” Open the clamp on the 30.5 cm (12 in.) section of tubing on the recirculation loop “Y” and connect to the intended transfer line. Use the peristaltic pump already installed on the recirculation line (section 5.3) to transfer the contents of the S.U.M. Be sure to stop the mixing motor before you reach the minimum working volume.

Harvesting manually without a recirculation loop

If you are not using a recirculation loop, follow the steps below to manually harvest liquid from the S.U.M. BPC.

1. Connect the bottom drain tubing set to the intended transfer line. **Note:** For sterile connections, this must be done aseptically.

2. Open the clamp that is positioned at the bottom drain port.

3. Begin draining the BPC using a peristaltic pump. Be sure to stop the mixing motor before the liquid in the BPC reaches the minimum working volume.

4. When approximately 3–5 liters remain in the BPC, lift the BPC from the top. Hold the bottom drain line near the floor while lifting to facilitate draining the final liter of liquid.

6.7 Shutdown and disposal

6.7.1 Shutting down the S.U.M.

1. After draining the S.U.M., verify that the motor agitation is off, and turn off the power to the outer support container by switching off the main power disconnect.

2. Remove the drive shaft and store it by reversing the steps used during assembly (section 5.6). **Note:** Exercise caution when removing the drive shaft from the S.U.M. under low-clearance ceilings to avoid impacting the ceiling or ceiling fixtures (see the ceiling height requirements in Chapter 8).

3. If the S.U.M. hardware has been in contact with caustic materials, rinse the affected areas with a light water rinse, followed by a routine cleaning. See Chapter 7—Maintenance for more information.

4. Return any loose items, such as the drive shaft and tools, to their storage locations to prevent accidental damage.

5. Remove the BPC from the outer support container and dispose of the BPC according to your facility regulations. All product contact materials may be disposed of in a waste container or incinerator. If the reusable bearing port has been used for open-top mixing, store it for future use.

6.7.2 Decommissioning the Touchscreen Console

1. Turn off the AC input switch and the internal AC switch.
2. Disconnect the input power cord.
3. Turn off the AC output switch.
4. Disconnect the M12 AC power cable and the motor cable. Then disconnect all other M12 cables.
5. Disconnect the optional remote E-Stop, if present.
6. Use caution to loosen the mounting screw and dismount the unit.
7. Keep the unit in a proper storage space after it has been removed.

6.7.3 Disposal information

Figure 6.12. WEEE symbol.

Dispose of used BPCs according to your facility regulations. All product contact materials may be disposed of in a waste container or incinerator. Products with the symbol shown to the left in Figure 6.12 are required to comply with the European Union's Waste Electrical & Electronic Equipment (WEEE) Directive 2002/96/EC.

If you are a user of Thermo Scientific products and are located within Europe, and you need to have our products recycled within the terms of the WEEE Directive, your product must have been purchased on or after 13 August 2005 and should be marked with the WEEE symbol. Thermo Scientific products will continue to meet the requirements of all relevant directives, including those of Restriction of Hazardous Substances (RoHS) Directive if and where applicable. Any of our products affected by or coming into the RoHS scope for the first time, as a result of the inclusion in the recast directive of product categories 8, 9, or (the new) 11, changes to the exclusions, or changes to exempted applications, will meet these new requirements from their due dates, or enable a finished product into which they may be incorporated to do so.

Please note that products that are considered a biological hazard or have been medically contaminated are not to be recycled through this program, but must be treated as biohazard waste and disposed of in accordance with your local regulations.

7

Maintenance and troubleshooting

Chapter contents

7.1 Maintenance guidelines

7.1.1 Routine maintenance guidelines

Environmental conditions, operating parameters, and the ability of the user to adhere to standard operating procedures, as outlined in this user's guide, can have a significant impact on the useful life of the S.U.M. hardware. High-wear items that are common to conventional systems, such as bearings, seals, O-rings, and sterilization valves, have been considered in the design of the disposable construction of the S.U.M. This creates a mixing system that is inherently robust, and requires low levels of routine maintenance. The following routine maintenance guidelines are based on standard operating conditions, as defined in this user's guide.

Take time between mixing batches to clean the exterior of the S.U.M. This will improve the appearance and overall longevity of the hardware system. Between runs, the outer support container, drive shaft, mixer drive, and Touchscreen Console can be wiped down with sanitary wipes. Steel surfaces on the outer support container can also be cleaned with a stainless steel cleaner. **Note:** Only use a clean, dry cloth to wipe down the touchscreen on the Touchscreen Console.

The S.U.M. hardware is constructed in accordance with IP-54 ingress protection ratings, and can be cleaned to the extent of standard laboratory cleaning procedures. Ensure that all electrical connections have been disconnected and electrical enclosures are closed tightly. The unit must be allowed to fully dry prior to being brought back into operation.

7.1.2 Touchscreen Console software maintenance

When available, you should install software updates on the Touchscreen Console. To do this, first insert the USB drive containing the latest software update into the USB port on the Touchscreen Console. Select the **Settings** icon on the Home screen, and touch **Maintenance**, followed by **Check for updates**.

7.1.3 Preventive maintenance guidelines

Follow the preventive maintenance guidelines below to ensure dependable system use. Wear components should be visually inspected before and after use. Refer to the drawings on the ETP for information on replacement parts. **Note:** The reusable S.U.M. bearing port should be replaced annually.

Drive motor

The drive motor is an industrial-grade induction motor with a permanently sealed and lubricated gear box. The drive motor will operate a minimum of 10,000 hours at a continuous load before it will need to be replaced.

Drive shaft assembly

The drive shaft will wear slightly with use, and should be visually inspected after each run. Lightly coat multi-segment drive shaft threads with food-grade anti-seize to aid in making drive shaft connections. Generally, the drive shaft assembly should be replaced after one year of use. For special conditions, refer to the drive shaft head wear specifications provided in Table 7.1.

Table 7.1 shows minimum drive shaft hex diameters. Diameters are measured at the widest location across the points. Replace a worn drive shaft head assembly when the drive shaft hex diameter at the widest location measures equal to or less than the measurement across the points. See Figure 7.1 for measurement location.

Table 7.1. Drive shaft head hex diameter measurements.

S.U.M. size	Minimum drive shaft hex diameter
50, 100, 200, 500, and 1,000 L	14.4 mm (0.566 in.)
2,000 L	20.8 mm (0.820 in.)

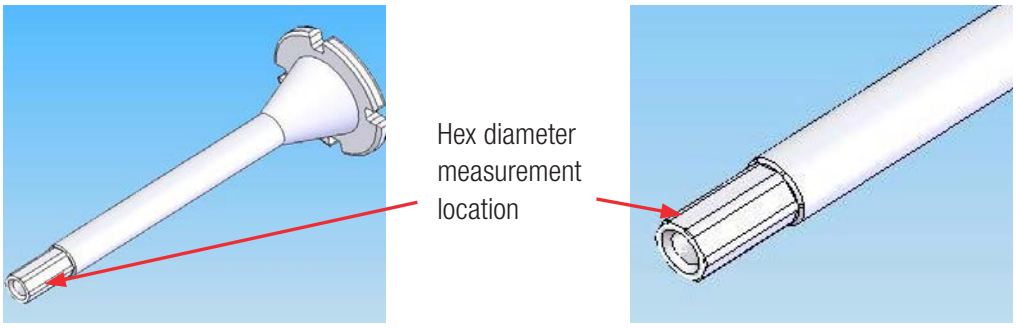


Figure 7.1. Drive shaft head assembly.

7.2 BPC-related troubleshooting

Issue: **There is too much tension in the film near the bearing port of the loaded BPC.**

Solution: **Reload the BPC, if possible, by carefully following the BPC loading instructions in this publication.**

- Provide excess film to that region of the BPC nearest to the bearing port when aligning the BPC in the tank.
- Do not begin liquid fill until the BPC is properly seated in the tank.
- Verify that the black bumper located in the motor mount block is present.

Issue: **I am not familiar with the use of Pall Kleenpak connectors, and am concerned about making aseptic connections.**

Solution: **Read the Pall Kleenpak Connector instructions found in section 5.7 of this guide before beginning to make aseptic connections.**

- When a connection is being made, visually evaluate the status of the four locking external clips and verify that they are tightly secured. The snap should be audible for all four clips when pressing the connectors together. Always make sure the four locking clips are fully engaged for the male/female connection before removing the paper strips.
- A common cause for a leaking Kleenpak connector is an error in the final step of seating the tapered barrels of the male/female connector. There is a series of concentric rings inside the male connector (0.3 in. in front of the black O-ring). Visually verify that the four internal clips are on the last set of rings. Using both hands, place the connector flanges between your index fingers and thumbs, and squeeze until properly seated.

Issue: **I did not introduce the pH probe prior to liquid fill. Can a sterile connection still be made under these conditions?**

Solution: **You can still make a sterile connection after filling the BPC, as long as the clamps were closed on the Kleenpak connector probe ports before liquid fill.**

The Kleenpak connectors must be dry to make the connection of the probe assemblies. When media is already present in the S.U.M., follow the probe insertion procedures as outlined in section 5.8 of this guide. Some fluid may enter the bellows when the probe is inserted into a BPC already filled with fluid.

7.3 Touchscreen Console troubleshooting

See Table 7.2 for Touchscreen Console troubleshooting issues and potential causes. For further assistance in resolving Touchscreen Console technical issues, call +1 435 792 8500 (United States) or +44 (0) 1670 734093 (Europe, U.K.), or contact: customerservice.bioprocessing@thermofisher.com

CAUTION: Do not open or attempt to service the Touchscreen Console. Servicing of the unit should only be performed by Thermo Scientific service personnel. Servicing by anyone other than Thermo Fisher Scientific personnel will void the system warranty.

Table 7.2. Touchscreen Console troubleshooting issues and potential causes.

Issue	Potential cause(s)
Touchscreen Console will not turn on	• Power plug or outlet is faulty • Fuse (circuit breaker) is shut off
Touchscreen Console is stuck on the boot-up screen	• If intermittent, may be due to a read failure, which requires rebooting • Firmware corrupted or hardware failure
The motor will not turn on	Motor communication cable issue
Motor rpm is outside of tolerance	Should not be an issue for DC motors; optical sensor feedback keeps rpm within tolerance
Mass reading is not displaying	• Load cell/load cell cable issue • Load cell summing box issue
Mass readings are inaccurate	• Vessel size is incorrect • Load cell calibration is inaccurate
pH readings are not displaying or the pH transmitter is unable to recognize the sensor	• pH connection issue • pH board issue in the Touchscreen Console
pH readings are inaccurate	• pH readings will always be displayed, even without a sensor or cable connected • pH calibration issue
Conductivity readings are not displaying	• Conductivity sensor issue • Conductivity connection issue
Conductivity readings are inaccurate	• Conductivity calibration issue • Conductivity sensor issue
BPC pressure is not reading	• Pressure sensor in BPC is not working • Connection issue between pressure sensor and the Touchscreen Console
BPC pressure readings are inaccurate	• Pressure sensor calibration issue • Connection issue between pressure sensor and the Touchscreen Console
BPC pressure module is not pumping air into the BPC when “Start” is pressed	• Issue with air supply into the Touchscreen Console • Issue with pneumatic solenoid valves

Table 7.3. Touchscreen Console troubleshooting issues and potential causes (continued).

Issue	Potential cause(s)
Touchscreen Console will not control the TCU	• Issue with TCU parameters • Issue with TCU cordsets
Touchscreen Console has multiple breaker trips within a 4 hour window	• Inadequate power supply; ensure no other device is sharing the power outlet • Too much power consumed by devices (defective or otherwise) connected on auxiliary power outlets; remove device(s) to identify defective component
Touchscreen Console HMI screen is unresponsive	• Issue with software • Issue with electrical hardware
Touchscreen Console does not recognize USB drive	• USB drive is not in FAT format • Electronics hardware issue
Touchscreen Console will not control pinch valve	• Incorrect pinch valve feedback and control connection • Pressurized air inlet issue
Touchscreen Console will not control external device (4-20 mA output)	• Issue with parameters on external component • Issue with cordset
Touchscreen Console fails to recognize auxiliary input (4-20 mA input)	• Issue with external 4-20 mA supply • Issue with cordset
Auxiliary breaker has multiple breaker trips within a 4 hour window	• Overload of auxiliary plugs • Issue with breaker
Temperature readings are not displaying or fail to recognize a sensor	• Issue with RTD • Issue with cordset
Temperature readings are inaccurate	• Issue with RTD • Temperature calibration is inaccurate
Digital communication protocol is not working	• Issue with software • Issue with cordset
External E-Stop is not recognized	• Issue with cordset • Issue with E-Stop circuit
E-Stop buzzer will not turn off	• Issue with E-Stop reset circuit • Issue with buzzer
E-Stop buzzer will not turn on when the E-Stop button is pressed	• Issue with buzzer • Issue with E-Stop circuit
Auxiliary power outlets are not working	• Auxiliary breaker may have tripped • Issue with power cord
Overtemperature warning	• Issue with exhaust fan • Issue with inlet filter
HMI is slow to respond or is lagging	Issue with firmware
DC motor overtemperature	• Issue with cooling fan • Issue with wiring

8

Specifications and parts information

Chapter contents

8.1 Hardware features

8.1.1 Design features of 50, 100, and 200 L S.U.M.s

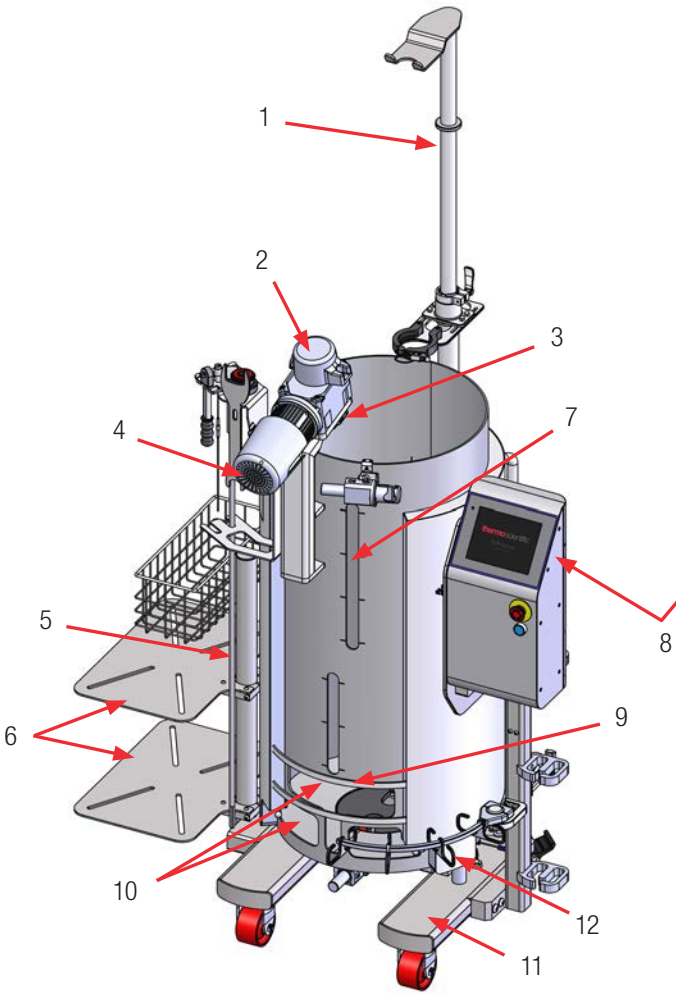


Figure 8.1. 200 L jacketed S.U.M. (front view).

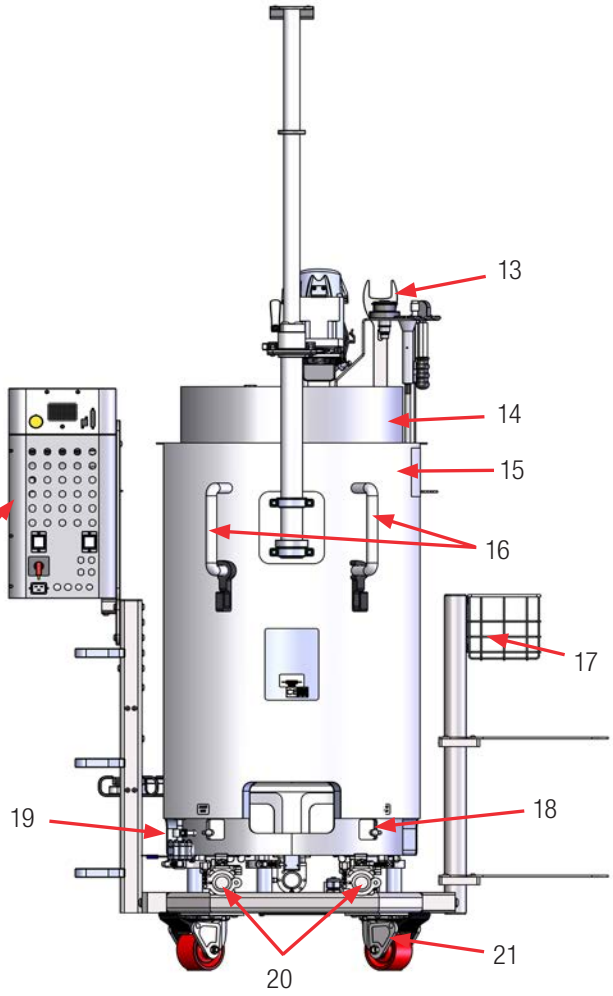


Figure 8.2. 200 L jacketed S.U.M. (back view).

1. Powdertainer arm (optional)
2. Mixing assembly with shield
3. Bearing port receiver with clamp
4. Mixer motor
5. Drive shaft, stored
6. Shelves (optional)
7. Liquid sight window
8. Touchscreen Console
9. Probe clip hanger
10. Probe access windows
11. Cart assembly
12. Cable management hooks
13. 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
14. 0.95 cm (3/8 in.) Dimpled jacket
15. Stainless steel outer support container
16. Handles with cable management clips
17. Basket (optional)
18. Bottom cutouts/pins for BPC attachment and alignment
19. Bleed valve (jacketed models only)
20. 3.81 cm (1.5 in.) Tri-clamp connection ports for water inlet/outlet (jacketed models only)
21. Casters (2 swiveling, 2 fixed)

8.1.2 Design features of 500 and 1,000 L S.U.M.s

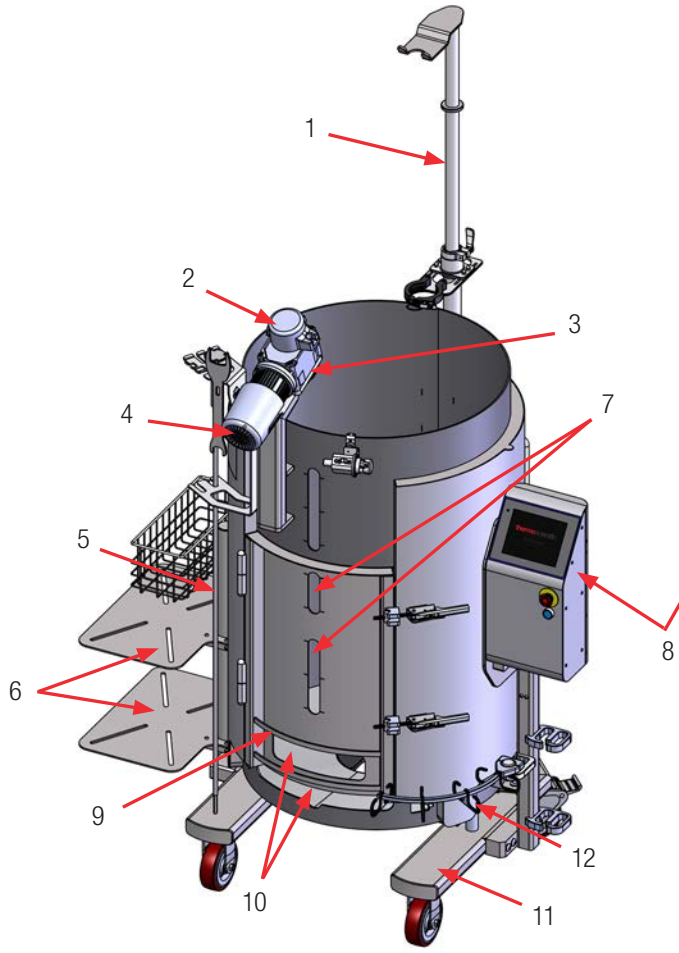


Figure 8.3. 500 L jacketed S.U.M. (front view).

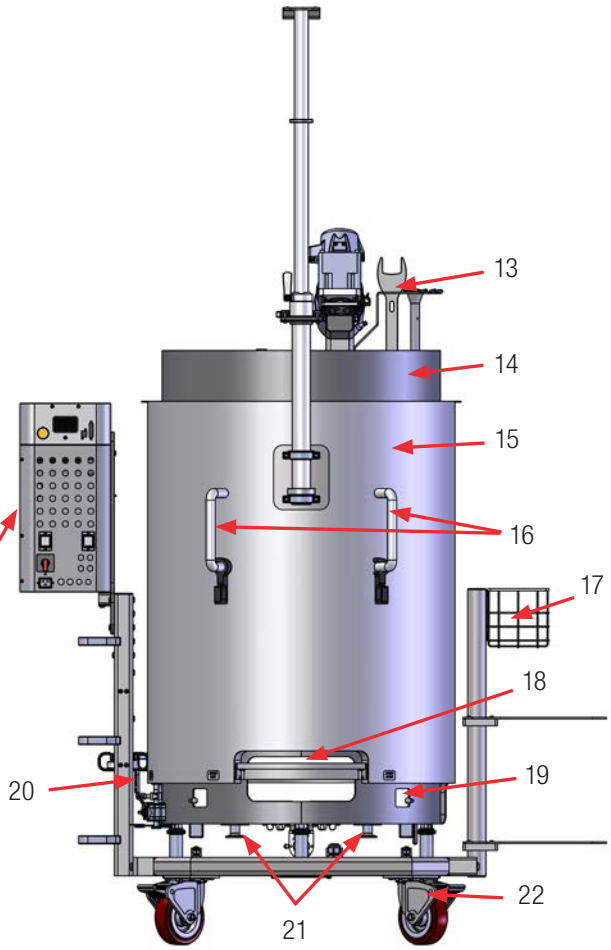


Figure 8.4. 500 L jacketed S.U.M. (back view).

1. Powdertainer arm (optional)
2. Mixing assembly with safety cap
3. Bearing port receiver with clamp
4. Mixer motor
5. Drive shaft, stored
6. Shelves (optional)
7. Door for BPC loading with liquid sight windows
8. Touchscreen Console
9. Probe clip hanger
10. Probe access windows
11. Cart assembly
12. Cable management hooks
13. 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
14. 0.95 cm (3/8 in.) Dimpled jacket
15. Stainless steel outer support container
16. Handles with cable management clips
17. Basket (optional)
18. Cutout with removable brace for BPC loading
19. Bottom cutouts/pins for BPC attachment and alignment
20. Bleed valve (jacketed models only)
21. 3.81 cm (1.5 in.) Tri-clamp connection ports for water inlet/outlet (jacketed models only)
22. Casters (2 swiveling, 2 fixed)

8.1.3 Design features of 2,000 L S.U.M.s

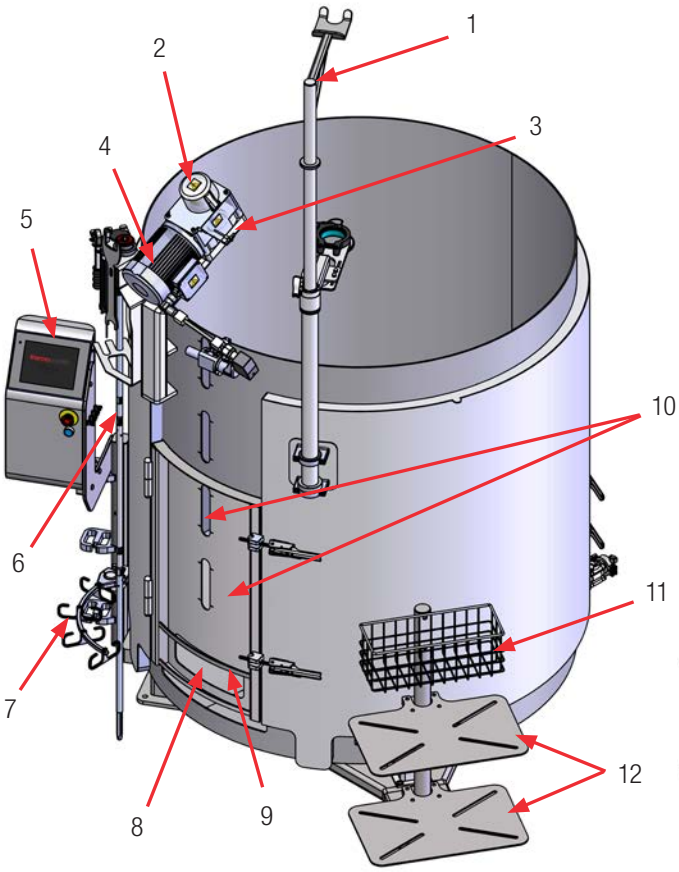


Figure 8.5. 2,000 L jacketed S.U.M. (front view).

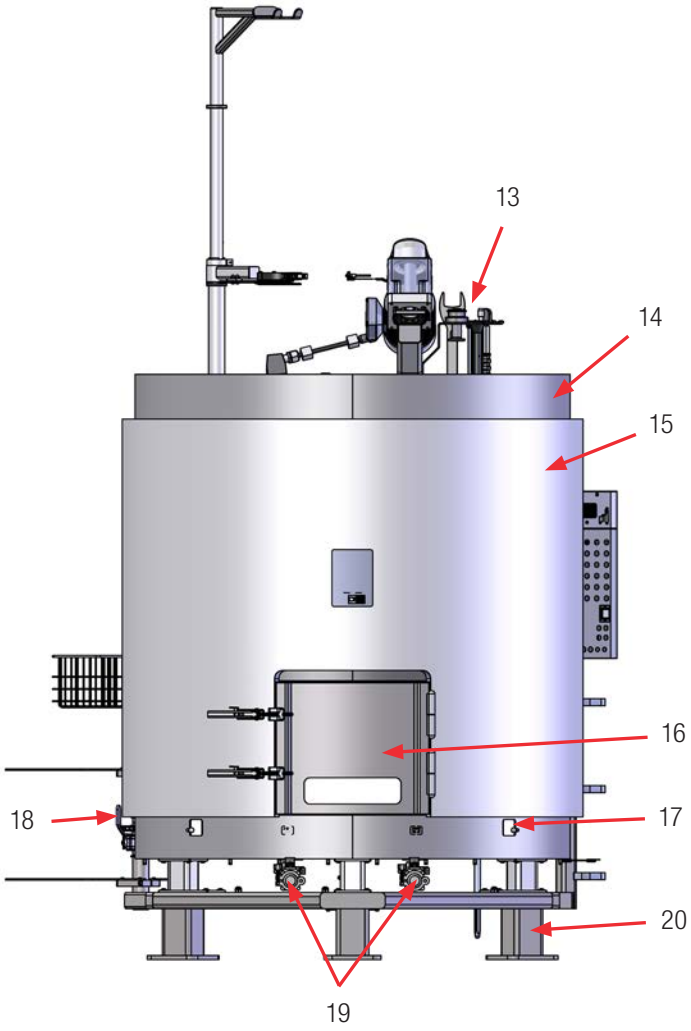


Figure 8.6. 2,000 L jacketed S.U.M. (back view).

1. Powdertainer arm (optional)
2. Mixing assembly with safety cap
3. Bearing port receiver with clamp
4. Mixer motor
5. Touchscreen Console
6. Drive shaft, stored
7. Cable management hooks
8. Probe access window
9. Probe clip hanger
10. BPC loading door and liquid sight windows
11. Basket (optional)
12. Shelves (optional)
13. 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
14. 0.95 (3/8 in.) Dimpled jacket
15. Stainless steel outer support container
16. Rear door (for BPC loading), with sight window
17. Bottom cutouts/pins for BPC attachment and alignment
18. Bleed valve (jacketed models only)
19. 3.81 cm (1.5 in.) Tri-clamp connection ports for water inlet/outlets (jacketed models only)
20. Leveling feet (3)

8.2 Hardware specifications

The following tables and figures provide specification information for 50, 100, 200, 500, 1,000, and 2,000 L S.U.M. systems.

Note: Figures 8.7 through 8.18 show mixers with water jackets. Models without water jackets may have slightly different dimensions. See the drawings provided with your unit for exact measurements.

Table 8.1. 50 L S.U.M. specifications.

		DC motors only	
		Jacketed	Non-jacketed
Mixer geometry	Rated liquid working volume	50 L	
	Minimum liquid working volume	10 L	
	Total chamber volume (liquid & gas)	80 L	
	BPC chamber diameter	34.9 cm (13.75 in.)	
	BPC chamber shoulder height	84.8 cm (33.4 in.)	
	Liquid height at rated working volume	52.1 cm (20.5 in.)	
	Fluid geometry at working volume (height/diameter) ratio	1.5:1	
	Hold-up volume	< 50 mL	
	Overall mixer geometry (height/diameter ratio)	1.9:1	
	Tank baffles	None	
Impeller	Impeller (quantity x blade count)	1 x 3	
	Impeller scaling (impeller diameter/tank diameter)	2/5	
	Impeller blade pitch (angle)	45°	
	Impeller diameter	14.6 cm (5.75 in.)	
Agitation	Mixing rate range	30–356 rpm	
	Tip speed	15 cm/s (28.5 ft/min)–272 cm/s (535.4 ft/min)	
	Counterclockwise mixing flow direction	Down-pumping	
	Agitation shaft resolved angle	12.5°	
	Agitation shaft centerline offset	1.9 cm (0.75 in.)	
	Overall drive shaft length	91.7 cm (36.1 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	11.75 cm (4.63 in.)	

Table 8.2. 50 L S.U.M. specifications (continued).

		DC motors only	
		Jacketed	Non-jacketed
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 Nm (76 in-lb.)	
	Gear reduction	7.5:1	
	Motor communication methods	Via Touchscreen Console through communication ports	
Fluid jacket	Jacket area: full/half volume	0.38 m^2 (4.1 ft^2) / 0.32 m^2 (3.4 ft^2)	N/A
	Jacket volume	2 L (0.53 gal.)	N/A
	Jacket flow rate at 3.4 bar (50 psi)	99 L/min (26.4 gal/min)	N/A
	Process connection	1 in. Sanitary tri-clamp	N/A
Temperature control	TCU model: maximum heating/cooling	TF2500: 2800/2500 W	N/A
	Approximate liquid heat-up time (5°C to 37°C)	1.2 hr	N/A
	Approximate liquid cool-down time (37°C to 5°C)	2.7 hr	N/A
	RTD or thermocouple, 3.18 mm (1/8 in.) OD	Pt-100 (standard)	
Support container (without shelves/basket)	Overall width	138.4 cm (54.5 in.)	
	Overall length	89.56 cm (35.26 in.)	
	Overall height (without Powdertainer arm)	153.4 cm (60.4 in.)	
	Dry skid weight (mass)	217.0 kg (478.3 lb.)	198.4 kg (437.3 lb.)
	Wet skid weight—rated working volume (mass)	266.8 kg (588.3 lb.)	248.3 kg (547.3 lb.)
General	Ceiling height required for drive shaft loading	228.6 cm (90 in.)	
	Electrical power rating	100–120 VAC, 50/60 Hz, single, 15 A 220–240 VAC, 50/60 Hz, single, 10.4 A	
	pH & 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 to 65°C	
	Relative humidity	20–80% non-condensing	
Recommended operating parameters	Operating temperature range	S.U.M.: 2 to 40°C ± 0.1°C (36 to 104°F ± 0.2°F) DC motor: 0 to 40°C	
	Motor speed	30–356 rpm	
	Volume range	10–50 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	

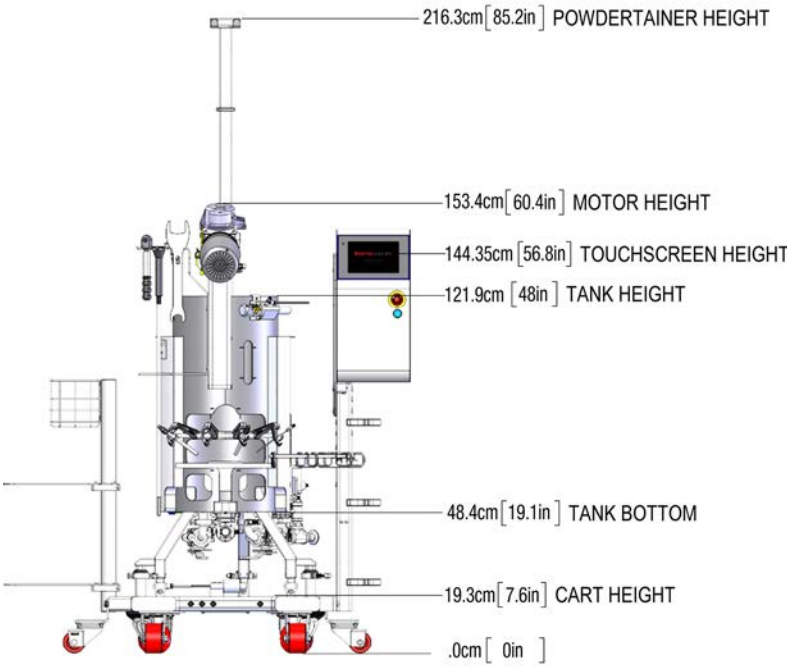


Figure 8.7. 50 L S.U.M. dimensions (front view).

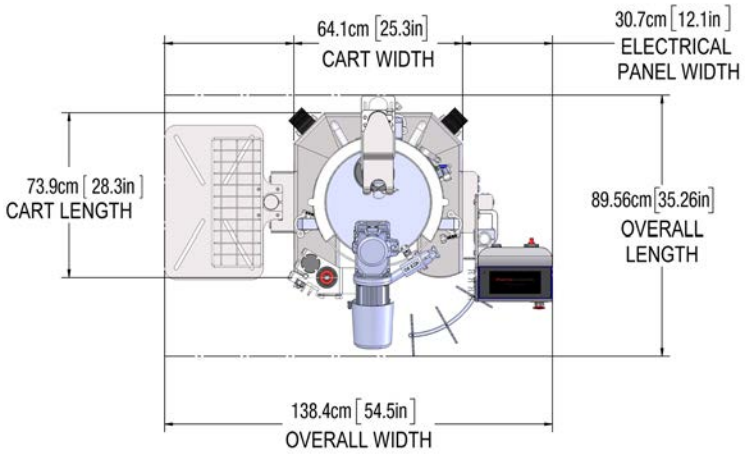


Figure 8.8. 50 L S.U.M. dimensions (top view).

Table 8.3. 50 L S.U.M. ordering information.

Description	Cat. no.
50 L Non-jacketed, DC motor, Touchscreen Console, with load cells	SUM0050.9001
50 L Jacketed, DC motor, Touchscreen Console, with load cells	SUM0050.9002

Table 8.4. 100 L S.U.M. specifications.

		DC motors only	
		Jacketed	Non-jacketed
Mixer geometry	Rated liquid working volume	100 L	
	Minimum liquid working volume	20 L (complete impeller coverage)	
	Total chamber volume (liquid & gas)	150 L	
	BPC chamber diameter	43.8 cm (17.25 in.)	
	BPC chamber shoulder height	100.8 cm (39.7 in.)	
	Liquid height at rated working volume	66 cm (26 in.)	
	Fluid geometry at working volume (height/diameter) ratio	1.5:1	
	Hold-up volume	< 50 mL	
	Overall mixer geometry (height/diameter ratio)	1.9:1	
	Tank baffles	None	
Impeller	Impeller (quantity x blade count)	1 x 3	
	Impeller scaling (impeller diameter/tank diameter)	1/3	
	Impeller blade pitch (angle)	45°	
	Impeller diameter	14.6 cm (5.75 in.)	
Agitation	Mixing rate range	30–356 rpm	
	Tip speed	22.9 cm/s (45.2 ft/min)–267.7 cm/s (526.9 ft/min)	
	Counterclockwise mixing flow direction	Down-pumping	
	Agitation shaft resolved angle	15°	
	Agitation shaft centerline offset	5.08 cm (2 in.)	
	Overall drive shaft length	104.4 cm (41.1 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	4.9 cm (1.93 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 Nm (76 in-lb.)	
	Gear reduction	7.5:1	
	Motor communication methods	Via Touchscreen Console through communication ports	

Table 8.5. 100 L S.U.M. specifications (continued).

		DC motors only	
		Jacketed	Non-jacketed
Fluid jacket	Jacket area: full/half volume	0.69 m^2 (7.4 ft^2) / 0.41 m^2 (4.4 ft^2)	N/A
	Jacket volume	4 L (1.1 gal.)	N/A
	Jacket flow rate at 3.4 bar (50 psi)	100 L/min (26.4 gal/min)	N/A
	Process connection	1 in. Sanitary tri-clamp	N/A
Temperature control	TCU model: maximum heating/cooling	TF2500: 2800/2500 W	N/A
	Approximate liquid heat-up time (5°C to 37°C)	2 hr	N/A
	Approximate liquid cool-down time (37°C to 5°C)	5.1 hr	N/A
	RTD or thermocouple, 3.18 mm (1/8 in.) OD	Pt-100 (standard)	
Support container (without shelves/basket)	Overall width	141.9 cm (55.9 in.)	
	Overall length	92.5 cm (36.4 in.)	
	Overall height (without Powdertainer arm)	155.29 cm (61.14 in.)	
	Dry skid weight (mass)	232.8 kg (513.3 lb.)	211.5 kg (466.3 lb.)
	Wet skid weight—rated working volume (mass)	333.1 kg (734.3 lb.)	311.8 kg (687.3 lb.)
General	Ceiling height required for drive shaft loading	236.2 cm (93 in.)	
	Electrical power rating	100–120 VAC, 50/60 Hz, single, 15 A 220–240 VAC, 50/60 Hz, single, 10.4 A	
	pH & 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 to 65°C	
	Relative humidity	20–80% non-condensing	
Recommended operating parameters	Operating temperature range	S.U.M.: 2 to 40°C ± 0.1°C (36 to 104°F ± 0.2°F) DC motor: 0 to 40°C	
	Motor speed	30–356 rpm	
	Volume range	20–100 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	

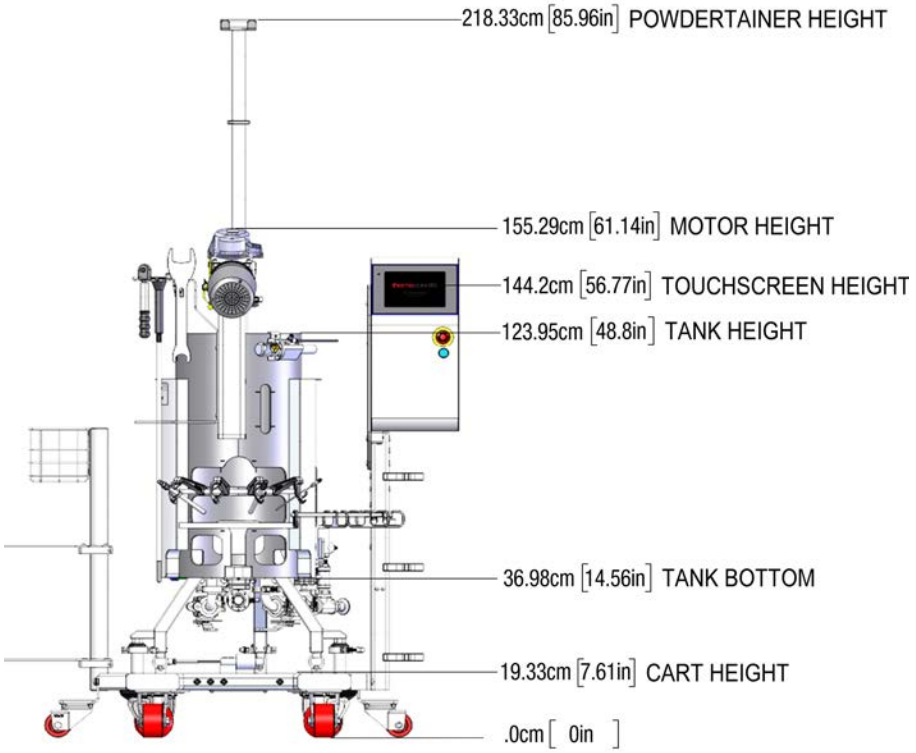


Figure 8.9. 100 L S.U.M. dimensions (front view).

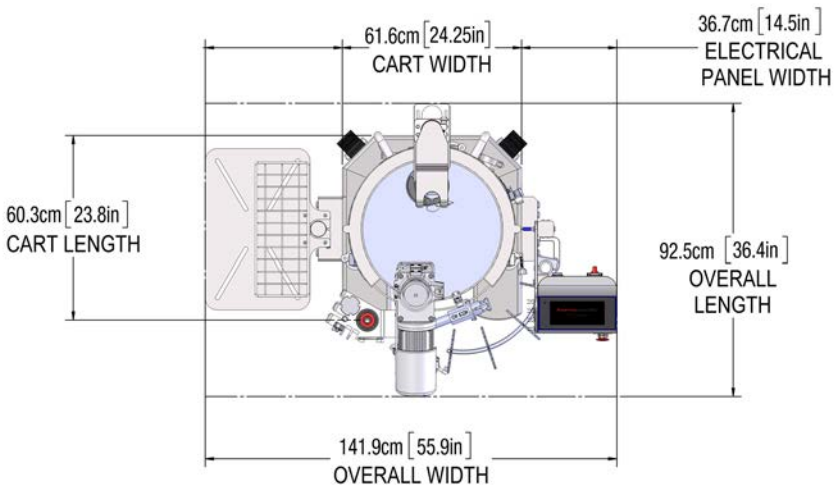


Figure 8.10. 100 L S.U.M. dimensions (top view).

Table 8.6. 100 L S.U.M. ordering information.

Description	Cat. no.
100 L Non-jacketed, DC motor, Touchscreen Console, with load cells	SUM0100.9001
100 L Jacketed, DC motor, Touchscreen Console, with load cells	SUM0100.9002

Table 8.7. 200 L S.U.M. specifications.

		DC motors only	
		Jacketed	Non-jacketed
Mixer geometry	Rated liquid working volume	200 L	
	Minimum liquid working volume	40 L (complete impeller coverage)	
	Total chamber volume (liquid & gas)	250 L	
	BPC chamber diameter	59.7 cm (20 in.)	
	BPC chamber shoulder height	123.4 cm (48.6 in.)	
	Liquid height at rated working volume	99 cm (39 in.)	
	Fluid geometry at working volume (height/diameter) ratio	1.5:1	
	Hold-up volume	< 50 mL	
	Overall mixer geometry (height/diameter ratio)	1.95:1	
	Tank baffles	None	
Impeller	Impeller (quantity x blade count)	1 x 3	
	Impeller scaling (impeller diameter/tank diameter)	2/5	
	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/s (61.9–721.6 ft/min)	
	Counterclockwise mixing flow direction	Down-pumping	
	Agitation shaft resolved angle	12.5°	
	Agitation shaft centerline offset	6.4 cm (2.5 in.)	
	Overall drive shaft length	129.5 cm (51 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	7.9 cm (3.1 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 Nm (76 in-lb.)	
	Gear reduction	7.5:1	
	Motor communication methods	Via Touchscreen Console through communication ports	

Table 8.8. 200 L S.U.M. specifications (continued).

		DC motors only	
		Jacketed	Non-jacketed
Fluid jacket	Jacket area: full/half volume	1.2 m^2 (13 ft^2) / 0.69 m^2 (7.4 ft^2)	N/A
	Jacket volume	6.5 L (1.7 gal.)	N/A
	Jacket flow rate at 3.4 bar (50 psi)	99.4 L/min (26.3 gal/min)	N/A
	Process connection	1 in. Sanitary tri-clamp	N/A
Temperature control	TCU model: maximum heating/cooling	TF2500: 2800/ 2500 W	N/A
	Approximate liquid heat-up time (5°C to 37°C)	3.4 hr	N/A
	Approximate liquid cool-down time (37°C to 5°C)	6.8 hr	N/A
	RTD or thermocouple, 3.18 mm (1/8 in.) OD	Pt-100 (standard)	
Support container (without shelves/basket)	Overall width	133 cm (52.4 in.)	
	Overall length	107 cm (42 in.)	
	Overall height (without Powdertainer arm)	174 cm (68.5 in.)	
	Dry skid weight (mass)	259.1 kg (570.8 lb.)	230.1 kg (507.8 lb.)
	Wet skid weight—rated working volume (mass)	459.1 kg (1011.8 lb.)	430.1 kg (948.8 lb.)
General	Ceiling height required for standard drive shaft loading	281.9 cm (111 in.)	
	Ceiling height required for optional 2-piece drive shaft loading	242.3 cm (95.4 in.)	
	Electrical power rating	100–120 VAC, 50/60 Hz, single, 15 A 220–240 VAC, 50/60 Hz, single, 10.4 A	
	Storage temperature	–25 to 65°C	
	Relative humidity	20–80% non-condensing	
	pH & 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	
Recommended operating parameters	Operating temperature range	S.U.M.: 2 to 40°C ± 0.1°C (36 to 104°F ± 0.2°F) DC motor: 0 to 40°C	
	Motor speed	30–356 rpm	
	Volume range	40–200 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	

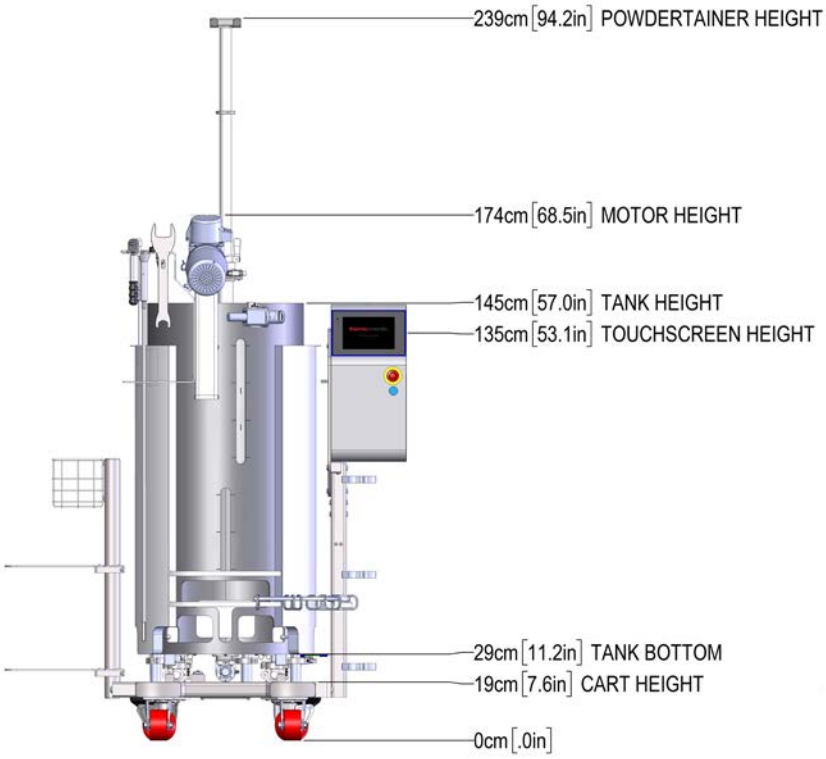


Figure 8.11. 200 L S.U.M. dimensions (front view).

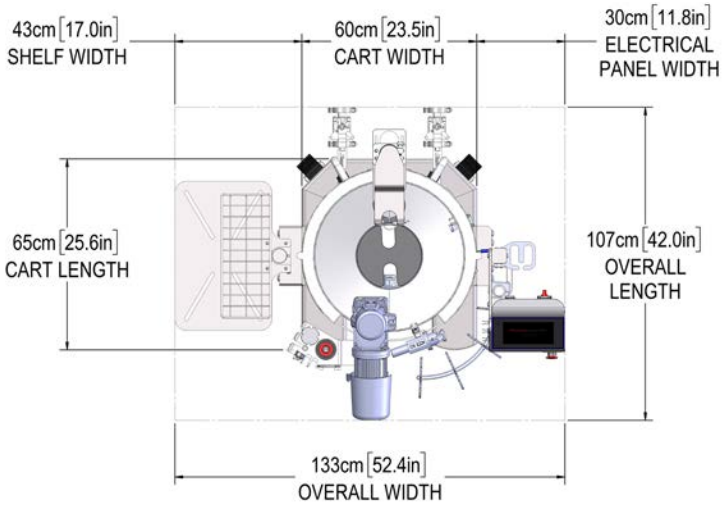


Figure 8.12. 200 L S.U.M. dimensions (top view).

Table 8.9. 200 L S.U.M. ordering information.

Description	Cat. no.
200 L Non-jacketed, DC motor, Touchscreen Console, with load cells	SUM0200.9001
200 L Jacketed, DC motor, Touchscreen Console, with load cells	SUM0200.9002

Table 8.10. 500 L S.U.M. specifications.

		DC motors only	
		Jacketed	Non-jacketed
Mixer geometry	Rated liquid working volume	500 L	
	Minimum liquid working volume	100 L (complete impeller coverage)	
	Total chamber volume (liquid & 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/s (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	N/A	
	Gear reduction	7.5:1	
	Motor communication methods	Via Touchscreen Console through communication ports	

Table 8.11. 500 L S.U.M. specifications (continued).

		DC motors only	
		Jacketed	Non-jacketed
Fluid jacket	Jacket area: full/half volume	2.2 m^2 (23.9 ft^2) / 1.4 m^2 (14.8 ft^2)	N/A
	Jacket volume	11 L (2.9 gal.)	N/A
	Jacket flow rate at 3.4 bar (50 psi)	96.8 L/min (25.5 gal/min)	N/A
	Process connection	1 in. Sanitary tri-clamp	N/A
Temperature control	TCU model: maximum heating/cooling	TF10000: 6100/10000 W	N/A
	Approximate liquid heat-up time (5°C to 37°C)	2.6 hr	N/A
	Approximate liquid cool-down time (37°C to 5°C)	3.7 hr	N/A
	RTD or thermocouple, 3.18 mm (1/8 in.) OD	Pt-100 (standard)	
Support container (without shelves/basket)	Overall width	161 cm (63.2 in.)	
	Overall length	132 cm (51.8 in.)	
	Overall height (without Powdertainer arm)	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 (2037.8 lb.)	826.1 kg (1820.8 lb.)
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 supply rating	100–120 VAC, 50/60 Hz, single, 15 A 220–240 VAC, 50/60 Hz, single, 10.4 A	
	pH & 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 to 65°C	
	Relative humidity	20–80% non-condensing	
Recommended operating parameters	Operating temperature range	S.U.M.: 2 to 40°C ± 0.1°C (36 to 104°F ± 0.2°F) DC motor: 0 to 40°C	
	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	

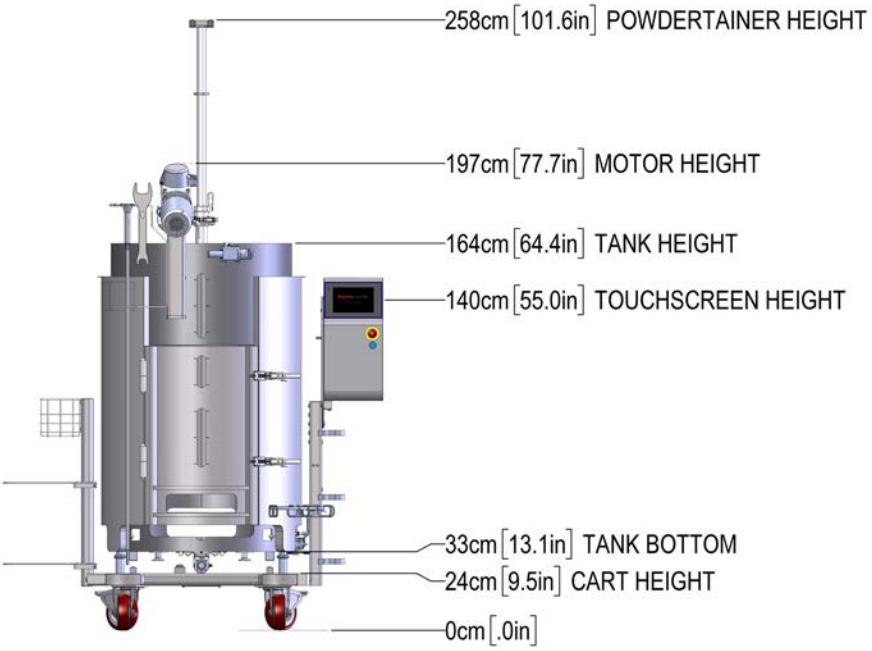


Figure 8.13. 500 L S.U.M. dimensions (front view).

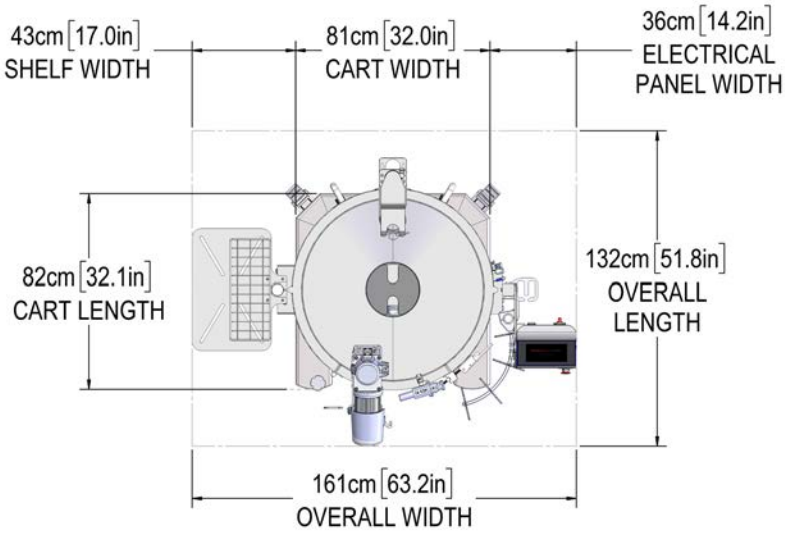


Figure 8.14. 500 L S.U.M. dimensions (top view).

Table 8.12. 500 L S.U.M. ordering information.

Description	Cat. no.
500 L Non-jacketed, DC motor, Touchscreen Console, with load cells	SUM0500.9001
500 L Jacketed, DC motor, Touchscreen Console, with load cells	SUM0500.9002

Table 8.13. 1,000 L S.U.M. specifications.

		DC motors only	
		Jacketed	Non-jacketed
Mixer geometry	Rated liquid working volume	1,000 L	
	Minimum liquid working volume	200 L (complete impeller coverage)	
	Total chamber volume (liquid & gas)	1,380 L	
	BPC chamber diameter	105.4 cm (41.52 in.)	
	BPC chamber shoulder height	157.2 cm (61.9 in.)	
	Liquid height at rated working volume	115.6 cm (45.5 in.)	
	Fluid geometry at working volume (height/diameter) ratio	1.1:1	
	Hold-up volume	< 300 mL	
	Overall mixer geometry (height/diameter ratio)	1.2:1	
	Tank baffles	None	
Impeller	Impeller (quantity x blade count)	1 x 3	
	Impeller scaling (impeller diameter/tank diameter)	8/25	
	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/s (61.9–721.6 ft/min)	
	Counterclockwise mixing flow direction	Down-pumping	
	Agitation shaft resolved angle	22°	
	Agitation shaft centerline offset	12.7 cm (5 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	11.81 cm (4.65 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 Nm (76 in-lb.)	
	Gear reduction	7.5:1	
	Motor communication methods	Via Touchscreen Console through communication ports	

Table 8.14. 1,000 L S.U.M. specifications (continued).

		DC motors only	
		Jacketed	Non-jacketed
Fluid jacket	Jacket area: full/half volume	3.5 m^2 (37.6 ft^2) / 2.1 m^2 (22.7 ft^2)	N/A
	Jacket volume	17.5 L (4.6 gal.)	N/A
	Jacket flow rate at 3.4 bar (50 psi)	102 L/min (27 gal/min)	N/A
	Process connection	1 in. Sanitary tri-clamp	N/A
Temperature control	TCU model: maximum heating/cooling	TF24000: 22500/24000 W	N/A
	Approximate liquid heat-up time (5°C to 37°C)	1.6 hr	N/A
	Approximate liquid cool-down time (37°C to 5°C)	2.3 hr	N/A
	RTD or thermocouple, 3.18 mm (1/8 in.) OD	Pt-100 (standard)	
Support container (without shelves/basket)	Overall width	187 cm (73.4 in.)	
	Overall length	158 cm (62.3 in.)	
	Overall height (without Powdertainer arm)	200 cm (78.7 in.)	
	Dry skid weight (mass)	559.1 kg (1232.8 lb.)	439 kg (967.8 lb.)
	Wet skid weight—rated working volume (mass)	1559.1 kg (3437.8 lb.)	1439.1 kg (3172.8 lb.)
General	Ceiling height required for standard drive shaft loading	320 cm (126 in.)	
	Ceiling height required for optional 2-piece drive shaft loading	277.6 cm (109.3 in.)	
	Electrical power rating	100–120 VAC, 50/60 Hz, single, 15 A 200–240 VAC, 50/60 Hz, single, 10.4 A	
	Noise level	< 70 dB at 1.5 m	
	pH & DO probe—autoclavable type (Applisens, Broadley James, Mettler-Toledo)	12 mm diameter x 215–235 mm insertion length x 13.5 PG (pipe) thread	
	Storage temperature	–25 to 65°C	
	Relative humidity	20–80% non-condensing	
Recommended operating parameters	Operating temperature range	S.U.M.: 2 to 40°C ± 0.1°C (36 to 104°F ± 0.2°F) DC motor: 0 to 40°C	
	Motor speed	30–356 rpm	
	Volume range	200–1,000 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	

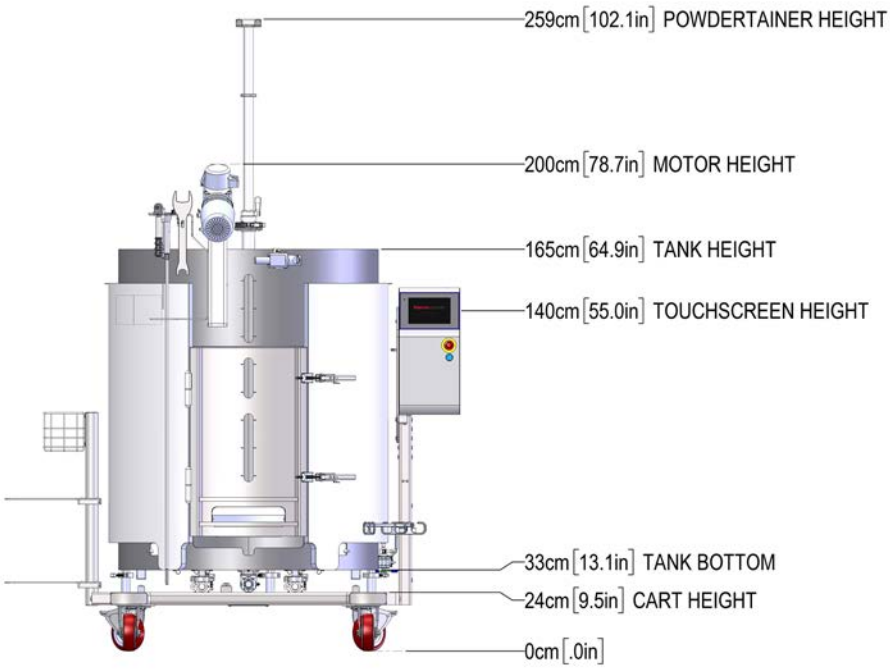


Figure 8.15. 1,000 L S.U.M. dimensions (front view).

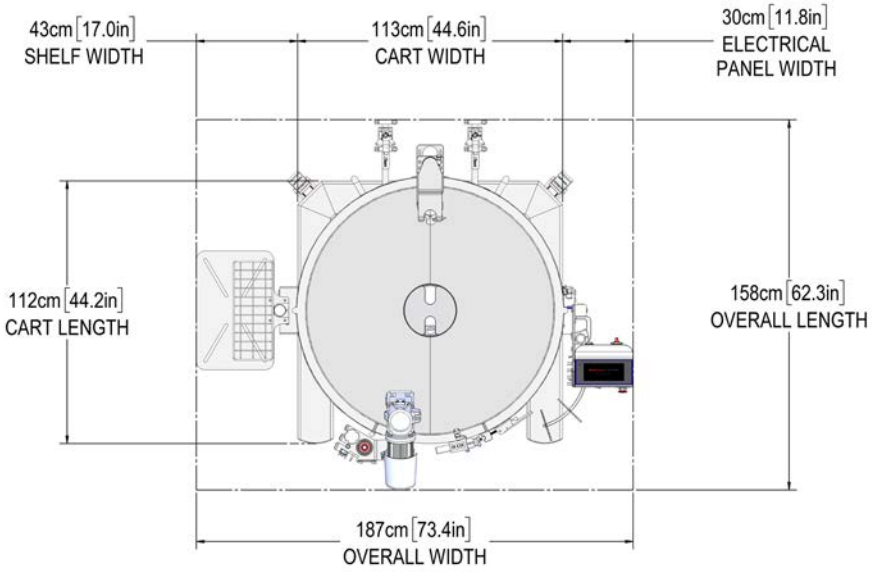


Figure 8.16. 1,000 L S.U.M. dimensions (top view).

Table 8.15. 1,000 L S.U.M. ordering information.

Description	Cat. no.
1,000 L Non-jacketed, DC motor, Touchscreen Console, with load cells	SUM1000.9001
1,000 L Jacketed, DC motor, Touchscreen Console, with load cells	SUM1000.9002

Table 8.16. 2,000 L S.U.M. specifications.

		AC motors only	
		Jacketed	Non-jacketed
Mixer geometry	Rated liquid working volume	2,000 L	
	Minimum liquid working volume	400 L (complete impeller coverage)	
	Total chamber volume (liquid & gas)	2,700 L	
	BPC chamber diameter	135 cm (53 in.)	
	BPC chamber shoulder height	185 cm (73 in.)	
	Liquid height at rated working volume	140 cm (55 in.)	
	Fluid geometry at working volume (height/diameter) ratio	1:1	
	Hold-up volume	< 1 L	
	Overall mixer geometry (height/diameter ratio)	1.2:1	
	Tank baffles	None	
Impeller	Impeller (quantity x blade count)	1 x 3	
	Impeller scaling (impeller diameter/tank diameter)	1/5	
	Impeller blade pitch (angle)	45°	
	Impeller diameter	25.02 cm (9.85 in.)	
Agitation	Mixing rate range	30–350 rpm	
	Tip speed	39.4–459.7 cm/s (77.6–904.8 ft/min)	
	Counterclockwise mixing flow direction	Down-pumping	
	Agitation shaft resolved angle	27°	
	Agitation shaft centerline offset	17.8 cm (7 in.)	
	Overall drive shaft length	192.5 cm (75.78 in.)	
	Drive shaft diameter	1.9 cm (0.75 in.)	
	Drive shaft poly-sheath outside diameter	2.54 cm (1 in.)	
	Impeller clearance from tank bottom	5.08 cm (2 in.)	
Motor	Agitation motor drive (type, voltage, phase)	Induction, 208 VAC, 3 phase	
	Motor power rating	745.7 W (1 hp) Motor: 208VAC, 3.2 A	
	Motor torque rating	18 Nm (159 in-lb.)	
	Gear reduction	5:1	
	Motor communication methods	Via Touchscreen Console through communication ports	

Table 8.17. 2,000 L S.U.M. specifications (continued).

		AC motors only	
		Jacketed	Non-jacketed
Fluid jacket	Jacket area: full/half volume	5.3 m^2 (57.3 ft^2) / 3.3 m^2 (35.5 ft^2)	N/A
	Jacket volume	26 L (6.9 gal.)	N/A
	Jacket flow rate at 3.4 bar (50 psi)	93 L/min (24.5 gal/min)	N/A
	Process connection	1 in. Sanitary tri-clamp	N/A
Temperature control	TCU model: maximum heating/cooling	TF24000: 22,500/24,000 W	N/A
	Approximate liquid heat-up time (5°C to 37°C)	2.7 hr	N/A
	Approximate liquid cool-down time (37°C to 5°C)	3.9 hr	N/A
	RTD or thermocouple, 3.18 mm (1/8 in.) OD	Pt-100 (standard)	
Support container (without shelves/basket)	Overall width	190 cm (74.8 in.)	
	Overall length	171 cm (67.4 in.)	
	Overall height (without Powdertainer arm)	225 cm (88.5 in.)	
	Dry skid weight (mass)	755.1 kg (1664.8 lb.)	551.1 kg (1214.8 lb.)
	Wet skid weight—rated working volume (mass)	2755.1 kg (6073.8 lb.)	2551.1 kg (5623.8 lb.)
General	Ceiling height required for standard drive shaft loading	292.1 cm (115 in.)	
	Electrical power rating	100–120 VAC, 50/60 Hz, single, 15 A 220–240 VAC, 50/60 Hz, single, 10.4 A	
	Noise level	< 70 dB at 1.5 m	
	pH & DO probe—autoclavable type (Applisens, Broadley James, Mettler-Toledo)	12 mm diameter x 215–235 mm insertion length x 13.5 PG (pipe) thread	
	Storage temperature	–25 to 65°C	
	Relative humidity	S.U.M.: 20–80% non-condensing AC motor: 100% max. (without any dew condensation)	
Recommended operating parameters	Operating temperature range	2 to 40°C ± 0.1°C (36 to 104°F ± 0.2°F)	
	Motor speed	30–350 rpm	
	Volume range	500–2,000 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	

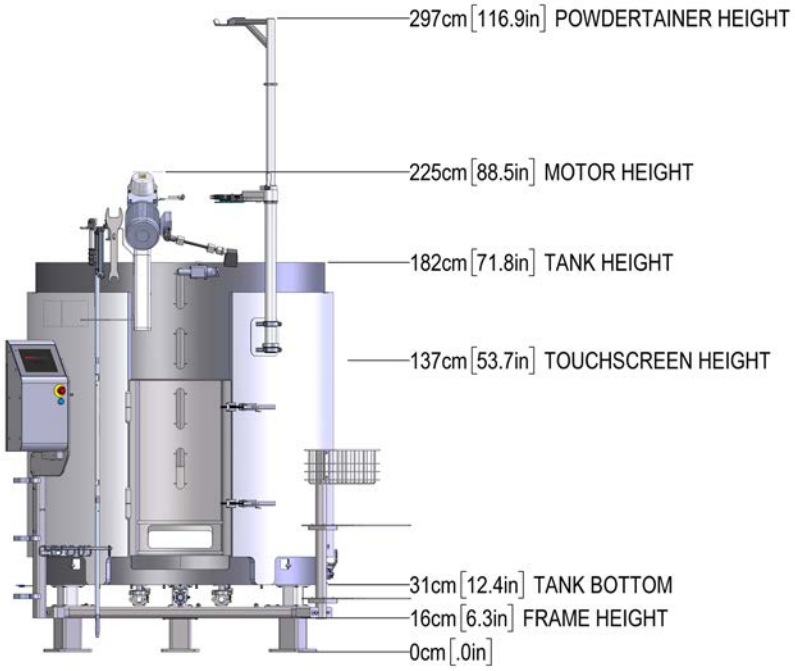


Figure 8.17. 2,000 L S.U.M. dimensions (front view).

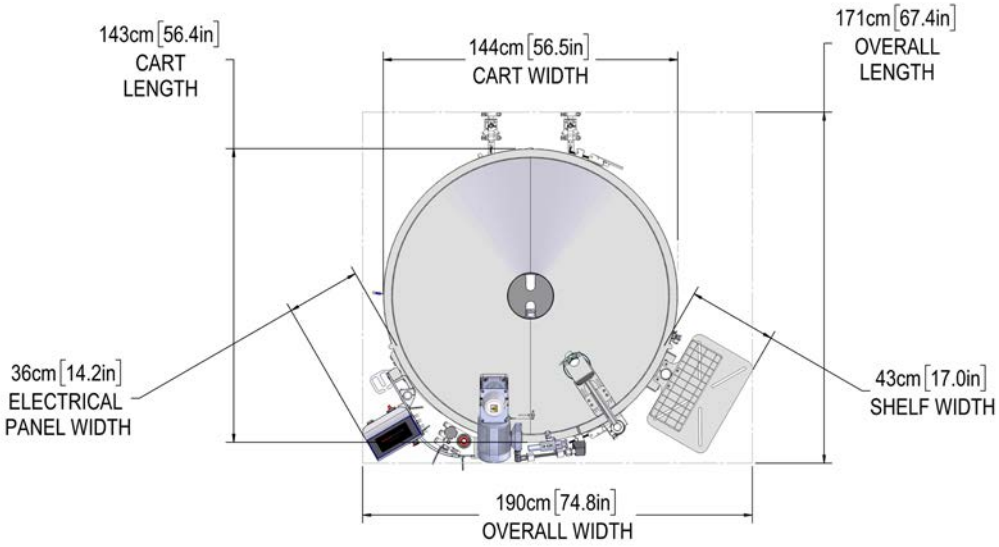


Figure 8.18. 2,000 L S.U.M. dimensions (top view).

Table 8.18. 2,000 L S.U.M. ordering information.

Description	Cat. no.
2,000 L Non-jacketed, AC motor, Touchscreen Console, 240 V, with load cells	SUM2000.9003
2,000 L Jacketed, AC motor, Touchscreen Console, 240 V, with load cells	SUM2000.9004

8.3 Touchscreen Console specifications

See Table 8.19 below for specifications for the Touchscreen Console.

Table 8.19. Touchscreen Console specifications.

		Specification
General	Dimensions (W x H x D)	25 x 52 x 23.4 cm (9.84 x 20.42 x 9.21 in.)
	Total weight	18.5 kg (40.8 lb)
	HMI	21.34 cm (8.4 in.) LCD panel with capacitive touchscreen
	Construction material	AISI 304 stainless steel
	Electrical requirements	120/240 VAC, 50/60 Hz, single, 15/10.4 A
	Air pressure range	4.14–6.55 bar (60–95 psi)
	Operating temperature range	18 to 30°C
	Noise level	< 70 dB at 1.5 m
	Relative humidity	15–80%
	IP rating	IP54
	RoHS 2011/65/EU	CE compliant
External components and data	Pumps	Supports various pumps with 4-20 mA signal control
	Load cells	Mettler Toledo MTB
	Supported pH sensors	Thermo, Mettler Toledo, Broadley James
	Supported conductivity sensors	Jumo, Mettler Toledo
	Pinch valves	Bimba ACRO 935 pinch valve 19 mm (3/4 in.) OD x 3.17 mm (1/8 in.) wall tubing
	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)
	File formats	CSV
	Data recording*	User-defined data record transfer via Ethernet, Profibus, or Modbus RTU; 72 hour data storage exportable via USB
	Data exporting*	Local via USB flash drive; remote via PC/Network with Ethernet, Profibus, or Modbus RTU

*Has not been designed to be compliant with CFR11

Table 8.20. Touchscreen Console measurement options and specifications.

	Load cell	Temperature	pH	Conductivity	BPC and in-line liquid pressure	rpm accuracy
Accuracy after calibration	± 0.5% of full scale	0.2°C	± 0.05 pH	± 5%	± 3.5% of full scale (30 psi)	1 rpm or 1% of set point (whichever is greater)
Calibration	1–3 points and zero/tare function	1–3 points	1–3 points	1–3 points	1 point; zero/tare	1 point offset
Resolution	0.1 kg	0.01°C	0.01 pH	1 µS/cm	0.01 psi	0.1 rpm
Sensor range	50/100 L: 0–300 kg 200 L: 0–600 kg 500 L: 0–900 kg 1000 L: 0–1500 kg 2000 L: 0–3300 kg	0 to 200°C	0–14	20–20,000 µS/cm	0–30 psi	30–350 rpm
Measurement units	kg	Degrees Celsius	pH	µS/cm	psi	rpm
Probe type	3x Mettler Toledo MTB load cells	RTD	Electrochemical with 225 mm S8 connector	Two-pole conductivity sensor	Single use sensor, part of BPC and/or fluid transfer assembly design	N/A

8.4 BPC specifications

8.4.1 Standard 50 L BPCs

See the following sections for various standard 50 L S.U.M. BPC drawings and specifications. Ordering information for all types is provided in Table 8.25.

Standard 50 L powder-to-liquid BPC (without probe ports)

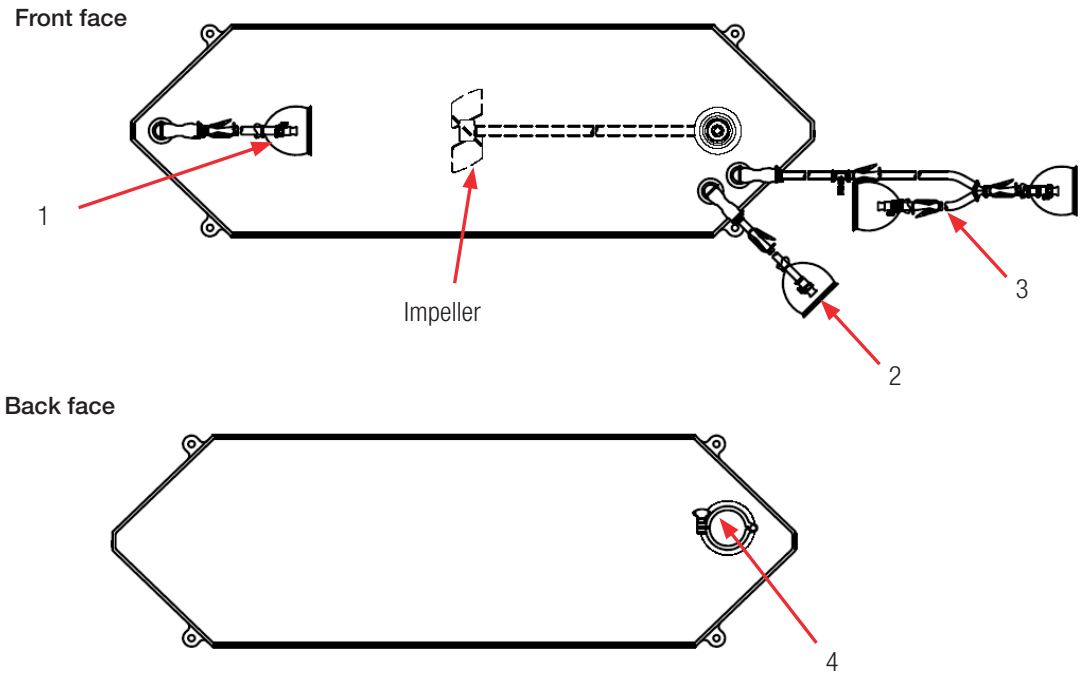


Table 8.21. 50 L BPC without probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
2	Addition line	12.7 mm (1/2 in.) x 19 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX insert
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	76 mm (3 in.) sanitary fitting, tri-clamp	Cap with gasket

Standard 50 L liquid-to-liquid BPC (without probe ports)

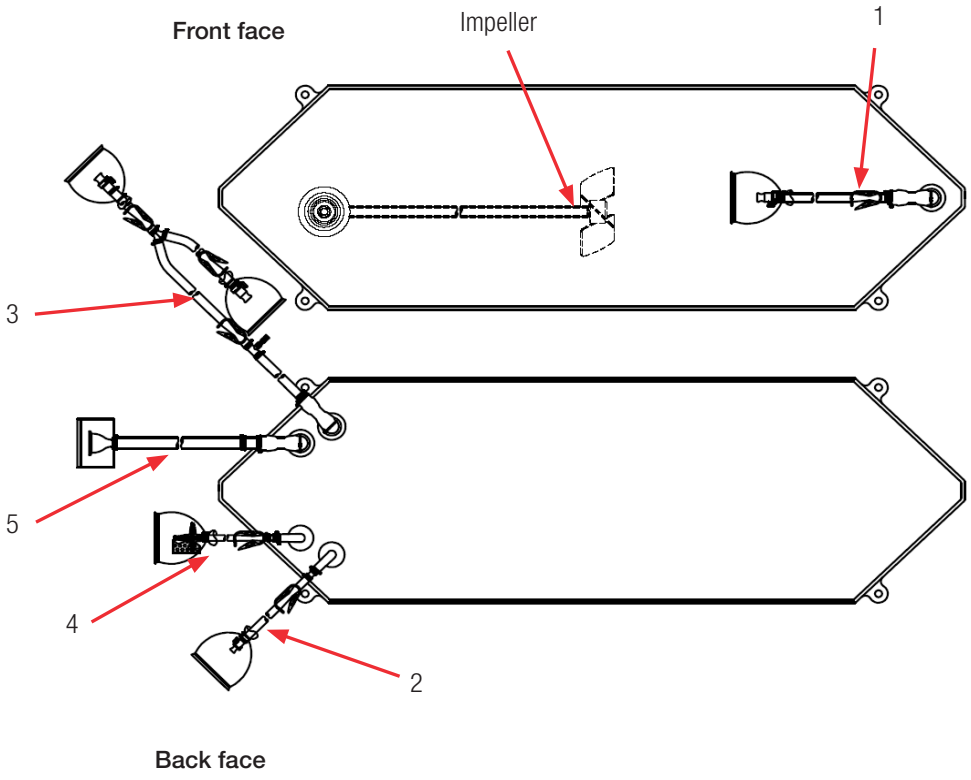


Table 8.22. 50 L BPC without probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX insert
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 61 cm (24 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz

Standard 50 L powder-to-liquid BPC (with probe ports)

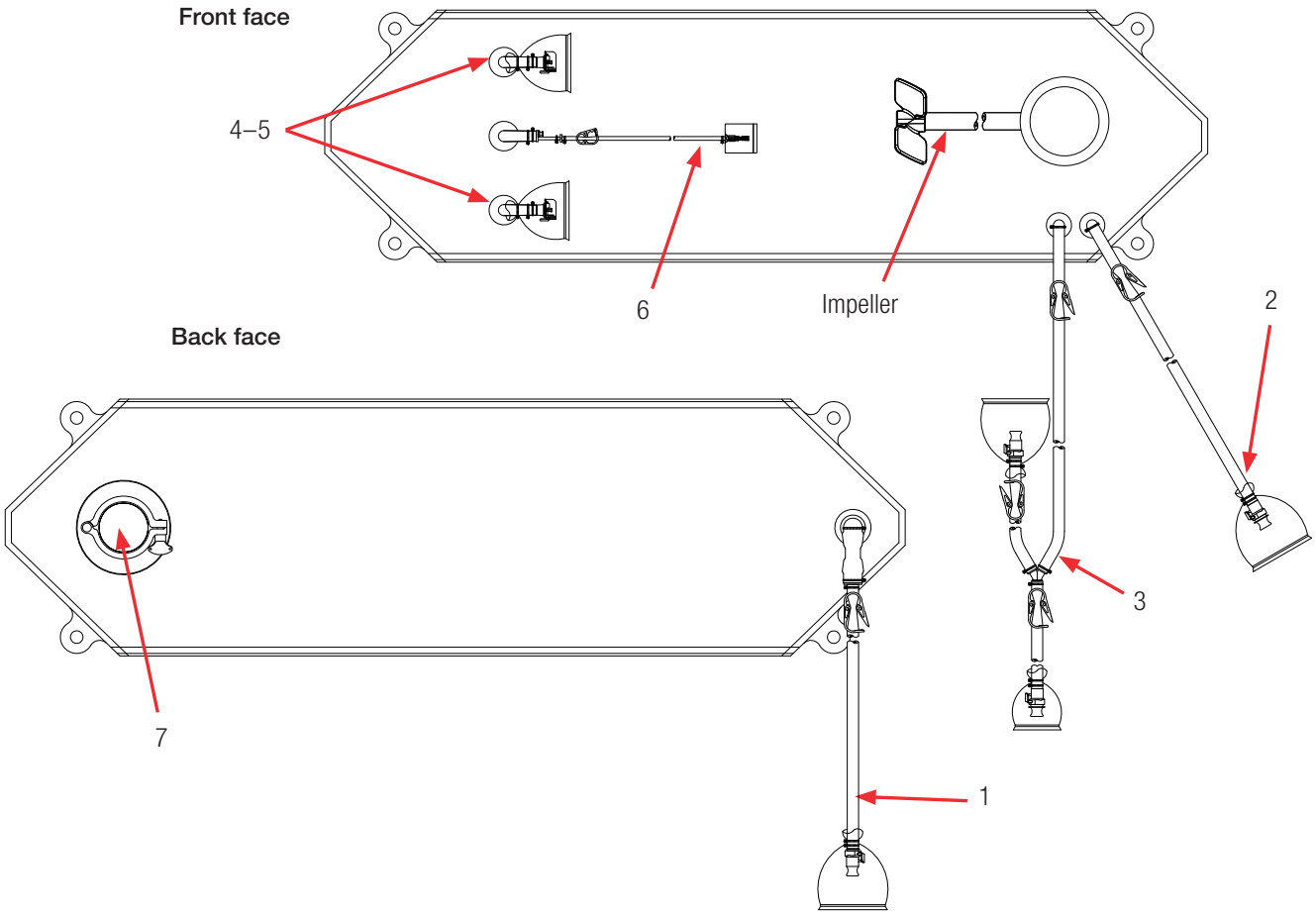


Table 8.23. 50 L BPC with probe ports for powder-to-liquid applications.

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

Standard 50 L liquid-to-liquid BPC (with probe ports)

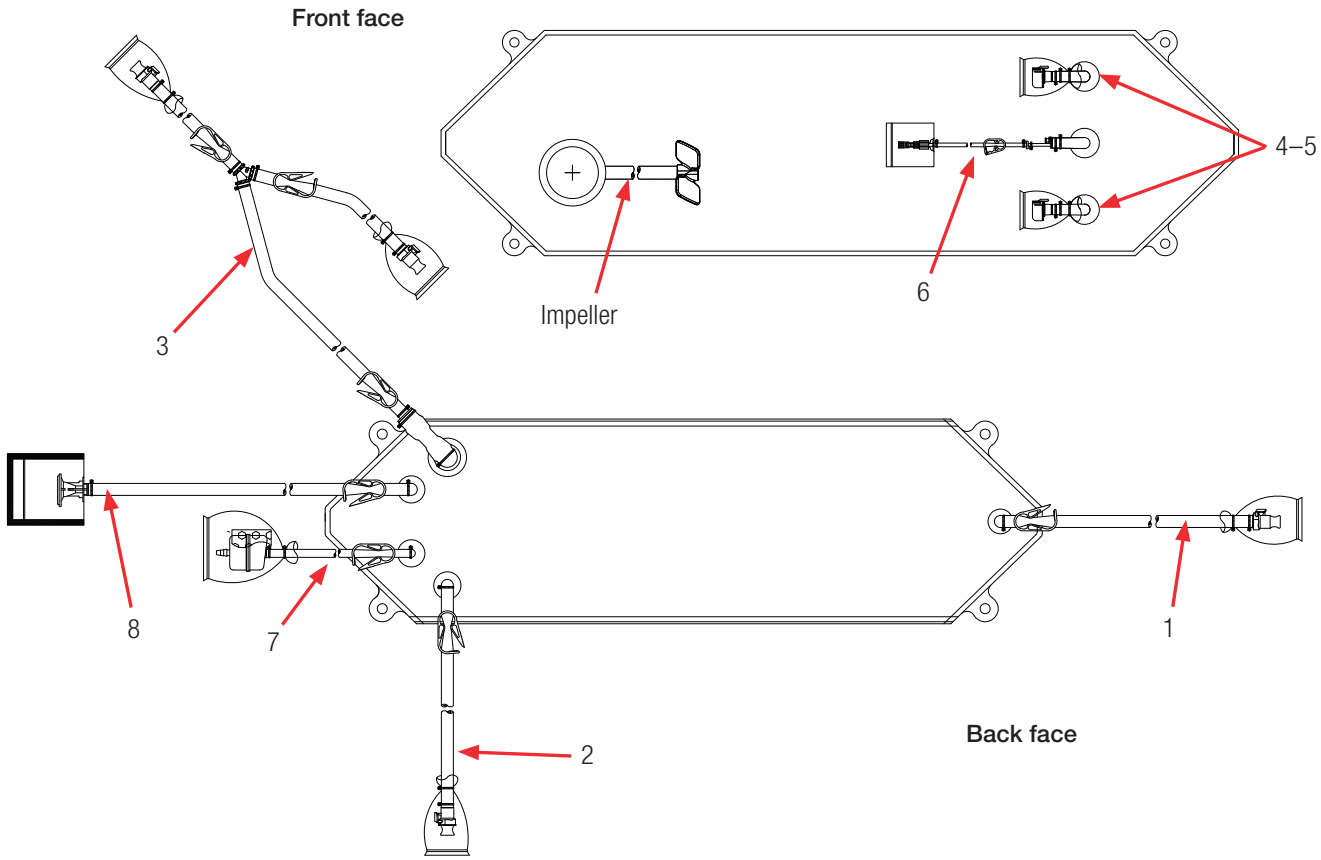


Table 8.24. 50 L BPC with probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX insert
3	Recirculation line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4–5	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
6	Thermowell/ small volume sample line	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port
7	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Cap with gasket
8	Fill line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	1.5 in. Tri-clamp SterilEnz

Ordering information for 50 L BPCs

See Table 8.25 for 50 L BPC ordering information. Contact your sales representative for more information.

Probe port note: All 50 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 publication. 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's guide or data sheets.

Table 8.25. 50 L BPC ordering information.

Size	Description	Film type	Cat. no.
50 L	Standard powder-to-liquid BPC without probe ports	CX5-14	SH30768.01
50 L	Standard powder-to-liquid BPC without probe ports	Aegis5-14	SH30973.01
50 L	Standard liquid-to-liquid BPC without probe ports	CX5-14	SH30767.01
50 L	Standard liquid-to-liquid BPC without probe ports	Aegis5-14	SH30983.01
50 L	Standard powder-to-liquid BPC with probe ports	CX5-14	SH31055.02
50 L	Standard powder-to-liquid BPC with probe ports	Aegis5-14	SH31051.02
50 L	Standard liquid-to-liquid BPC with probe ports	CX5-14	SH31055.04
50 L	Standard liquid-to-liquid BPC with probe ports	Aegis5-14	SH31051.01

8.4.2 Standard 100 L BPCs

See the following sections for various standard 100 L S.U.M. BPC drawings and specifications. Ordering information for all types is provided in Table 8.30.

Standard 100 L powder-to-liquid BPC (without probe ports)

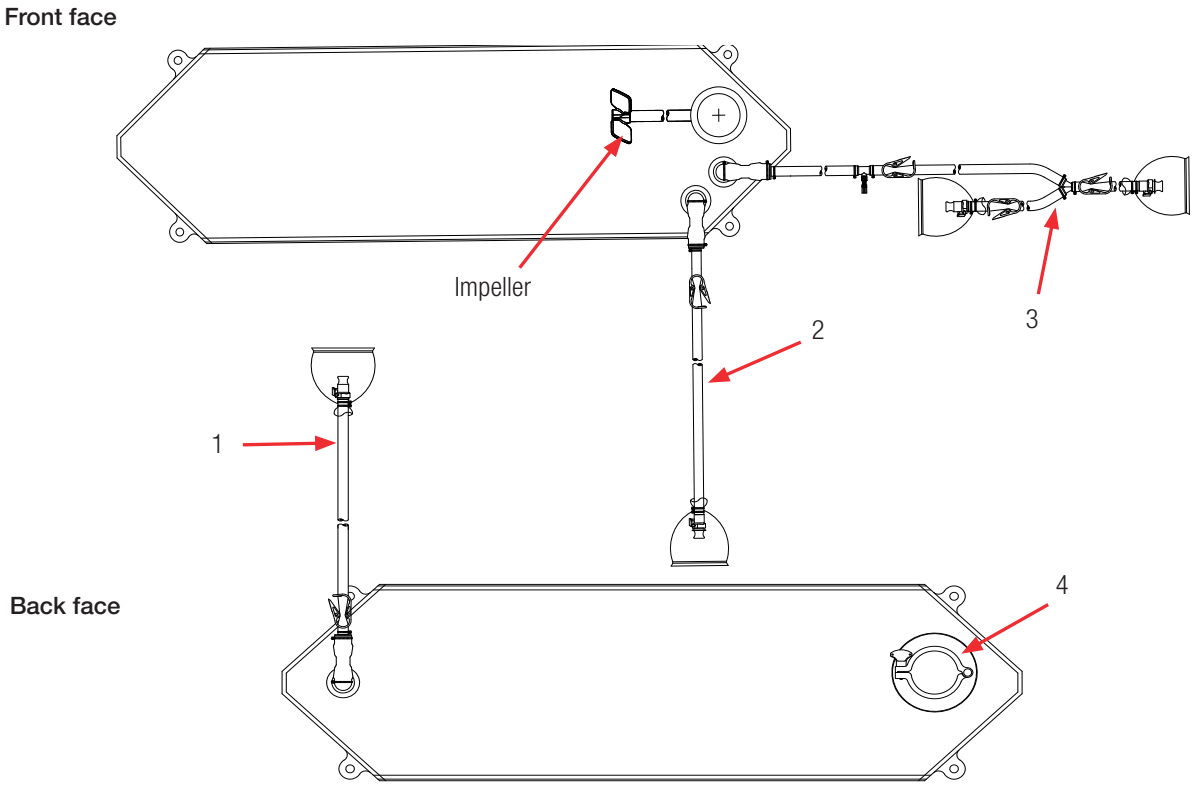


Table 8.26. 100 L BPC without probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX insert
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	76 mm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket

Standard 100 L liquid-to-liquid BPC (without probe ports)

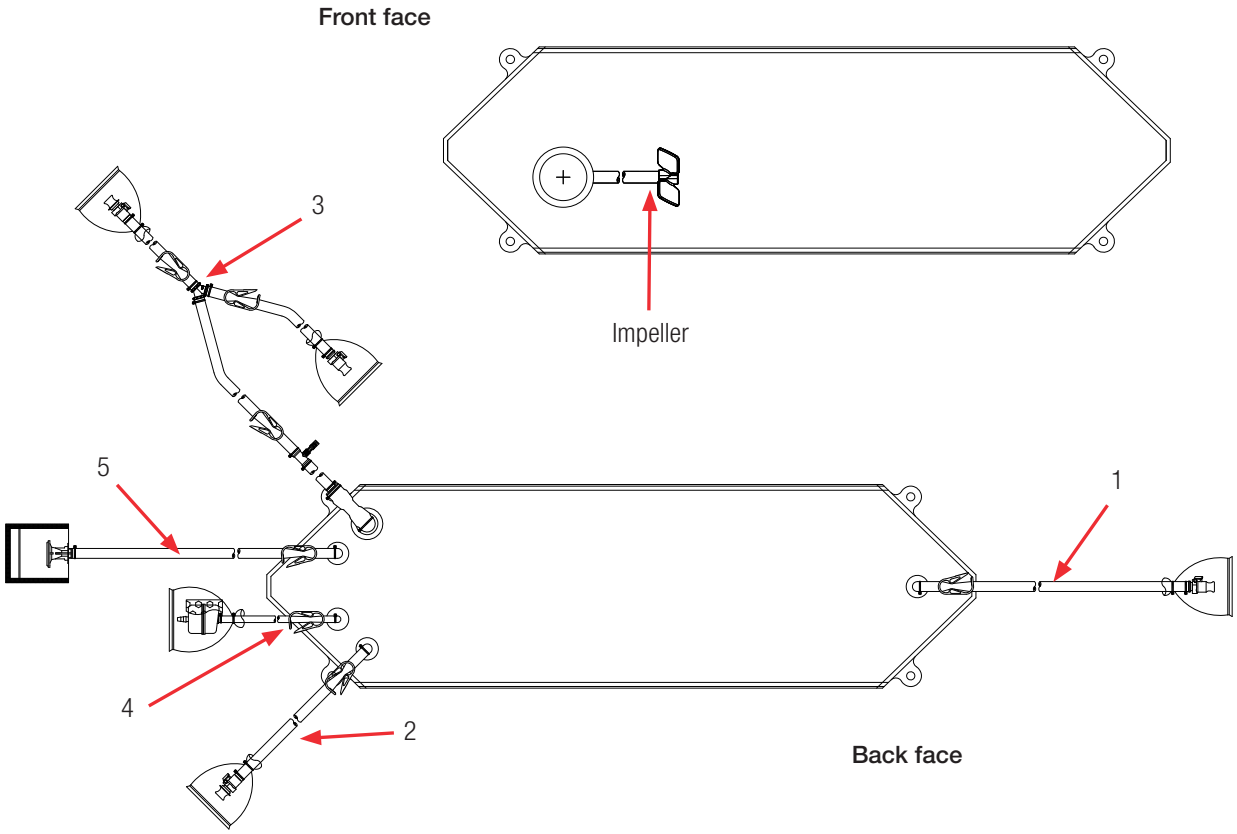


Table 8.27. 100 L BPC without probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX insert
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz

Standard 100 L powder-to-liquid BPC (with probe ports)

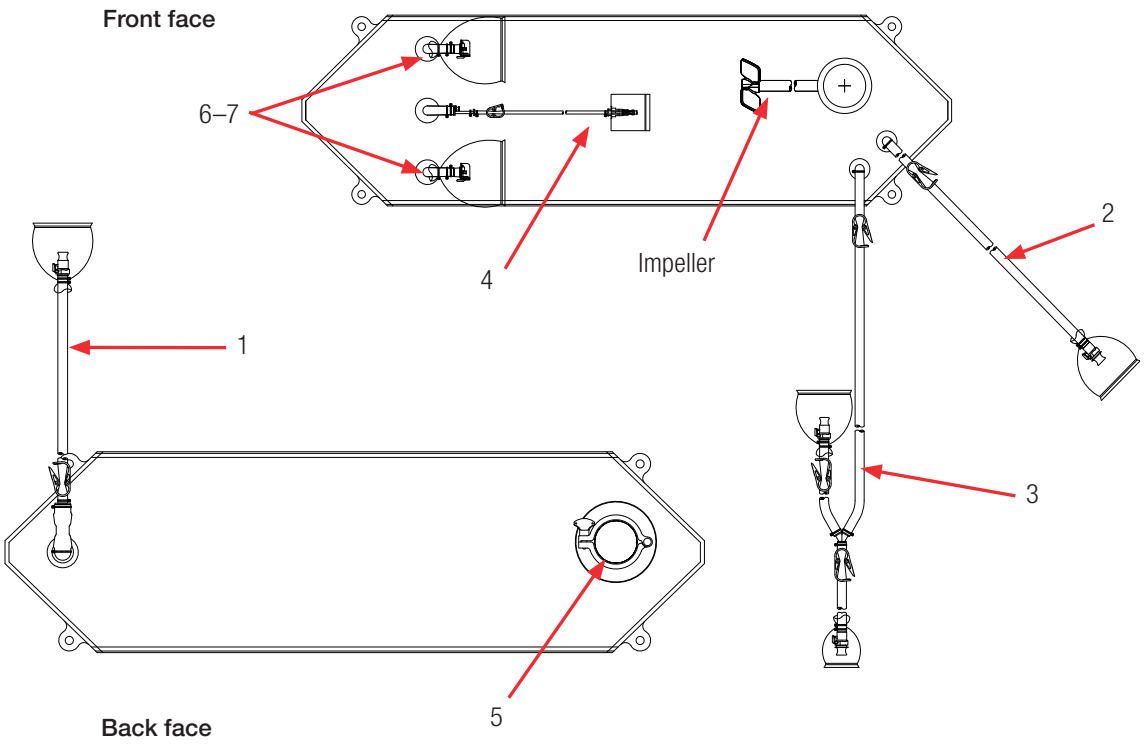


Table 8.28. 100 L BPC with probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 9.5 mm (3/8 in.) MPX insert
3	Recirculation line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Thermowell/ small volume sample line	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port
5	Powder addition port	76 mm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket
6–7	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)

Standard 100 L liquid-to-liquid BPC (with probe ports)

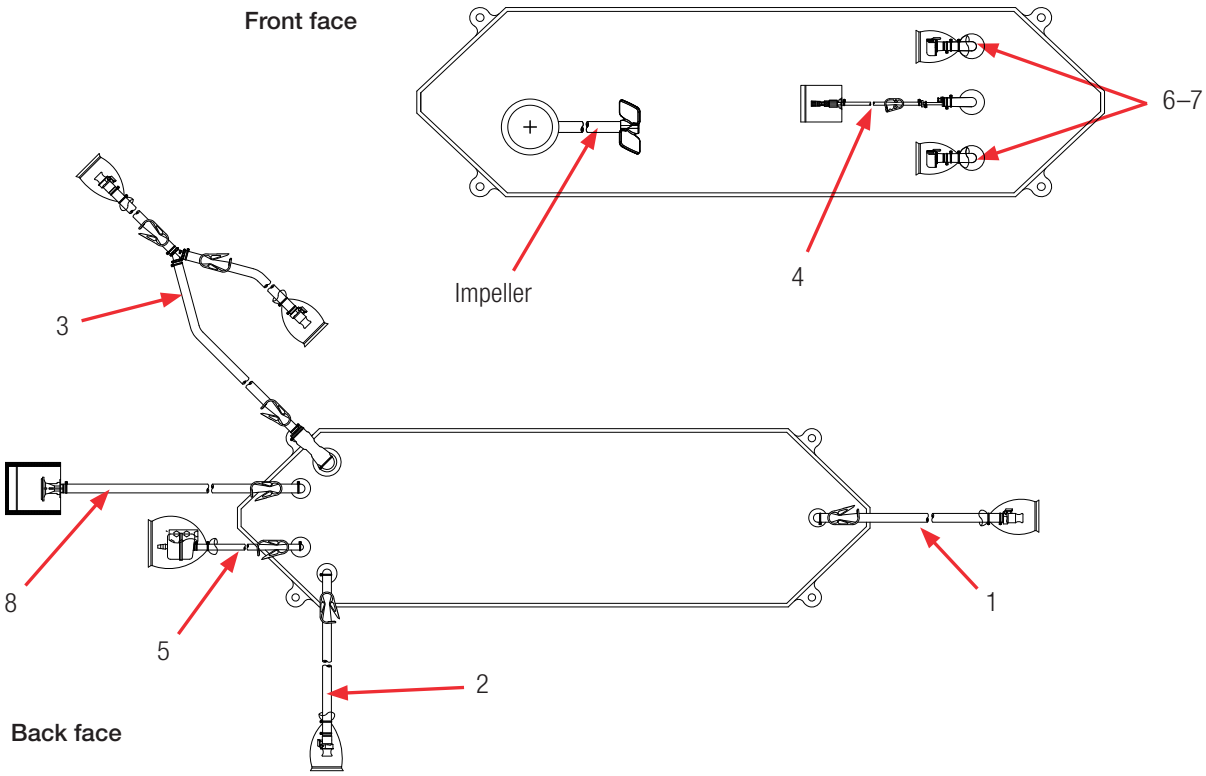


Table 8.29. 100 L BPC with probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX body
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 9.5 mm (3/8 in.) MPX insert
3	Recirculation line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Thermowell/ small volume sample line	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port
5	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
6–7	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
8	Fill line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	38.1 mm (1/5 in.) Tri-clamp SterilEnz

Ordering information for 100 L BPCs

See Table 8.30 for 100 L BPC ordering information. Contact your sales representative for more information.

Probe port note: All 100 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 publication. 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's guide or data sheets.

Table 8.30. 100 L BPC ordering information.

Size	Description	Film type	Cat. no.
100 L	Standard powder-to-liquid BPC without probe ports	CX5-14	SH31046.01
100 L	Standard powder-to-liquid BPC without probe ports	Aegis5-14	SH31052.01
100 L	Standard liquid-to-liquid BPC without probe ports	CX5-14	SH31046.03
100 L	Standard liquid-to-liquid BPC without probe ports	Aegis5-14	SH31052.03
100 L	Standard powder-to-liquid BPC with probe ports	CX5-14	SH31046.02
100 L	Standard powder-to-liquid BPC with probe ports	Aegis5-14	SH31052.02
100 L	Standard liquid-to-liquid BPC with probe ports	CX5-14	SH31046.04
100 L	Standard liquid-to-liquid BPC with probe ports	Aegis5-14	SH31052.04

8.4.3 Standard 200 L BPCs

See the following sections for various standard 200 L S.U.M. BPC drawings and specifications. Ordering information for all types is provided in Table 8.35.

Standard 200 L powder-to-liquid BPC (without probe ports)

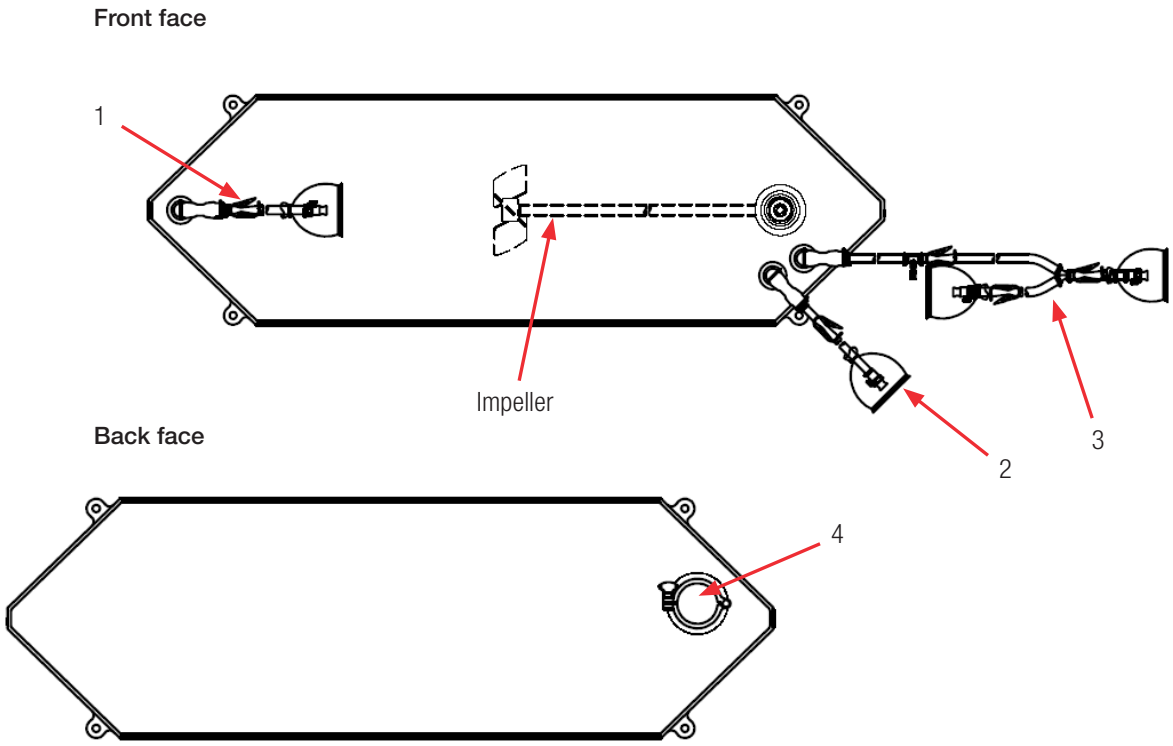


Table 8.31. 200 L BPC without probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket

Standard 200 L liquid-to-liquid BPC (without probe ports)

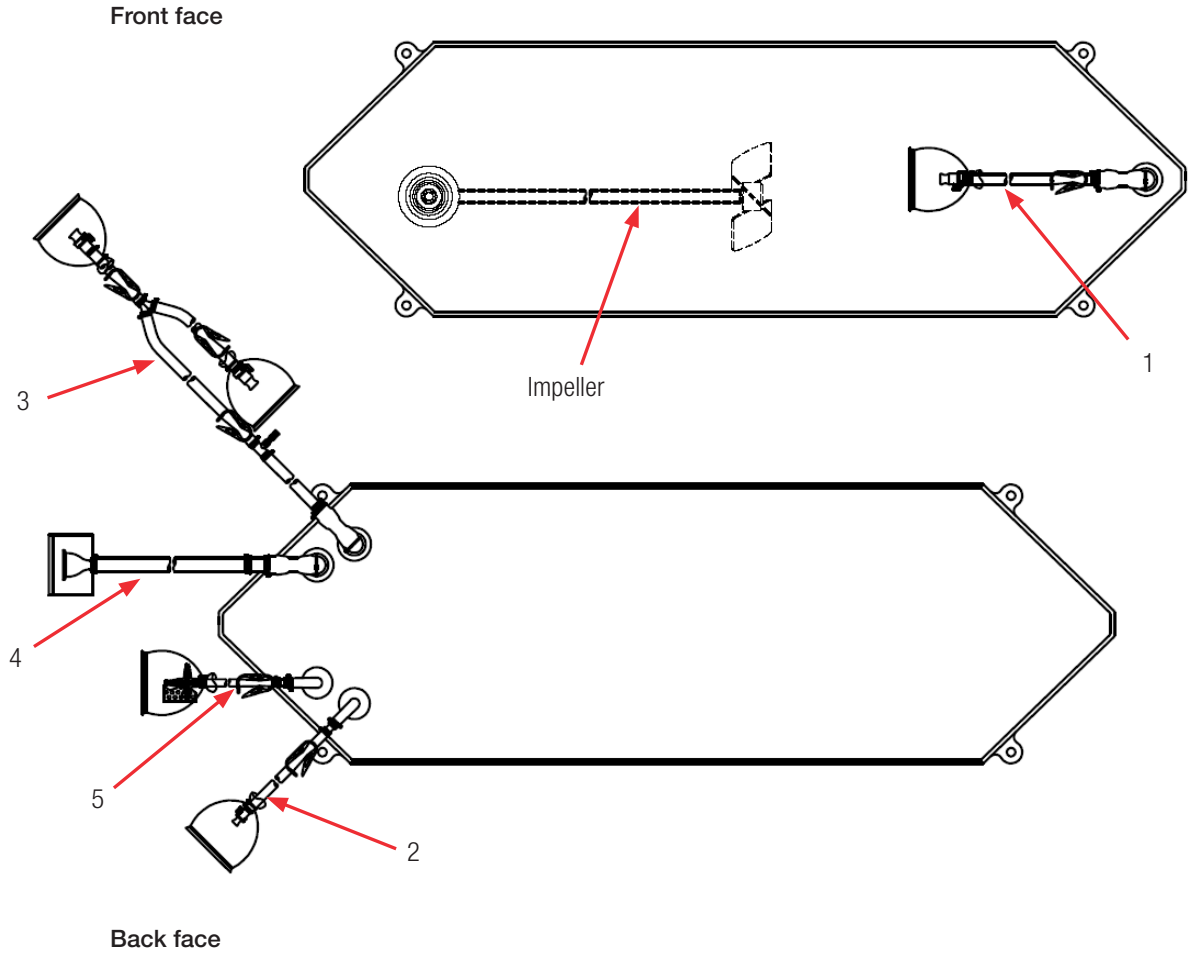


Table 8.32. 200 L BPC without probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 122 cm (48 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz
5	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)

Standard 200 L powder-to-liquid BPC (with probe ports)

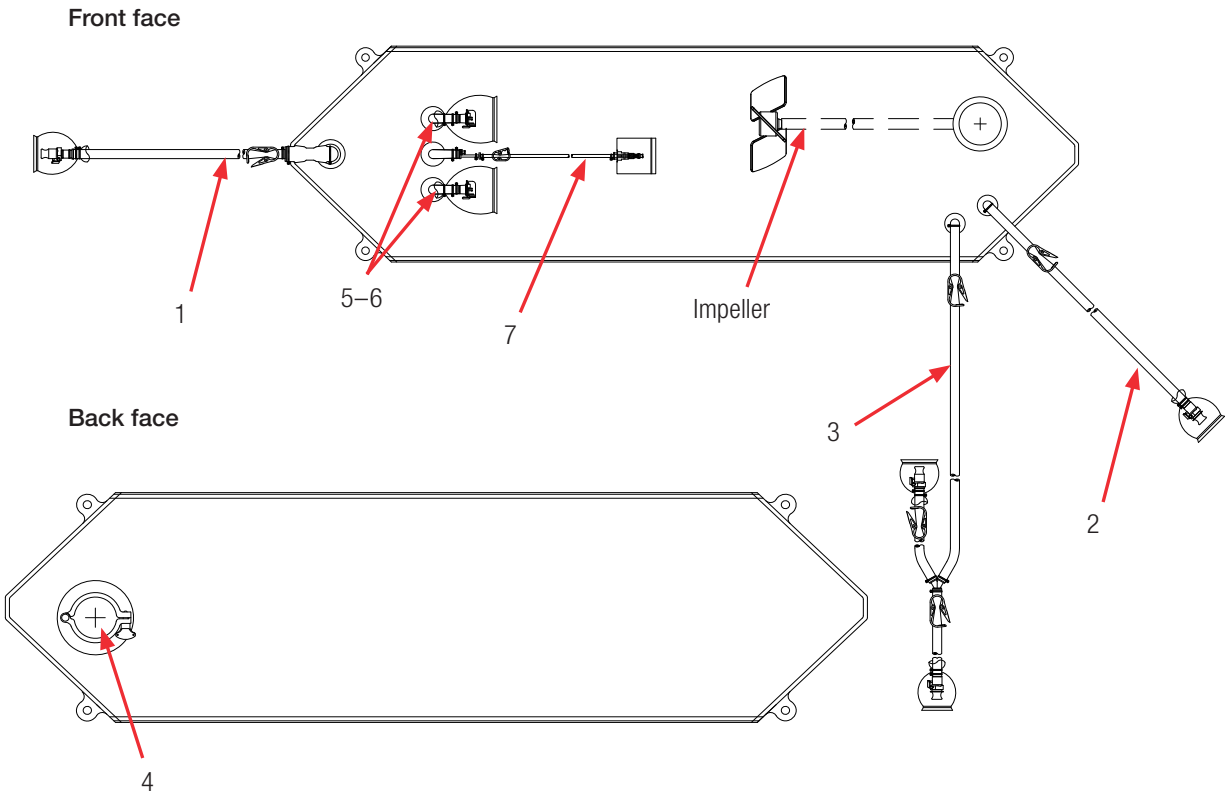


Table 8.33. 200 L BPC with probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket
5–6	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
7	Thermowell/ small volume sample port	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port

Standard 200 L liquid-to-liquid BPC (with probe ports)

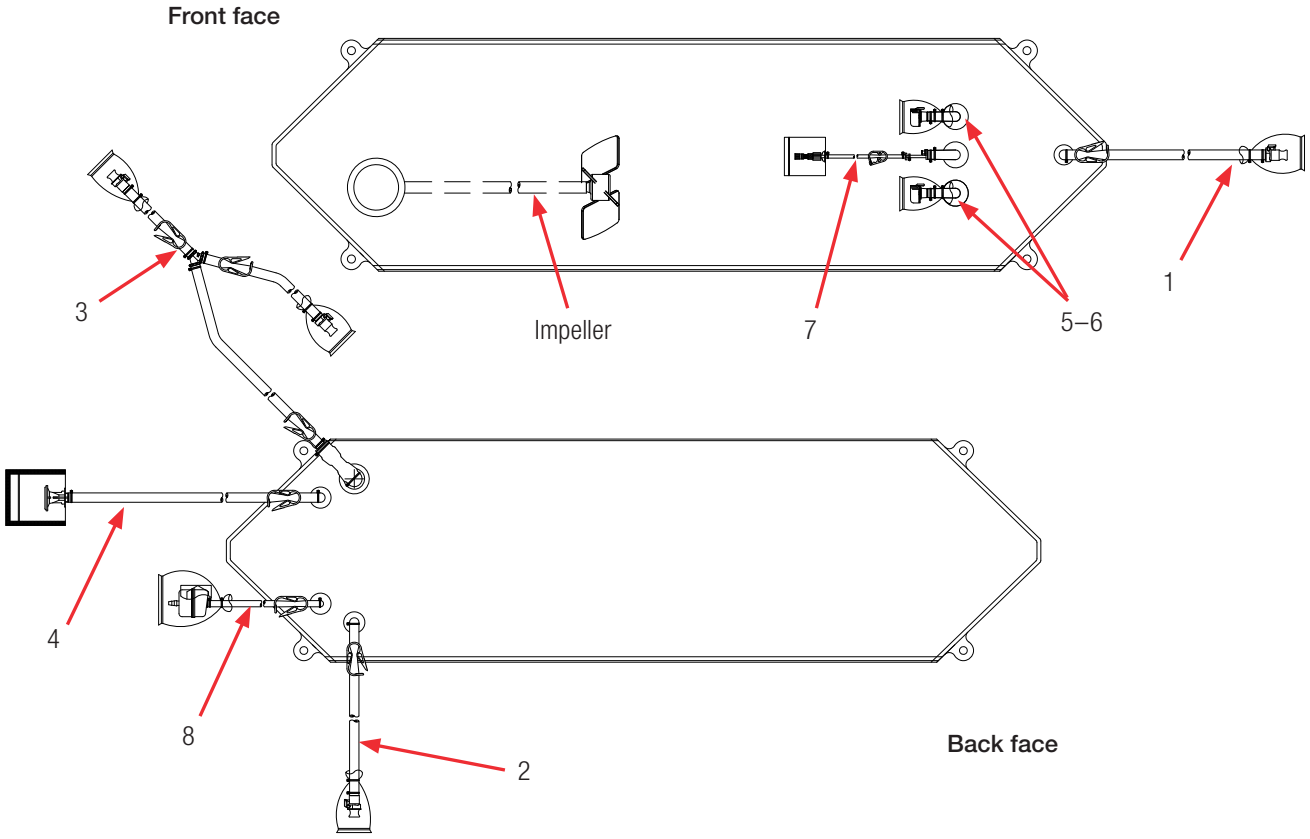


Table 8.34. 200 L BPC with probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 6 cm (24 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 122 cm (48 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz
5–6	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
7	Thermowell/ small volume sample port	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port
8	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)

Ordering information for 200 L BPCs

See Table 8.35 for 200 L BPC ordering information. Contact your sales representative for more information.

Probe port note: All 200 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 publication. 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's guide or data sheets.

Table 8.35. 200 L BPC ordering information.

Size	Description	Film type	Cat. no.
200 L	Standard powder-to-liquid BPC without probe ports	CX5-14	SH30750.01
200 L	Standard powder-to-liquid BPC without probe ports	Aegis5-14	SH30973.02
200 L	Standard liquid-to-liquid BPC without probe ports	CX5-14	SH30753.01
200 L	Standard liquid-to-liquid BPC without probe ports	Aegis5-14	SH30983.02
200 L	Standard powder-to-liquid BPC with probe ports	CX5-14	SH31054.02
200 L	Standard powder-to-liquid BPC with probe ports	Aegis5-14	SH31053.02
200 L	Standard liquid-to-liquid BPC with probe ports	CX5-14	SH31054.04
200 L	Standard liquid-to-liquid BPC with probe ports	Aegis5-14	SH31053.04

8.4.4 Standard 500 L BPCs

See the following sections for various standard 500 L S.U.M. BPC drawings and specifications. Ordering information for all types is provided in Table 8.40.

Standard 500 L powder-to-liquid BPC (without probe ports)

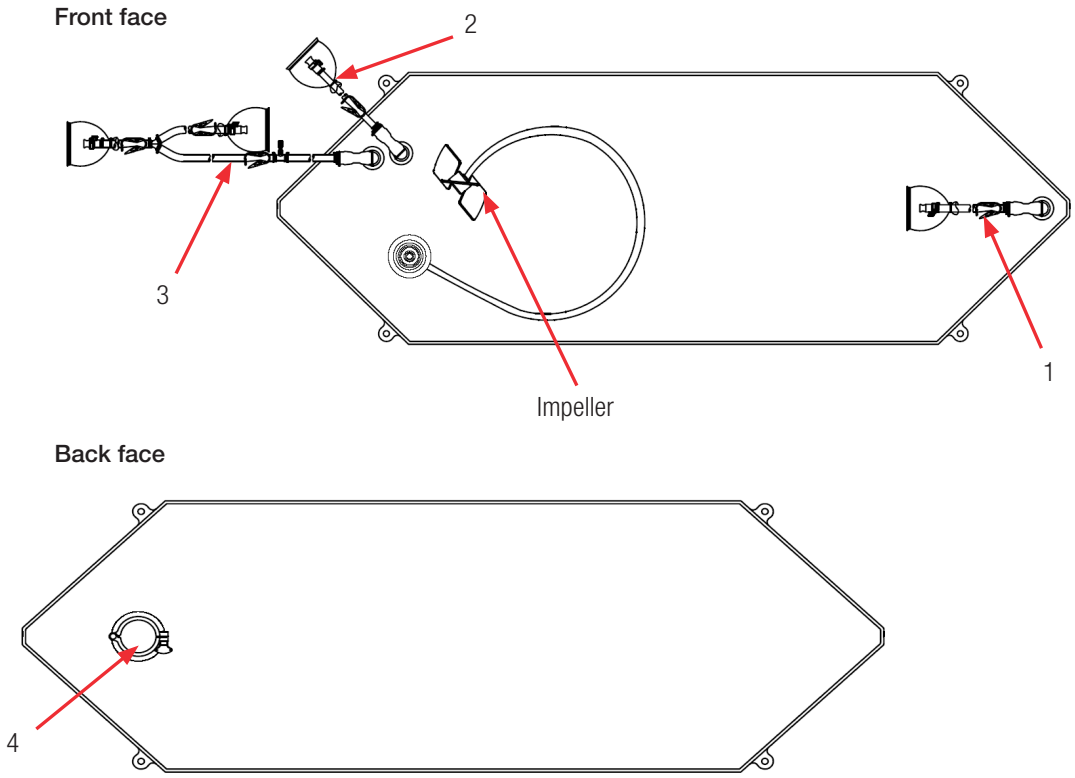


Table 8.36. 500 L BPC without probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	12.7 mm (1/2 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 152 cm (60 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 137 cm (54 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket

Standard 500 L liquid-to-liquid BPC (without probe ports)

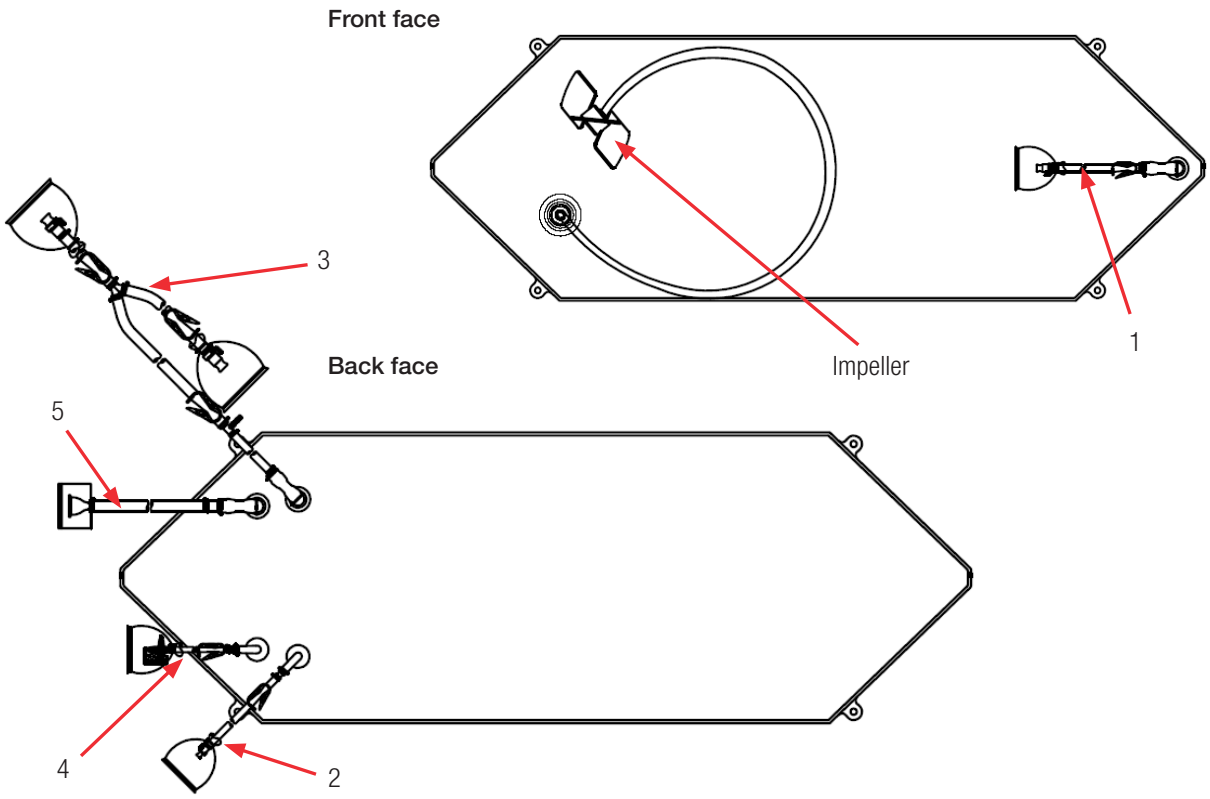


Table 8.37. 500 L BPC without probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 168 cm (66 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 152 cm (60 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz

Standard 500 L powder-to-liquid BPC (with probe ports)

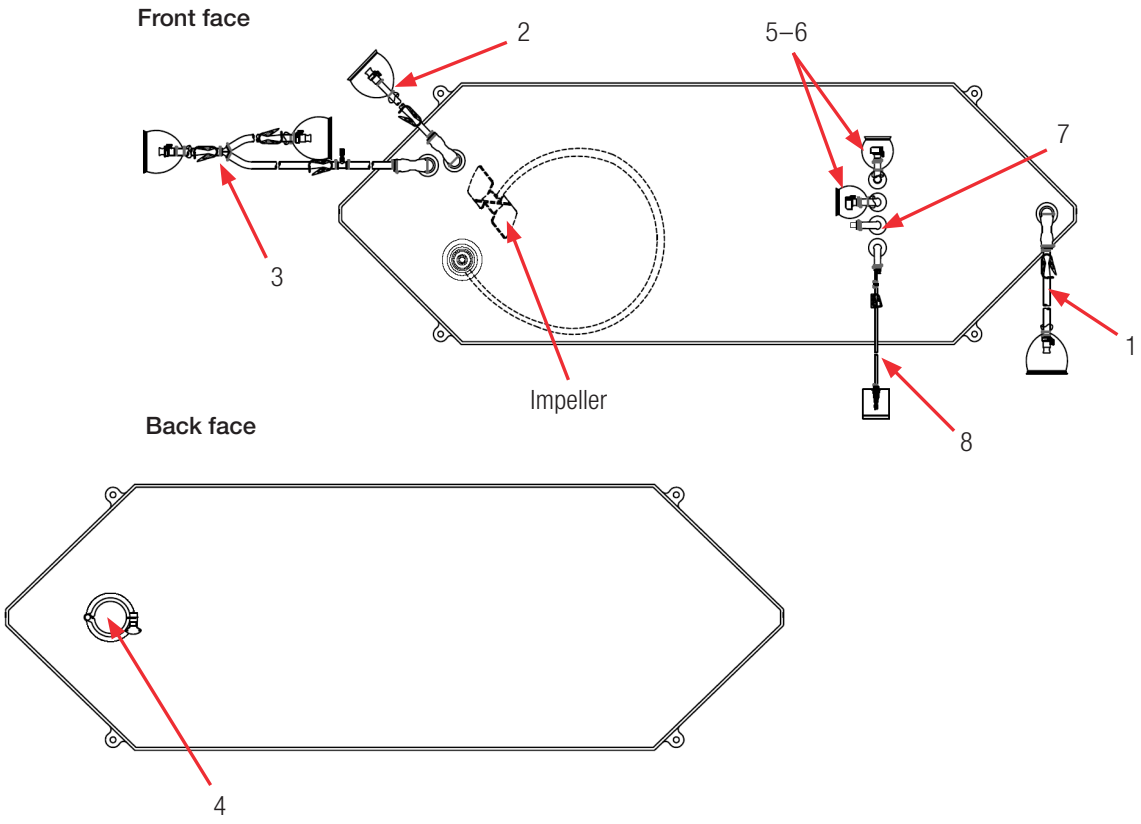


Table 8.38. 500 L BPC with probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	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 tubing x 152 cm (60 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 168 cm (66 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket
5–6	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
7	Unused	None	Plug
8	Thermowell/ small volume sample port	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port

Standard 500 L liquid-to-liquid BPC (with probe ports)

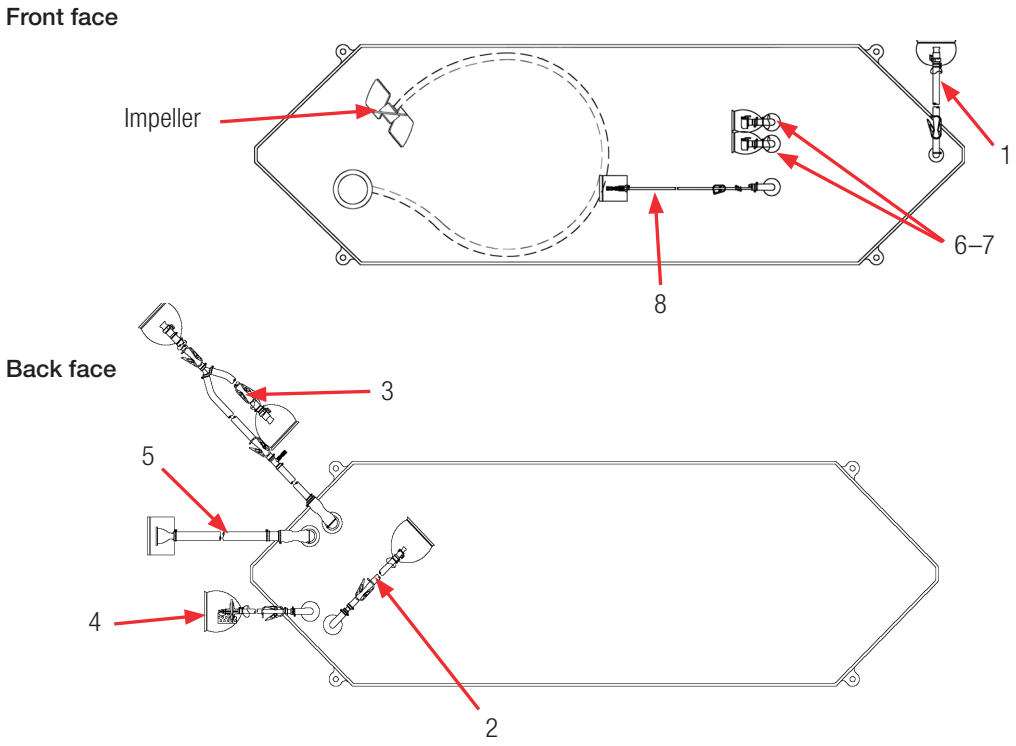


Table 8.39. 500 L BPC with probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 168 cm (66 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 152 cm (60 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz
6–7	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
8	Thermowell/ small volume sample	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port

Ordering information for 500 L BPCs

See Table 8.40, below, for 500 L BPC ordering information. Contact your sales representative for more information.

Table 8.40. 500 L BPC ordering information.

Size	Description	Film type	Cat. no.
500 L	Standard powder-to-liquid BPC without probe ports	CX5-14	SH30751.01
500 L	Standard powder-to-liquid BPC without probe ports	Aegis5-14	SH30973.03
500 L	Standard liquid-to-liquid BPC without probe ports	CX5-14	SH30754.01
500 L	Standard liquid-to-liquid BPC without probe ports	Aegis5-14	SH30983.03
500 L	Standard powder-to-liquid BPC with probe ports	CX5-14	SH30751.02
500 L	Standard powder-to-liquid BPC with probe ports	Aegis5-14	SH30974.03
500 L	Standard liquid-to-liquid BPC with probe ports	CX5-14	SH30754.02
500 L	Standard liquid-to-liquid BPC with probe ports	Aegis5-14	SH30982.03

8.4.5 Standard 1,000 L BPCs

See the following sections for various standard 1,000 L S.U.M. BPC drawings and specifications. Ordering information for all types is provided in Table 8.45.

Standard 1,000 L powder-to-liquid BPC (without probe ports)

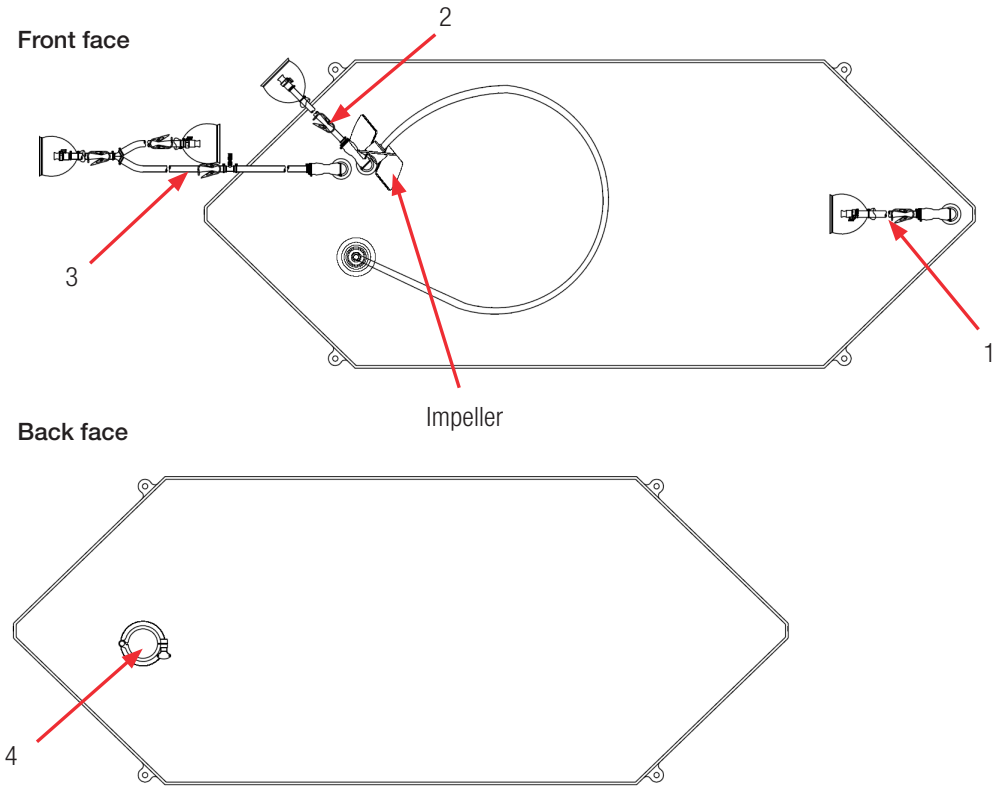


Table 8.41. 1,000 L BPC without probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 183 cm (72 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30.5 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket

Standard 1,000 L liquid-to-liquid BPC (without probe ports)

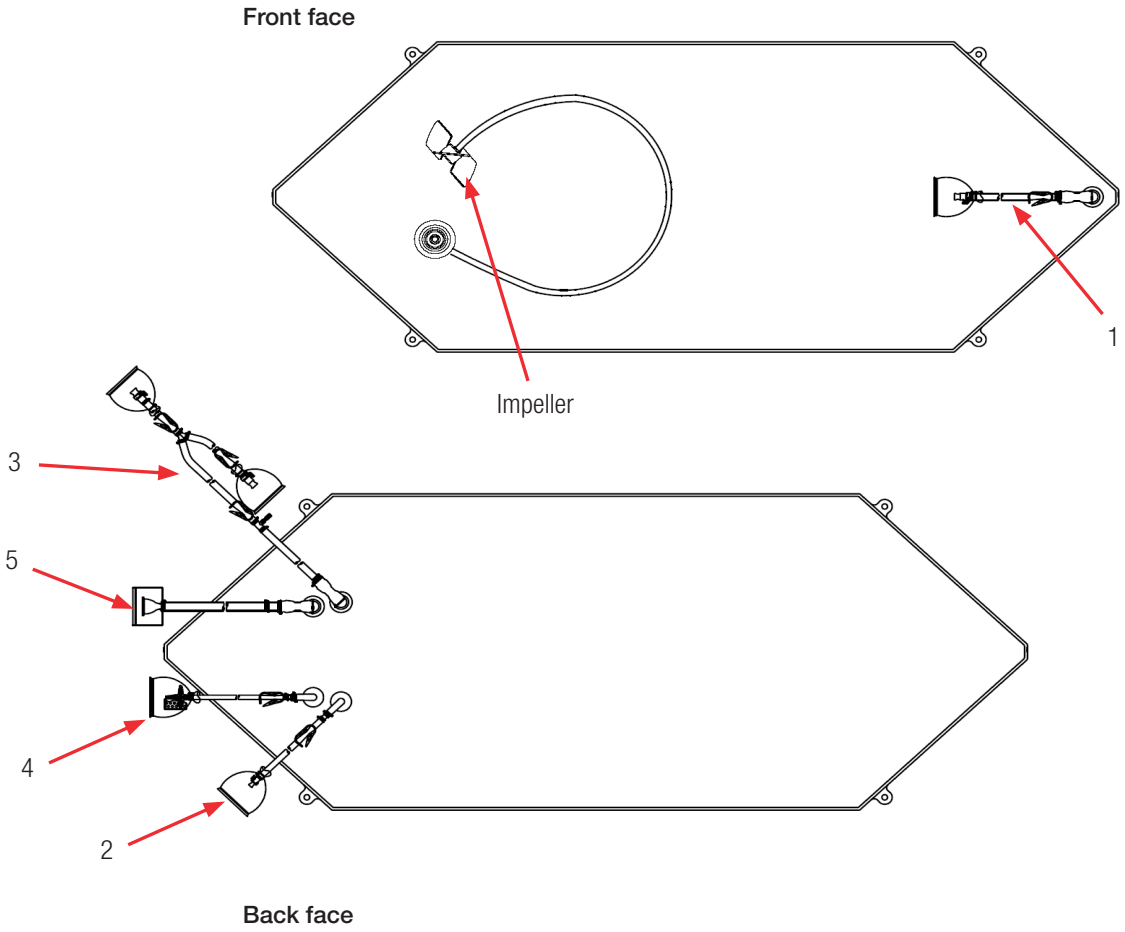


Table 8.42. 1,000 L BPC without probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 183 cm (72 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz

Standard 1,000 L powder-to-liquid BPC (with probe ports)

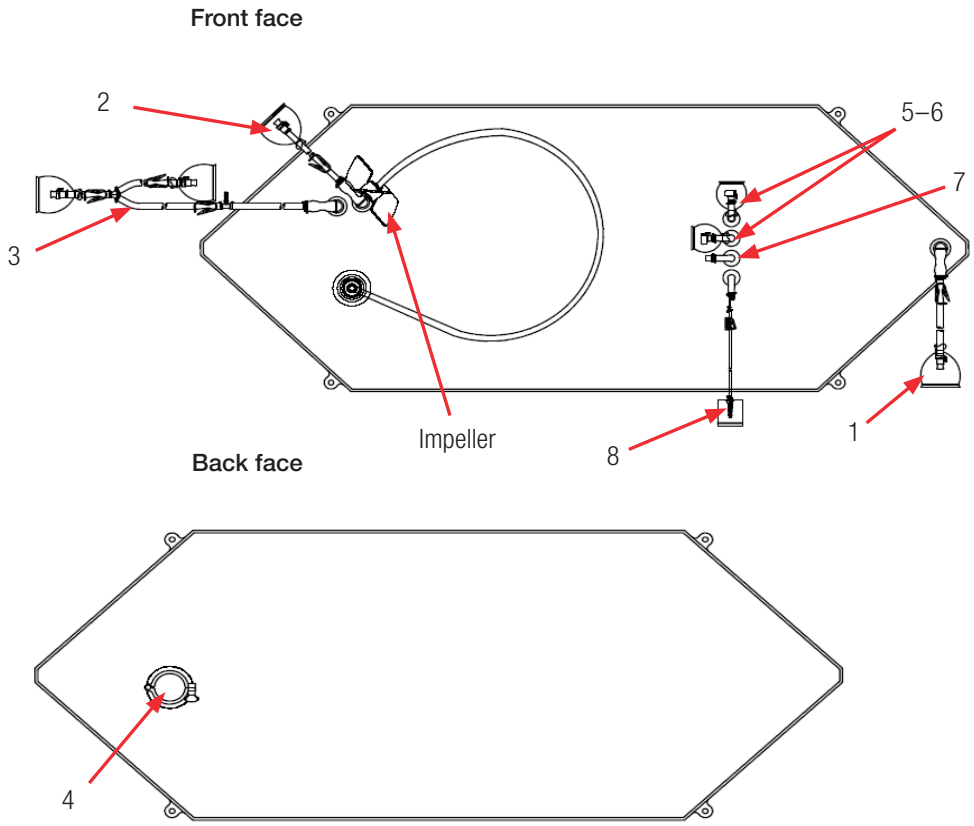


Table 8.43. 1,000 L BPC with probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	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 tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket
5–6	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
7	Unused	None	Plug
8	Thermowell/ small volume sample port	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port

Standard 1,000 L liquid-to-liquid BPC (with probe ports)

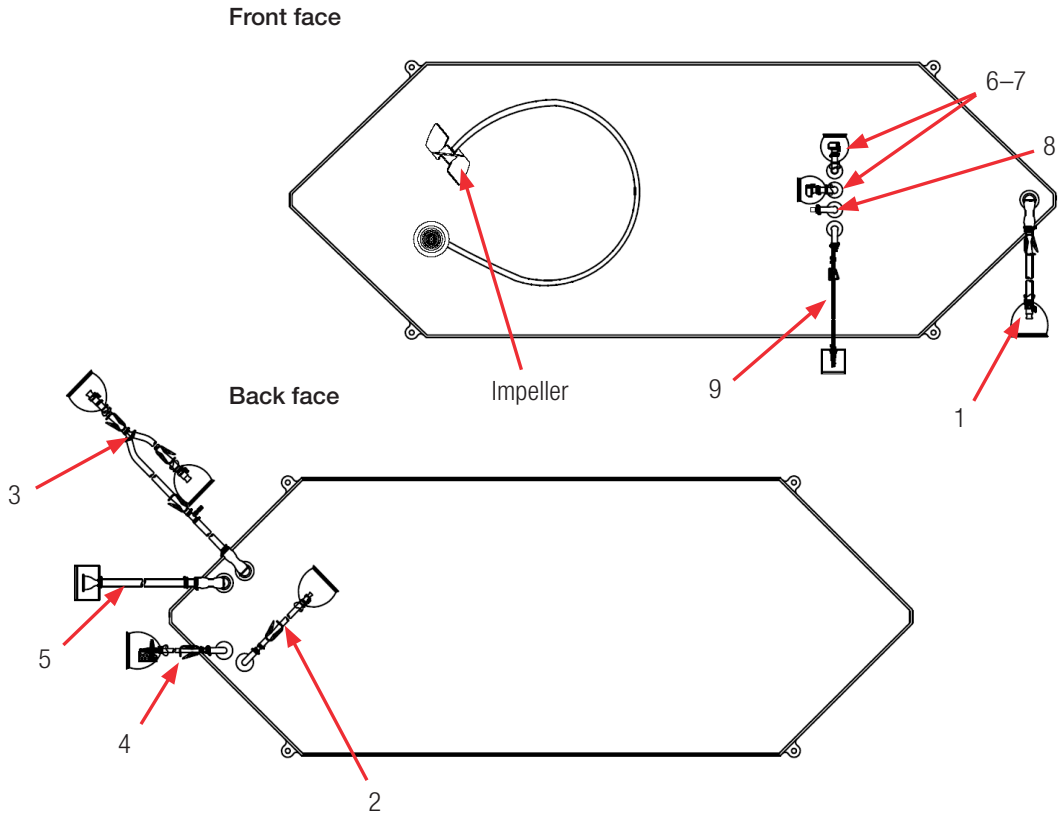


Table 8.44. 1,000 L BPC with probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 183 cm (72 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz
6–7	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
8	Unused	None	Plug
9	Thermowell/ small volume sample	Thermowell adapter for 3.2 mm (1/8 in.) diameter 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

Ordering information for 1,000 L BPCs

See Table 8.45, below, for 1,000 L BPC ordering information. Contact your sales representative for more information.

Table 8.45. 1,000 L BPC ordering information.

Size	Description	Film type	Cat. no.
1,000 L	Standard powder-to-liquid BPC without probe ports	CX5-14	SH30752.02
1,000 L	Standard powder-to-liquid BPC without probe ports	Aegis5-14	SH30973.04
1,000 L	Standard liquid-to-liquid BPC without probe ports	CX5-14	SH30755.01
1,000 L	Standard liquid-to-liquid BPC without probe ports	Aegis5-14	SH30983.04
1,000 L	Standard powder-to-liquid BPC with probe ports	CX5-14	SH30752.02
1,000 L	Standard powder-to-liquid BPC with probe ports	Aegis5-14	SH30974.04
1,000 L	Standard liquid-to-liquid BPC with probe ports	CX5-14	SH30755.02
1,000 L	Standard liquid-to-liquid BPC with probe ports	Aegis5-14	SH30982.04

8.4.6 Standard 2,000 L BPCs

See the following sections for various standard 2,000 L S.U.M. BPC drawings and specifications. Ordering information for all types is provided in Table 8.50.

2,000 L powder-to-liquid BPC (without probe ports)

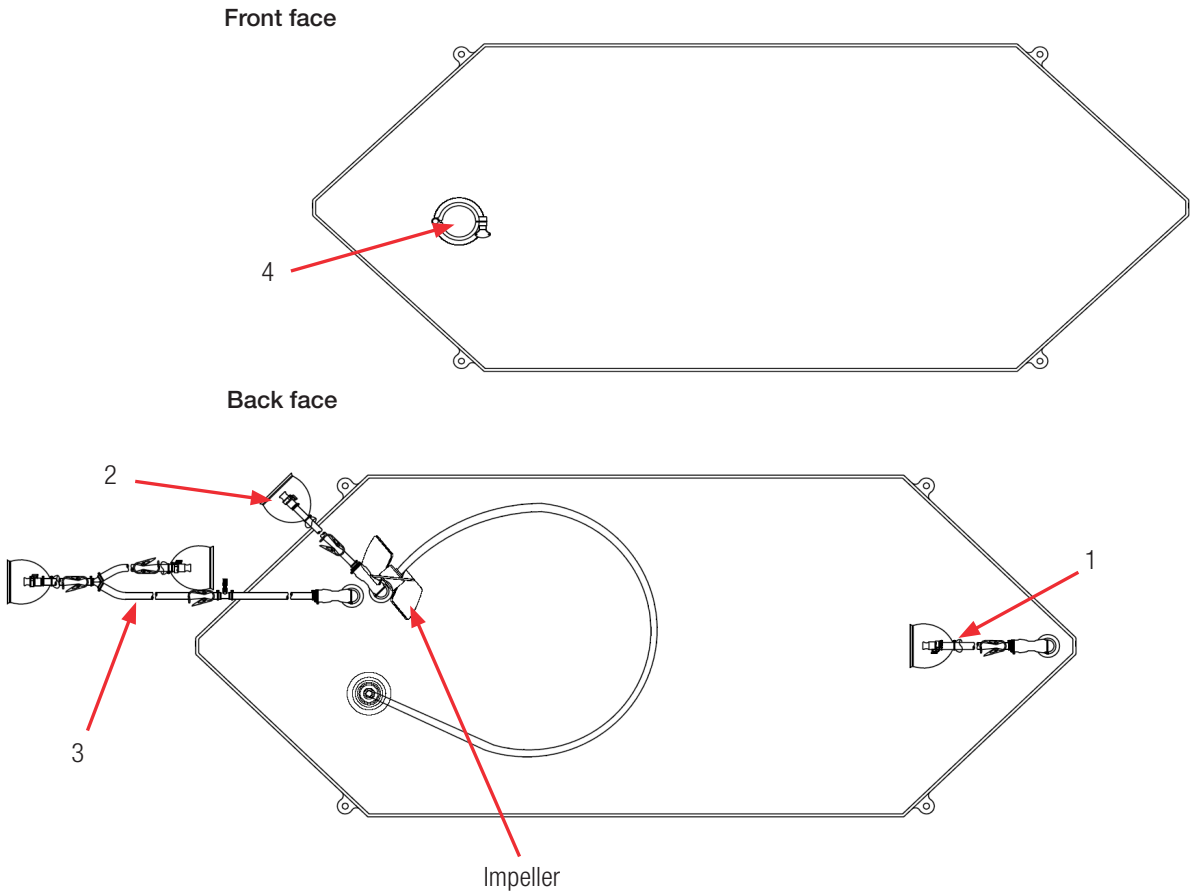


Table 8.46. 2,000 L BPC without probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 183 cm (72 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30.5 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket

Standard 2,000 L liquid-to-liquid BPC (without probe ports)

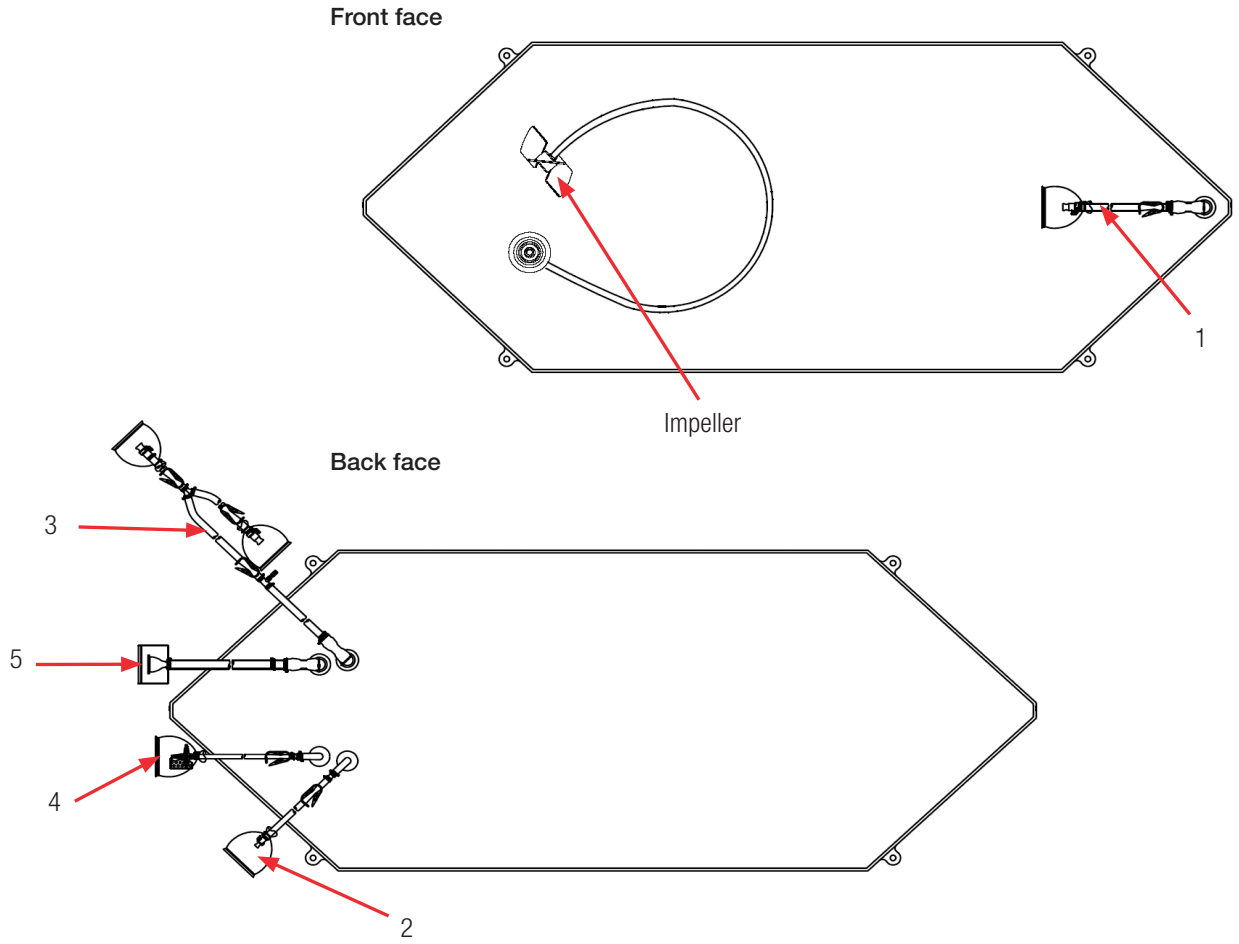


Table 8.47. 2,000 L BPC without probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 183 cm (72 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz

Standard 2,000 L powder-to-liquid BPC (with probe ports)

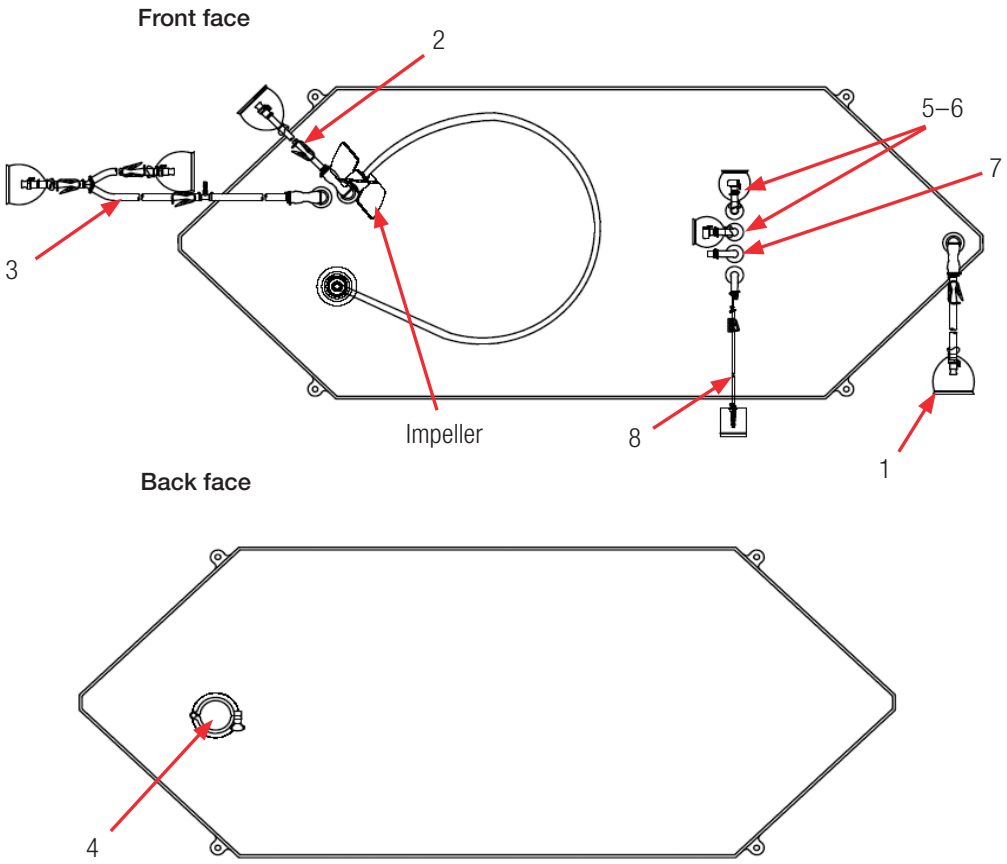


Table 8.48. 2,000 L BPC with probe ports for powder-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	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 tubing x 122 cm (48 in.)	Plugged 12.7 mm (1/2 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Powder addition port	7.6 cm (3 in.) Sanitary fitting, tri-clamp	Cap with gasket
5–6	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
7	Unused	None	Plug
8	Thermowell/ small volume sample port	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port

Standard 2,000 L liquid-to-liquid BPC (with probe ports)

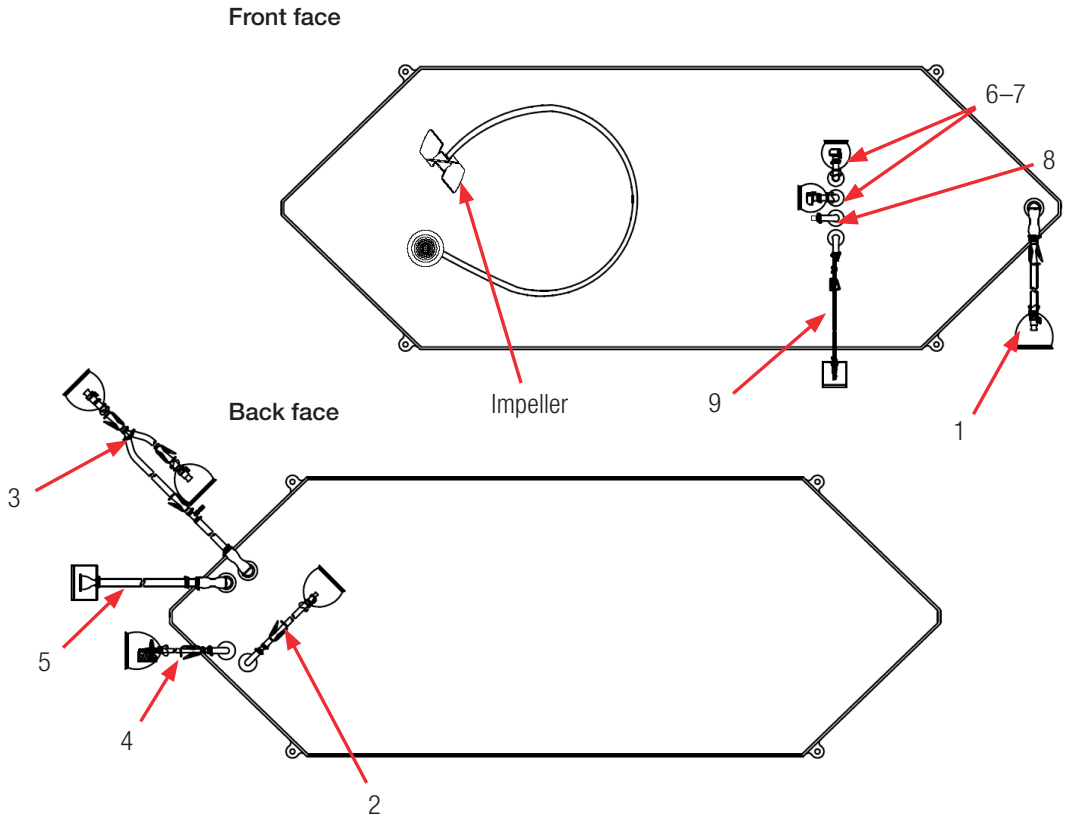


Table 8.49. 2,000 L BPC with probe ports for liquid-to-liquid applications.

Item	Description	Tubing set (ID x OD x length)	End treatment
1	Bottom drain	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 122 cm (48 in.)	Capped 12.7 mm (1/2 in.) MPX insert
2	Addition line	9.5 mm (3/8 in.) x 15.9 mm (5/8 in.) C-Flex tubing x 61 cm (24 in.)	Plugged 9.5 mm (3/8 in.) MPX body
3	Recirculation/ sample line	12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 198 cm (78 in.) splits to 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 61 cm (24 in.) and 12.7 mm (1/2 in.) x 19.1 mm (3/4 in.) C-Flex tubing x 30 cm (12 in.)	Capped 12.7 mm (1/2 in.) MPX insert, Plugged 12.7 mm (1/2 in.) MPX body
4	Vent filter	6.4 mm (1/4 in.) x 12.7 mm (1/2 in.) C-Flex tubing x 10.2 cm (4 in.)	Sterile hydrophobic vent filter (0.2 micron PVDF—Pall Acro 50)
5	Fill line	19.1 mm (3/4 in.) x 25.4 mm (1 in.) C-Flex tubing x 183 cm (72 in.)	38.1 mm (1.5 in.) Tri-clamp SterilEnz
6–7	Probe ports (2)	None	Pall Kleenpak aseptic connector KPCHT series (female)
8	Unused	None	Plug
9	Thermowell/ small volume sample	Thermowell adapter for 3.2 mm (1/8 in.) diameter 3.2 mm (1/8 in.) x 6.4 mm (1/4 in.) C-Flex tubing x 30 cm (12 in.)	Luer and SmartSite Valve port

Ordering information for 2,000 L BPCs

See Table 8.50, below, for 2,000 L BPC ordering information. Contact your sales representative for more information.

Table 8.50. 2,000 L BPC ordering information.

Size	Description	Film type	Cat. no.
2,000 L	Standard powder-to-liquid BPC without probe ports	CX5-14	SH30770.01
2,000 L	Standard powder-to-liquid BPC without probe ports	Aegis5-14	SH30973.05
2,000 L	Standard liquid-to-liquid BPC without probe ports	CX5-14	SH30769.01
2,000 L	Standard liquid-to-liquid BPC without probe ports	Aegis5-14	SH30983.05
2,000 L	Standard powder-to-liquid BPC with probe ports	CX5-14	SH30770.02
2,000 L	Standard powder-to-liquid BPC with probe ports	Aegis5-14	SH30974.05
2,000 L	Standard liquid-to-liquid BPC with probe ports	CX5-14	SH30769.02
2,000 L	Standard liquid-to-liquid BPC with probe ports	Aegis5-14	SH30982.05

8.4.7 Standard open-top liners and impeller sleeves

See the drawings and Tables 8.51–8.53 below for specification and ordering information for open-top liners and impeller sleeves.

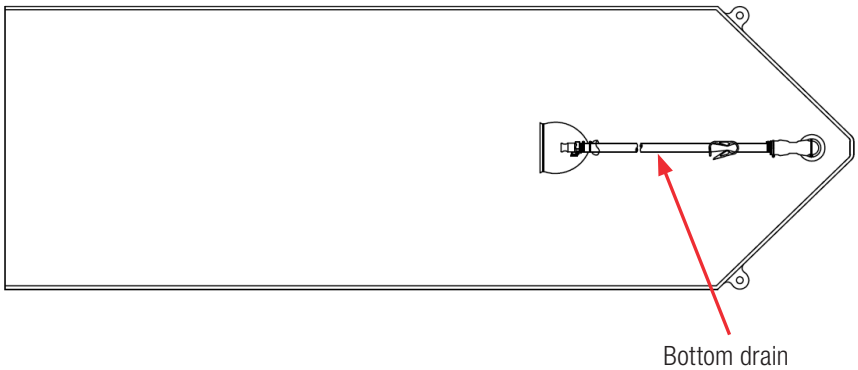
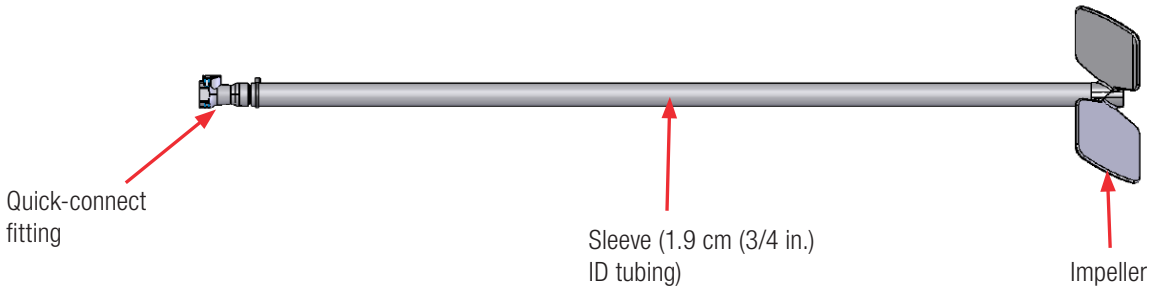


Table 8.51. Standard open-top liner.

Description	Tubing set (ID x OD x length)	End treatment
Bottom drain	182.9 mm (72 in.) of 12.7 mm (1/2 in.) C-Flex tubing	MPX insert connector



Please note: The bearing hub needed for open-top mixing is supplied standard with the tank hardware. The end treatment for the 2,000 L impeller has a tri-clamp fitting, rather than a quick-connect fitting.

Ordering information for open-top liners and impeller sleeves

Table 8.52. Ordering information for S.U.M. open-top liners.

Size	Description	Film type	Cat. no.
50 L	Standard open-top liner	CX3-9	SH30762.04
100 L	Standard open-top liner	CX3-9	SH30762.06
200 L	Standard open-top liner	CX3-9	SH30762.01
500 L	Standard open-top liner	CX3-9	SH30762.02
1,000 L	Standard open-top liner	CX3-9	SH30762.03
2,000 L	Standard open-top liner	CX3-9	SH30762.05

Table 8.53. Ordering information for S.U.M. impeller sleeves.

Size	Description	Cat. no.
50 L	Impeller sleeve for open-top mixing	SH30749.06
100 L	Impeller sleeve for open-top mixing	SH30749.14
200 L	Impeller sleeve for open-top mixing	SH30749.08
500 L	Impeller sleeve for open-top mixing	SH30749.10
1,000 L	Impeller sleeve for open-top mixing	SH30749.10
2,000 L	Impeller sleeve for open-top mixing	SH30772.01

8.4.8 Custom BPC products

See Table 8.54 below for descriptions of various custom BPC products. See your sales representative for more information.

Please note: Not all options are available for all ports. Port type, port location, chamber dimensions, and mixing assembly are not customizable. For additional information, please see the Selection Guides in the BPC Catalog.

Table 8.54. Specification information about 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 3.18–25.4 mm (1/8–1 in.) ID in various lengths	More information is available in the Tubing Selection Guide
Connectors	Luers, CPC quick-connects, SIP connectors, tri-clamp, Kleenpak, Lynx, SmartSite, Clave, Lynx steam thru, CPC steam thru, Gore steam valve, Gore Mini TC, BioQuate, SterilEnz, end plug, etc.	More information is available in the Connection System Selection Guide
Probe ports/line addition ports	Ports may be added if they are compatible with the hardware	Reusable probe connector can use Kleenpak or AseptiQuik connectors
Disposable sensors	Pressure sensor: PendoTECH and Thermo Scientific solutions (PendoTECH comes standard on 500 L and 1,000 L) DO and pH: Hamilton pH: 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 of 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	N/A

Table 8.55. BPC packaging information.

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

8.5 Accessories and options specifications

The following sections provide information about S.U.M. accessories and options.

8.5.1 Load cells

Load cells operate as a mechanical suspension and weighing system on the S.U.M. Load cells may be purchased either at the time of equipment sale or as retro-fit kits for existing S.U.M. units. Load cell systems include three load cells, a summing block, a display, and wiring.

Mettler Toledo 0745A Series load cells are used to enable weight measurements for 2,000 L S.U.M. units (Figure 8.19). Mettler Toledo MTB load cells (Figures 8.20 and 8.21) are used to enable weight measurements for all other S.U.M. sizes.

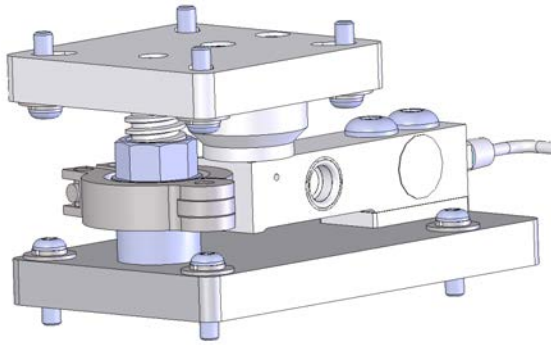


Figure 8.19. Mettler Toledo 0745A load cell for the 2,000 L S.U.M.

Figure 8.20. Mettler Toledo MTB load cell for 50–1,000 L S.U.M. units.

Figure 8.21. Close-up view of Mettler Toledo MTB load cell.

Load cells are typically radial 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. See Table 8.56 for load cell specifications, and Table 8.57 for ordering information.

Table 8.56. Specification information for S.U.M. load cells.

Weigh module parameter	50–100 L S.U.M.	200 L S.U.M.	500 L S.U.M.	1,000 L S.U.M.	2,000 L S.U.M.
Model number	MTB-100	MTB-200	MTB-300	MTB-500	0745A
Rated capacity per load cell	100 kg (220 lb)	200 kg (441 lb)	300 kg (661 lb)	500 kg (1102 lb)	1100 kg (2500 lb)
Safe load limit	150% of rated capacity				
Safe side load limit	100% of rated capacity				
Safe dynamic load	70% of rated capacity				
Weight (including load cell), nominal	0.6 kg (1.3 lb)				Entire assembly: 7.2 kg (16 lb) Load cell only: 0.9 kg (1.98 lb)
Material	304 stainless steel				

Table 8.57. Ordering information for Mettler Toledo load cell kits.

Size	Description	Cat. no.
50, 100 L	(3) Load cell with cables	SV51145.01
200 L	(3) Load cell with cables	SV51145.02
500 L	(3) Load cell with cables	SV51145.03
1,000 L	(3) Load cell with cables	SV51145.05
2,000 L	(3) Load cell with cables	SV51146.04

8.5.2 Powdertainer arm

The Powdertainer arm is available as an option for powder-to-liquid applications. Powdertainer arms are available in two sizes: one for 50 to 1,000 L units, and one for 2,000 L units (Figure 8.22). The arm 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 a powder container onto the hanger. See Table 8.58 for Powdertainer arm ordering information.

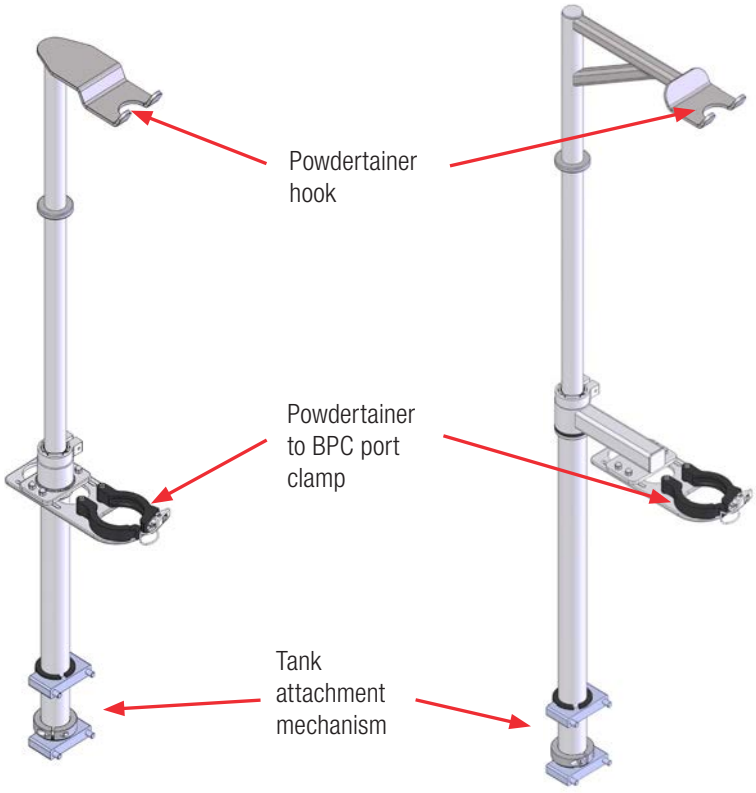


Figure 8.22. Powdertainer arms for 50–1,000 L units (left) and 2,000 L units (right).

Table 8.58. Ordering information for Powdertainer arms.

Size	Description	Cat. no.
50–1,000 L	Powdertainer arm for 50–1,000 L mixers	SV51002.01
2,000 L	Powdertainer arm for 2,000 L mixers	SV51002.02

8.5.3 Cable management system

The cable management system (Figure 8.23) is an accessory that assists users in containing the wires and cables coming from the Touchscreen Console. If ordered with your system, the cable management hooks will arrive attached to the mixer. Cable management systems may also be retro-fitted to existing S.U.M. units. See Table 8.59 for cable management system ordering information.

Figure 8.23. Cable management arm.

Table 8.59. Ordering information for cable management system.

Size	Description	Cat. no.
50–2,000 L	Cable management arm	SV50992.12

8.5.4 Miscellaneous items

The following ancillary components support the operation of the HyPerforma S.U.M., and enhance the performance of the complete system. Ordering information for all miscellaneous items can be found in Tables 8.60–8.61.

Autoclave tray for probes

The autoclave tray (Figure 8.24) holds the electrochemical probes and bellows in place during the autoclave sterilization process. The tray can accommodate two probes.

Design elements include:

- Stainless steel fabrication
- A plastic handle, providing easy transport right out of the autoclave
- Ability to position probes on a 15% incline for greater probe/membrane longevity
- Ability to restrain probe bellows from collapsing during sterilization

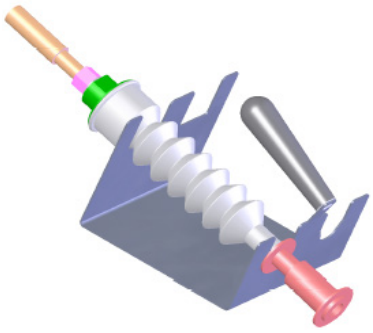


Figure 8.24. Autoclave tray for Kleenpak aseptic connectors.

Heavy-duty tubing clamps

Heavy-duty tubing clamps (Figure 8.25) are used for pinching off line sets that are not in use in order to prevent process fluids from escaping. Tubing clamps must be in place prior to sterile probe insertion to close off probe ports.

Figure 8.25. Tubing clamp.

Pinch valves

Pinch valves (Figure 8.26) are connected to the Touchscreen Console, and are used to automatically control the flow of fluids through the BPC tubing during filling or harvesting.

Figure 8.26. Pinch valve.

Probe clips

Plastic probe clips (Figure 8.27) are used to hold probes in place on the S.U.M. tank. The probe clips can be moved independently, and are positioned on a thin brace above the probe port tank cutout. Plastic probe clips are attached by sliding onto the brace with firm pressure.

Figure 8.27. Plastic probe clip.

Pumps

Pumps are optional for S.U.M. systems. If used with the Touchscreen Console functionality, pumps enable users to automatically fill and harvest liquid, as well as deliver boluses during mixing. Different sizes of pumps are available to accommodate varying user needs (Figure 8.28). Larger pumps are used to fill and harvest liquid from the S.U.M. Smaller pumps are primarily used for delivering buffer solutions and pH boluses during mixing.

Figure 8.28. Watson-Marlow pumps on shelves.

Shelves

Shelves for storing pumps (Figure 8.29) are an optional accessory for S.U.M. systems. These shelves are mounted to the attached arm on the tank, and can hold one large and two small Watson-Marlow pumps.

Figure 8.29. Pump shelves.

Basket

A basket is available as an accessory for the S.U.M. It provides convenient storage for bottles containing buffer or pH solutions (Figure 8.30). The basket mounts to the attached arm above the pump shelves.

Figure 8.30. Basket for solution bottles.

Ordering information

See Tables 8.60–8.61 for miscellaneous item ordering information.

Table 8.60. Ordering information for miscellaneous items.

Description	Cat. no.
Autoclave tray for aseptic connectors	SV50177.01
Probe assembly (non-sterile, for use in autoclave)	SH30720.01
Probe clips (4)	SV50177P.01
Heavy-duty tubing clamps (single)	SV20664.01
Heavy-duty tubing clamps (10)	SV20664.04
Watson-Marlow 120 VAC pump—large (0.004–6.85 L/min.)	SV511054.01
Watson-Marlow 240 VAC pump—large (0.004–6.85 L/min.)	SV511054.02
Watson-Marlow 120–240 VAC pump—small (0.09–170 mL/min.)	SV511054.03
Pump shelves and basket	SV50236A.12
T plug—RS485/Modbus/Canbus	SV51142.901
Terminator—RS485/Modbus/Canbus	SV51142.900
T plug—Profibus	SV51142.902
Terminator—Profibus	SV51142.903
Termination plug, external E-Stop	SV51142.904
pH probe (Hamilton), 225 mm K8	SV51147.02
pH probe (Broadley James), 225 mm K8	SV51147.03
pH probe (Mettler Toledo), 225 mm K8	SV51147.01
Dual element RTD	SV50999.08
Conductivity probe (Jumo)	SV51148.01
Conductivity probe (Mettler Toledo)	SV51148.02
Pinch valve, fill line	SV51108.05
Pinch valve, harvest line	SV51108.08
Cable, auxiliary input/output 4-20 mA	SV51142.01
Cable, external E-Stop	SV51142.02
Cable, external alarm	SV51142.03
Cable, legacy 17 pin	SV51142.04
Cable, Modbus TCP	SV51142.100
Cable, E-Box to TCU (Lauda)	SV51142.101
Cable, E-Box to TCU (Neslab)	SV51142.102
Cable, Profibus	SV51142.103
Cable, RS485/Modbus RTU	SV51142.104
Cable, CANBus	SV51142.106
Cable, single RTD	SV51142.200
Cable, dual RTD Lemo connector (for Lauda TCU)	SV51142.201
Cable, dual RTD DB9 connector (for Neslab TCU)	SV51142.202
Cable, pressure sensor	SV51142.300
Cable, pH for K8S connector	SV51142.400
Cable, pH for VP6 connector	SV51142.401
Cable, conductivity sensor with VarioPin connector (Mettler Toledo)	SV51142.500
Cable, conductivity sensor with M12 connector (Jumo)	SV51142.501

Table 8.61. Ordering information for miscellaneous items (continued).

Description	Cat. no.
Cable, DC motor D-Sub, comm, and power	SV51142.600
Cable, auxiliary AC output	SV51142.800
Cable, AC motor power cable	SV50986.18
Motor, DC with integrated drive, 400 W, 7.5:1 gear ratio	SV51152.01
Motor, AC, 1 hp, 5:1 gear ratio	SV50237.29
Touchscreen Console	SV51151.01

Spare parts

For information about recommended spare parts, refer to the drawings supplied with the ETP.

8.6 Configurable options

See Figures 8.31–8.37 below for configurable options for the HyPerforma S.U.M. with Touchscreen Console.

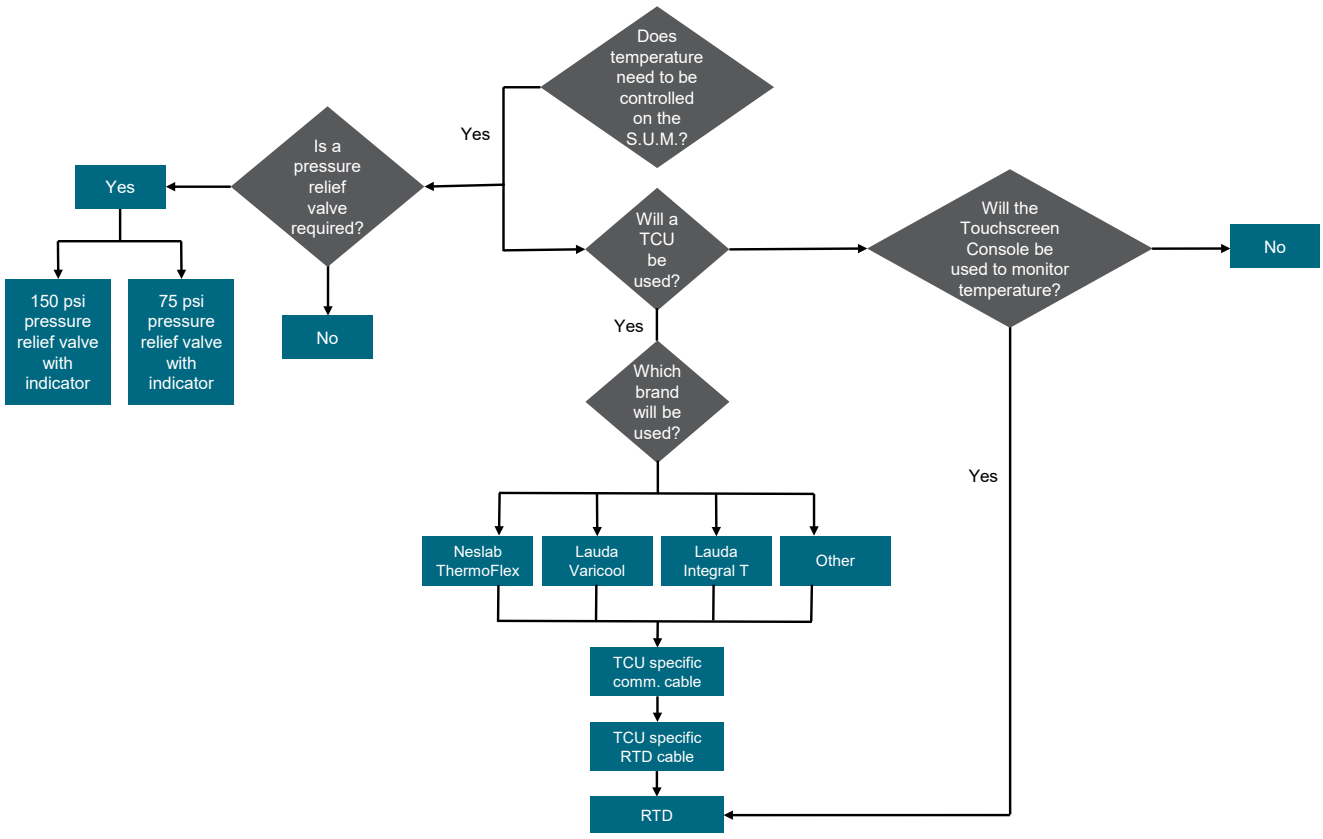


Figure 8.31. S.U.M. mandatory configurable options.

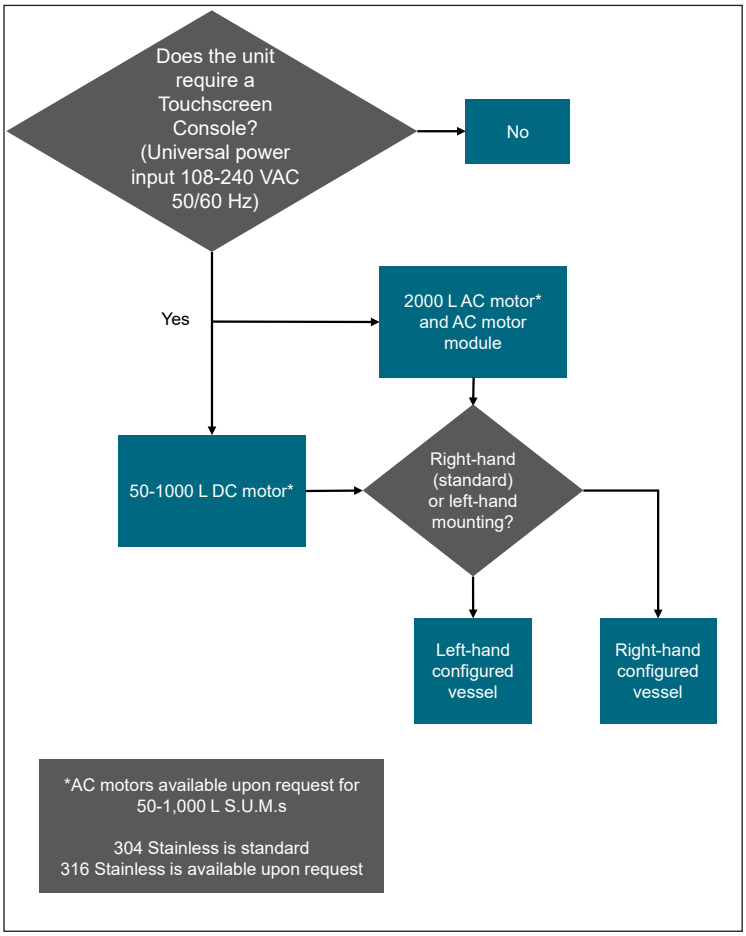


Figure 8.32. Motor options.

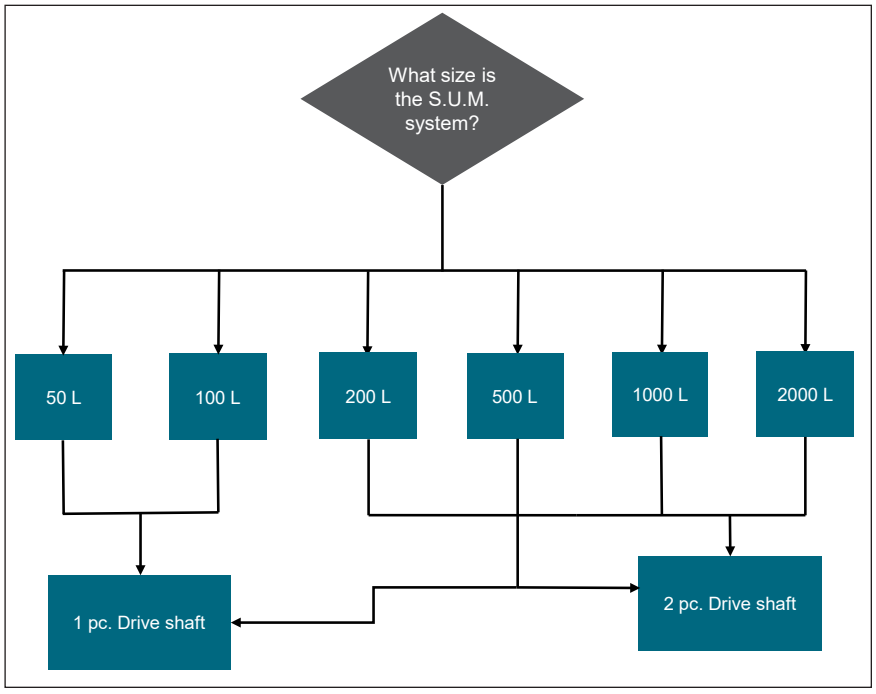


Figure 8.33. Drive shaft options.

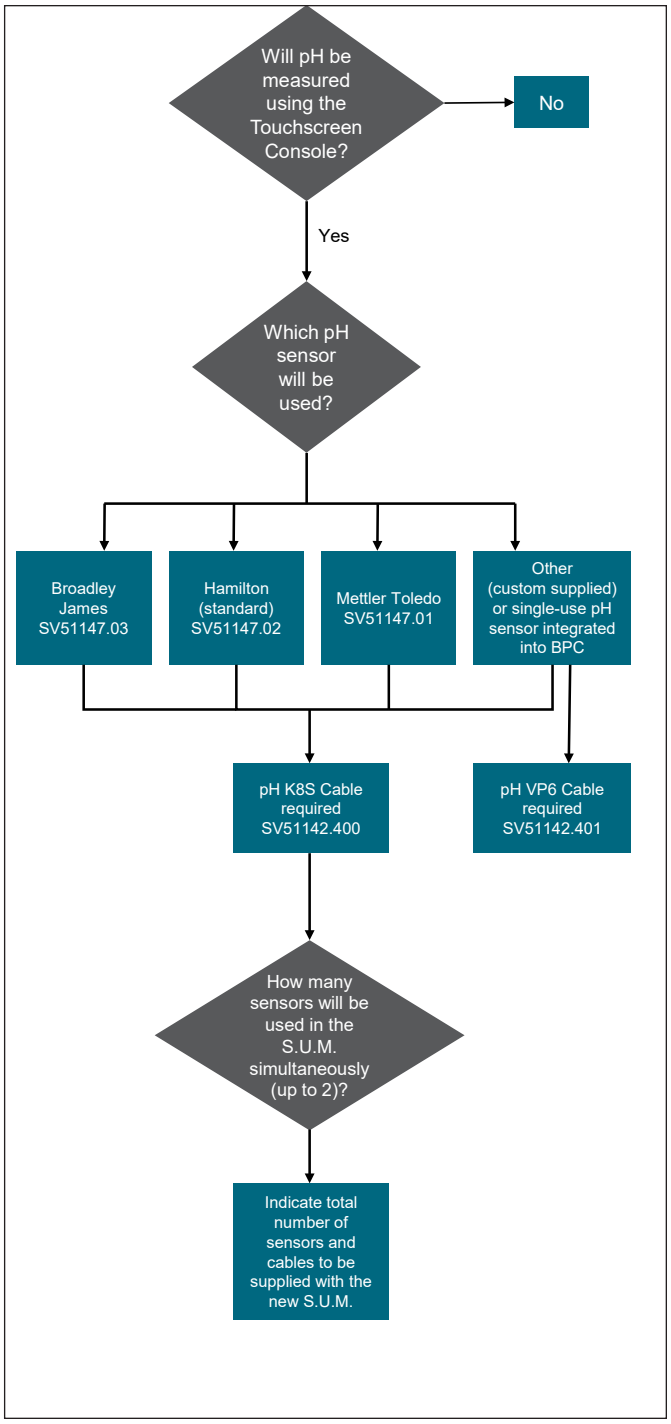


Figure 8.34. pH sensor options.

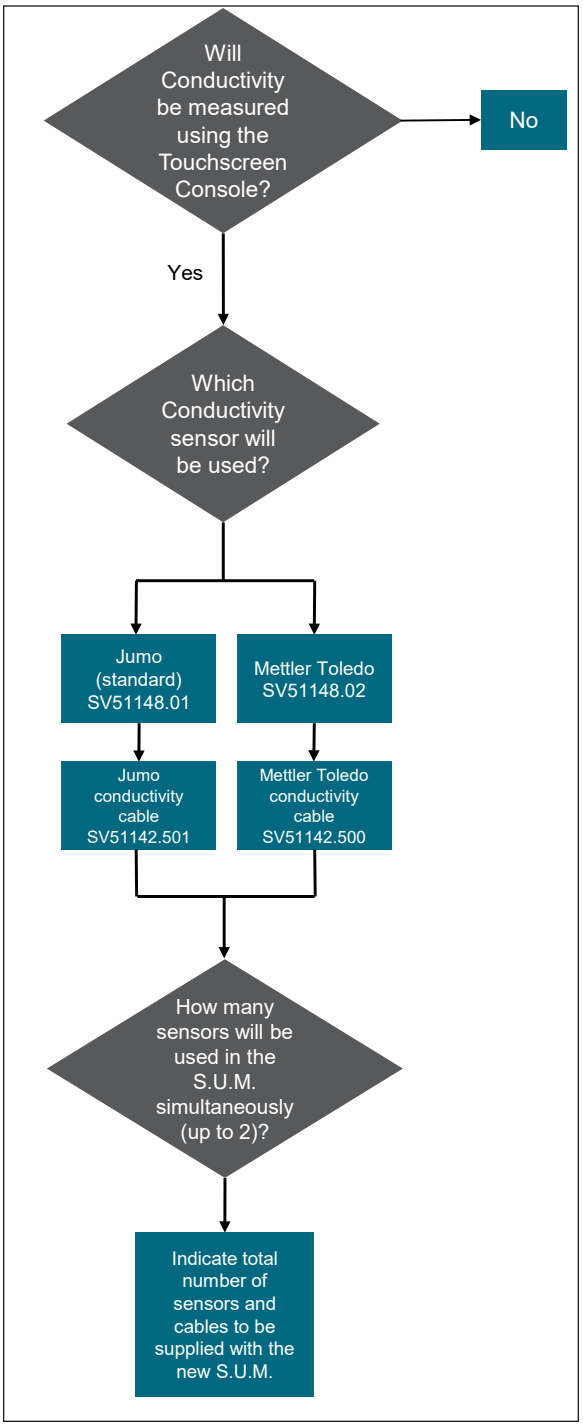


Figure 8.35. Conductivity sensor options.

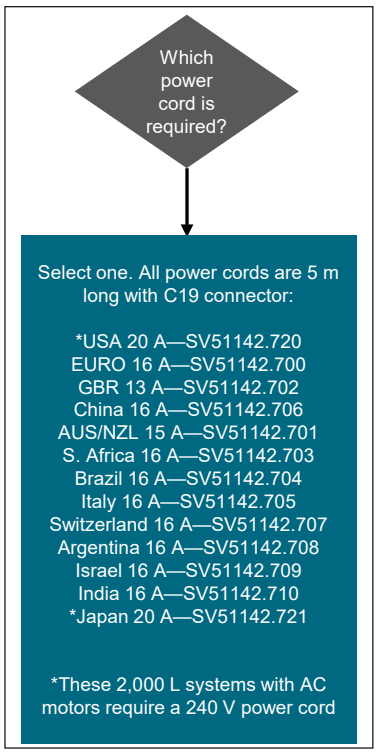


Figure 8.36. Power cord options.

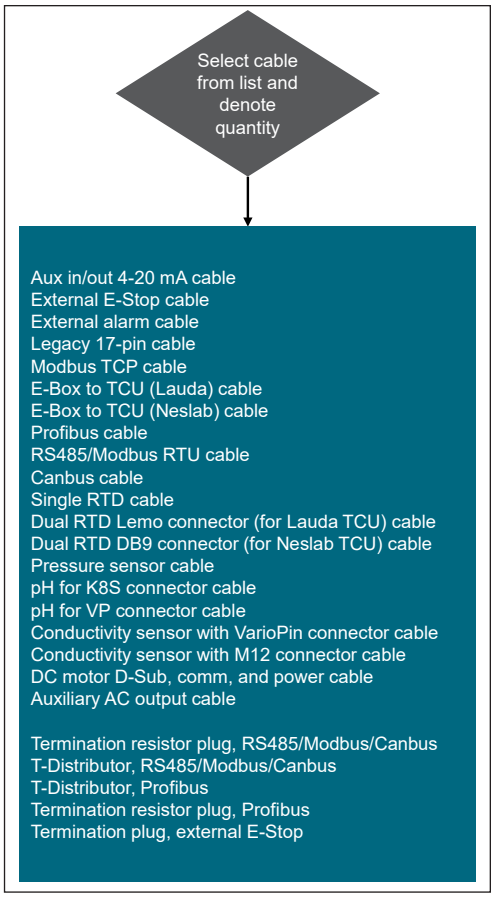


Figure 8.37. Cable options.

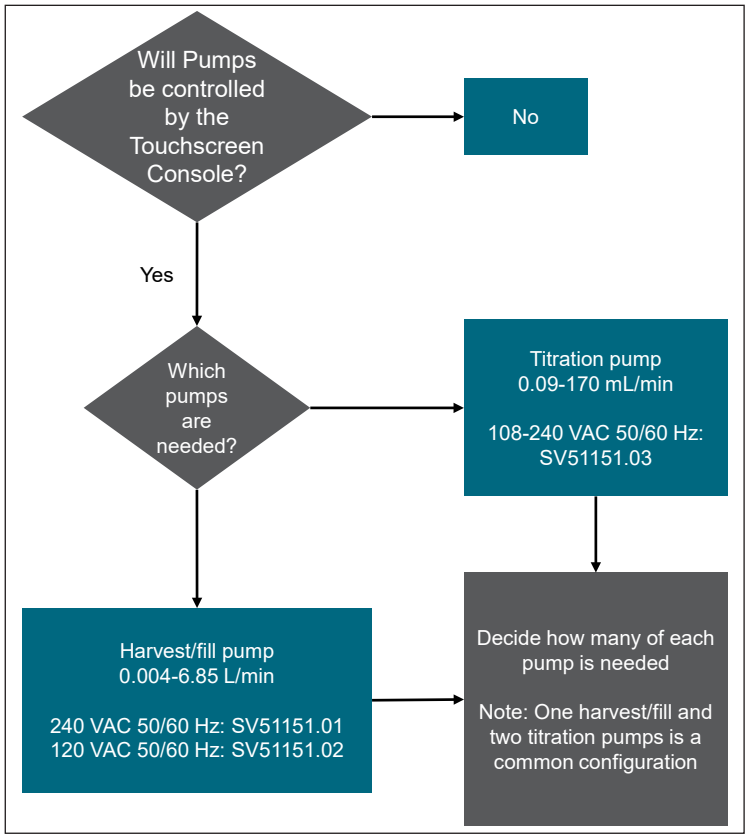


Figure 8.38. Pump options.

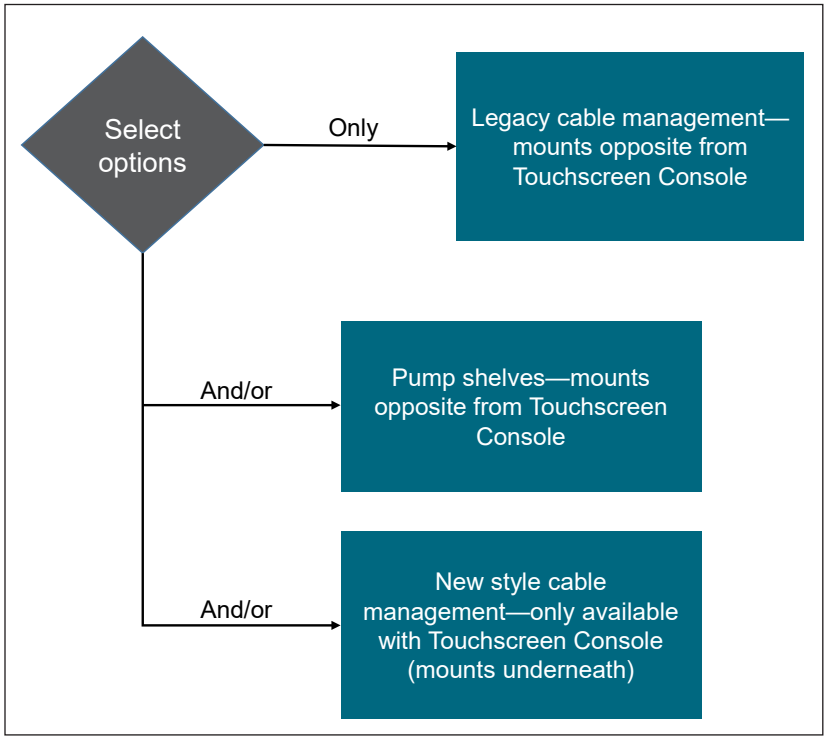


Figure 8.39. Secondary mounting options.

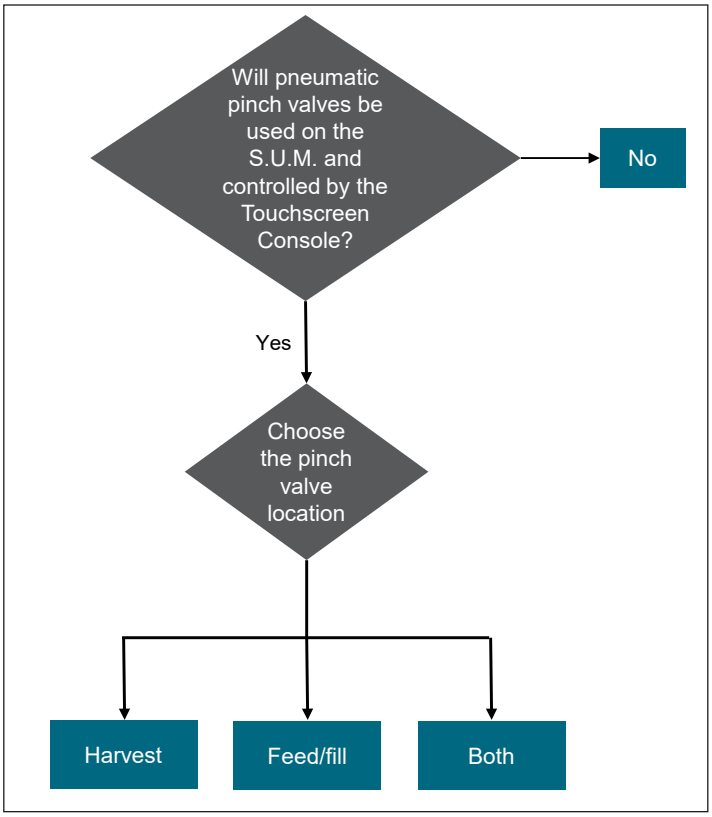


Figure 8.40. Pinch valve options.

9

General ordering information

Chapter contents

9.1 Ordering instructions

BPCs and hardware components for the HyPerforma S.U.M. can be ordered directly from Thermo Fisher Scientific. These items include all components that have part numbers beginning with the following digits:

- SH
- SV
- SUM

9.2 Ordering and support contact information

In the Americas and Asia
1726 Hyclone Drive
Logan, Utah 84321
United States
Tel: +1 435 792 8500
Email: customerservice.bioprocessing@thermofisher.com

In Europe
Unit 9 Atley Way
Cramlington, NE 23 1WA
Great Britain
Tel: +44 (0) 1670 734093
Fax: +44 (0) 1670 732537
Email: customerservice.bioprocessing@thermofisher.com

9.3 Technical support

Technical support for the HyPerforma S.U.M. is available in a variety of formats. Some or all of the following may be appropriate, depending on individual experience and circumstances.

Technical service hotline and email

Contact your Thermo Fisher Scientific sales representative for general product pricing, availability, delivery, order information, and product complaints.

Call +1 435 792 8500 (United States) or +44 (0) 1670 734093 (Europe, U.K.) for direct and immediate response to overall product questions, and product technical information (Technical Support). You can also contact Tech Support by emailing:
techsupport.bioprocessing@thermofisher.com

Initial setup and operation

Appropriate technical support is available to assist in the initial setup and operation of each S.U.M. system. If you require assistance in setting up and operating your S.U.M. system, please inquire at the time of purchase.

Training

Training can be provided for start-up and operation of the S.U.M. Contact your Thermo Fisher Scientific sales representative for more information.

thermoscientific

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

 DOC0042 Rev. E 1021

ThermoFisher SCIENTIFIC