



HyPerforma 5:1 Single-Use Bioreactor (S.U.B.)

For optimal cell culture performance

Industry-proven technology for consistent and reliable mammalian cell culture bioprocessing results

The Thermo Scientific™ HyPerforma™ Single-Use Bioreactor (S.U.B.) is one of the most widely used S.U.B.s designed for mammalian cell culture. We first launched the S.U.B. in 2006 and updated its design in 2013, while maintaining its robust, top-down, stirred-tank mixing system.

The S.U.B. has been widely adopted in process development and clinical trials as well as in bioproduction of cGMP cell culture. As a superior solution, our bioreactors can be easily integrated with any controller available in the market today.

The 3 key advantages of the HyPerforma S.U.B. are:

- Proven, widely used with more than 1,200 S.U.B.s installed
- Open architecture to allow interoperability with any available control system
- The S.U.B. works with single-use Thermo Scientific™ BioProcess Containers (BPCs) made with the most robust bioprocessing films available in the industry today—the Thermo Scientific™ CX5-14 and Aegis™5-14 films
 - Films have been tested for leachable and extractable (L&E) evaluation according to BioPhorum Operations Group (BPOG) guidelines

Functional and scalable

The HyPerforma S.U.B. equipment and BPC system are designed using traditional stainless steel bioreactor principles to help ensure optimal cell culture performance. The complete line of HyPerforma S.U.B.s includes 50, 100, 250, 500, 1,000, and 2,000 L sizes with a 5:1 turndown ratio for consistent scalability for final production.



Performance at the highest level

Ergonomic and elegant tank design

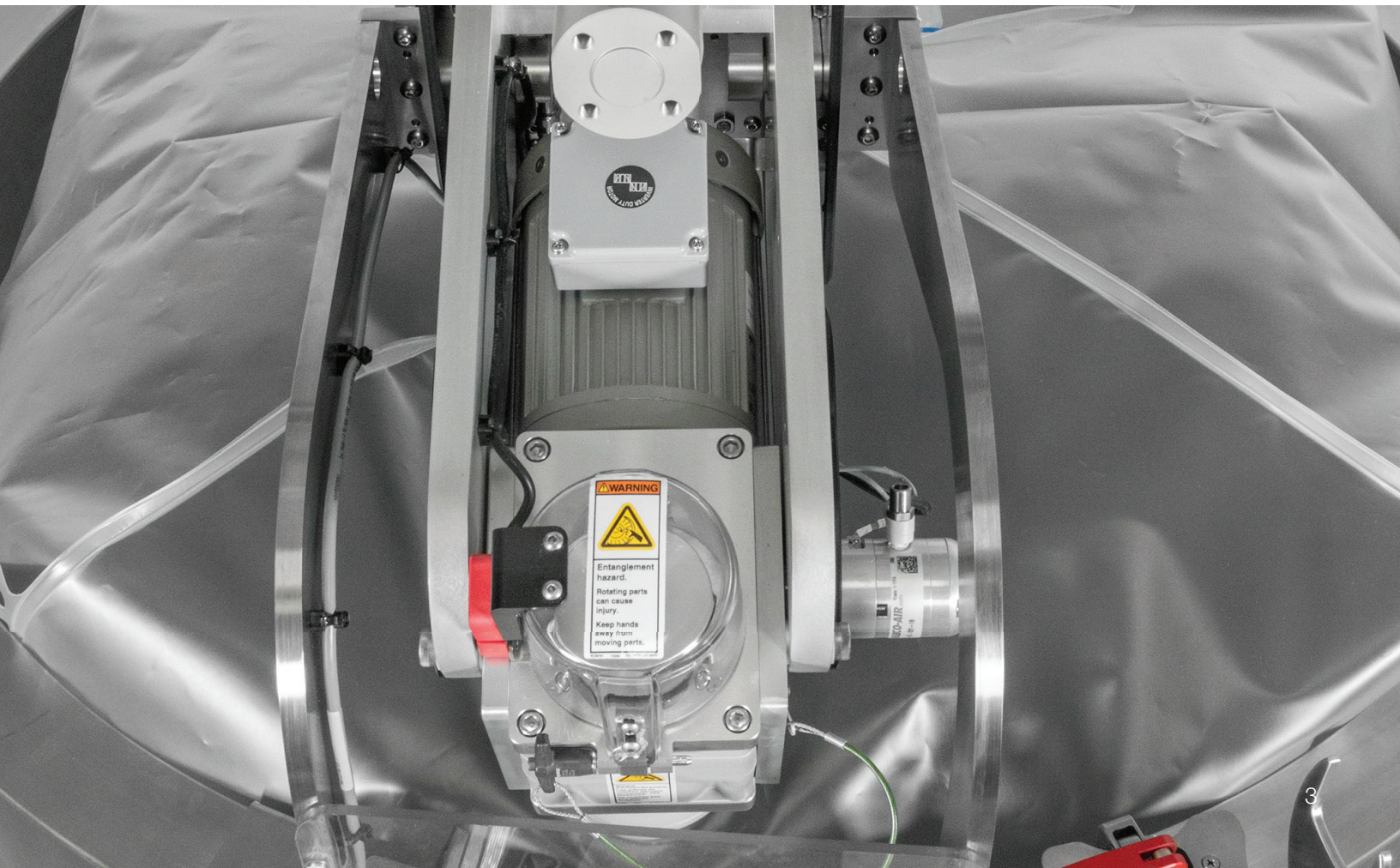
The S.U.B. is elegant in design while being highly functional, and it is designed to meet cGMP requirements. The S.U.B. tank provides operator ergonomics, a small footprint, and easy cleaning capabilities associated with an open-cart frame.

- Helps save precious lab space with a minimized vessel footprint
- Offers easier access to harvest lines with the open-frame design
- Reduce hold-up volumes with the smartly designed tank floor
- Simple bag loading with a vertical access door (available on 500, 1,000, and 2,000 L sizes; electromechanical hoist provided on 2,000 L S.U.B.)
- Pneumatic motor lift assembly for 1,000 and 2,000 L sizes is used to lower the impeller for proper mixing when 20% of fill volume is utilized

Efficient and fast

The water jacket design allows for fast heat-up and cool-down times, reducing process cycle time. The bottom water-jacketed systems increase surface area, improving heat transfer from low-volume cultures.

- Optimal precision load cells and standard sight-volume indicators allow you to keep your processes running efficiently
- Optional brushless DC motor includes encoder feedback for improved RPM accuracy and is ground-fault circuit-interrupter (GFCI)-compatible
- 3/8 in. dimple jacket improves flow rate through the water jacket for higher-performance temperature control
- Graduated sight-volume indicators accommodate visual volume references at a glance



Accessibility

Organized and ergonomic

Effectively manage the process of setting up and maintaining the S.U.B. with the following standard features:

- Dedicated and adjustable tool holder keeps necessary tools available for convenience and ease
- Load cell lockout clamps maneuver the S.U.B. easily utilizing a tri-clamp device
- Universal filter bracket easily adjusts to various heights and positions on the vessel and facilitates single or dual filters in either 6 in. and/or 10 in. filter sizes

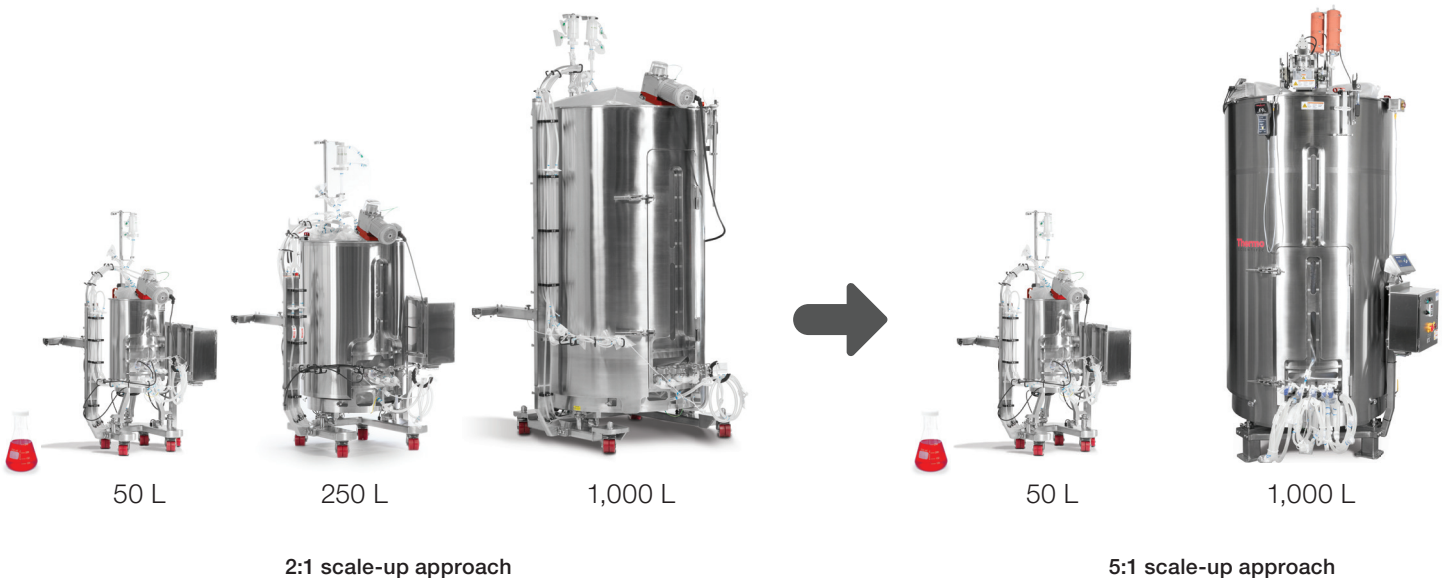
Additional options available

- Cable management system provides greater organization of electrical cables, tubing, and line sets, as well as makes the unit easier to clean
- Line labels provide rapid identification of tubing lines

5:1 S.U.B. benefits

We will build what you need, while maintaining our quality and delivery times. Through our open-architecture approach, we have developed a variety of single-use sensors, tubing, and connectors for customer design flexibility.

- Streamlining of bioprocesses by reducing seed-vessel requirements and maximizing process-vessel usage
- Seed vessels run at 20% volume; fill to larger volume (>40%) after 1–2 days
- Reduces hardware and single-use bag requirements
- Reduces cell transfers and associated adaptation
- 5:1 turndown ratio to run the 50 L bioreactor in as low as 10 L working volume or a 2,000 L bioreactor in as low as 400 L working volume







Controller choices

Adaptable and choice

The Thermo Scientific HyPerforma S.U.B. is offered with a Finesse™ DeltaV controller. This system was specifically designed and tested to be a complete out-of-the-box, ready-to-use solution for mammalian cell culture applications. Finesse Solutions, now a part of Thermo Scientific, provides additional strength in providing integrated products.

The user can also choose an open-architecture system, which allows you to integrate with any control of choice. Capital investment may also be reduced by utilizing a control system already in use in your facility. These systems work on DeltaV™, Allen-Bradley™, or Siemens™ software platforms.

The HyPerforma S.U.B. can be and has been integrated with many different controller systems. Please talk to your account representative about your specific controller integration needs.



HyPerforma S.U.B. with a G3Lite™ controller



BioProcess Container for the S.U.B.

Quality and performance

The BPCs for the HyPerforma S.U.B.s are available with our proprietary Aegis5-14 and CX5-14 films. We first introduced the CX5-14 film in 2001, and it is widely used in a majority of the global biopharmaceutical companies today for all bioprocessing steps. The Aegis5-14 film was introduced in 2013 and has the cleanest leachable profile.

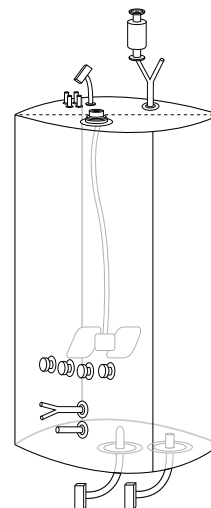
We have completed the BPOG L&E testing guidelines. As of August 2016, we are the only supplier who has completed the L&E testing for bioprocessing films according to that standard.

Key benefits

We can address your specific applications with either standard or customized configurations. The standard designs are configured for a variety of applications, while the custom designs are for customer-specific applications. The key benefits of our BPCs include:

- Uses the latest probe sensor technology in single-use or autoclavable probes

- Optional antifoam sensing technology
- Uses new crossflow sparger in conjunction with our drilled-hole sparger technology. Patented crossflow sparger allows for high mass transfer coefficient ($k_L a$) at lower seed volumes, scalable to full-volume cultures using the drilled-hole sparger. (Must be used with 5:1 S.U.B.s.)



Specifications

S.U.B. hardware specifications

	50 L	100 L	250 L	500 L	1,000 L	2,000 L
Liquid working volume	50 L	100 L	250 L	500 L	1,000 L	2,000 L
Minimum liquid working volume	10 L	20 L	50 L	100 L	200 L	400 L
Total reactor volume (not working volume)	65.5 L	120 L	316 L	660 L	1,320 L	2,575 L
Fluid geometry at working volume (height:diameter ratio)	1.5	1.5	1.5	1.5	1.5	1.5
Overall reactor geometry (height:diameter ratio)	1.9	1.9	1.9	1.9	1.9	1.9
Impeller (quantity x blade count)	1 x 3	1 x 3	1 x 3	1 x 3	1 x 3	1 x 3
Mixing rate range	30–200 RPM	30–200 RPM	30–150 RPM	30–150 RPM	20–110 RPM	20–75 RPM

S.U.B. hardware dimensions and weights

	Tank overall (including cable management tree: W x L x H)	Jacketed tank weight: dry/wet (at full working volume)
50 L	94.2 x 84.3 x 198.6 cm (37.1 x 33.2 x 78.2 in.)	141.2 kg (311 lbs) 191.2 kg (422 lbs)
100 L	98.5 x 91.2 x 201.5 cm (38.8 x 35.9 x 79.3 in.)	219.09 kg (483 lbs) 318.88 kg (703 lbs)
250 L	112.8 x 102.2 x 215.5 cm (44.4 x 40.25 x 84.4 in.)	248.9 kg (548.9 lbs) 498.9 kg (1,100 lbs)
500 L	125.2 x 124.4 x 251.1 cm (49.3 x 47.8 x 98.9 in.)	362.42 kg (799 lbs) 862.28 kg (1,901 lbs)
1,000 L	143.8 x 139.2 x 284 cm (56.6 x 54.8 x 111.8 in.)	655.01 kg (1,444 lbs) 1,655.21 kg (3,649 lbs)
2,000 L	179.7 x 171.4 x 355.5 cm (70.5 x 67.5 x 140 in.)	942.1 kg (2,078 lbs) 2,938.1 kg (6,478 lbs)

- Add 29.2 cm (11.5 in.) to overall system width if cable management tree is added.
- Filter bracket extends 56.9 cm (22.4 in.) above top of motor, height to top of filter bracket given.
- Electrical box adds 35 cm (13.8 in.) to system width, dimension with electrical box given in the table.
- All weights and dimensions are approximate measurements. Design request accruals will be presented.



Technical support: Knowledgeable and comprehensive

Our global field-based technical support team is available for local installation and technical support. A process development team is available for cell culture support, providing expertise on cell growth and troubleshooting. We can also provide you with additional support documentation upon request.

All systems are supplied with:

- Comprehensive user's guide
- Equipment turnover package (ETP)
- Validation guide

Ordering information

Description	Size	Cat. No.
HyPerforma S.U.B. products		
Jacketed S.U.B., 5:1, AC Motor, No E-Box, Load Cells without Display		SUB0050.8100
Jacketed S.U.B., 5:1, AC Motor, 120 VAC, E-Box, Analog Load Cells	50 L	SUB0050.8101
Jacketed S.U.B., 5:1, AC Motor, 240 VAC, E-Box, Analog Load Cells		SUB0050.8102
Jacketed S.U.B., 5:1, AC Motor, No E-Box, Load Cells without Display		SUB0100.8200
Jacketed S.U.B., 5:1, AC Motor, 120 VAC, E-Box, Analog Load Cells	100 L	SUB0100.8201
Jacketed S.U.B., 5:1, AC Motor, 240 VAC, E-Box, Analog Load Cells		SUB0100.8202
Jacketed S.U.B., 5:1, AC Motor, No E-Box, Load Cells without Display		SUB0250.8300
Jacketed S.U.B., 5:1, AC Motor, 120 VAC, E-Box, Analog Load Cells	250 L	SUB0250.8301
Jacketed S.U.B., 5:1, AC Motor, 240 VAC, E-Box, Analog Load Cells		SUB0250.8302
Jacketed S.U.B., 5:1, AC Motor, No E-Box, Load Cells without Display		SUB0500.8400
Jacketed S.U.B., 5:1, AC Motor, 240 VAC, E-Box, Analog Load Cells	500 L	SUB0500.8401
Jacketed S.U.B., 5:1, AC Motor, No E-Box, Load Cells without Display		SUB1000.9009
Jacketed S.U.B., 5:1, AC Motor, 240 VAC, E-Box, Analog Load Cells	1,000 L	SUB1000.9010
Jacketed S.U.B., 5:1, AC Motor, No E-Box, Load Cells without Display		SUB2000.9009
Jacketed S.U.B., 5:1, AC Motor, 240 VAC, E-Box, Analog Load Cells	2,000 L	SUB2000.9010
Additional products		
	50 L, 100 L	SV50992.01
	250 L	SV50992.02
Cable Management System	500 L	SV50992.03
	1,000 L	SV50992.04

Ordering information

Description	Size	Cat. No.
Load cells		
	50 L	SV50988.01
Load cell with Sum card, without display	100 L, 250 L	SV50988.02
	500 L	SV50988.03
BioProcess Containers, S.U.B., CX5-14 Film		
	50 L	SH31072.01
	100 L	SH31102.01
	250 L	SH31074.01
Bioprocess Container, S.U.B., 5:1, CX5-14, DHS/crossflow sparger	500 L	SH31076.01
	1,000 L	SH31132.01
	2,000 L	SH31138.01
Bioprocess Container, S.U.B., 5:1, CX5-14, DHS/crossflow sparger, with condenser	2,000 L	SH31137.01
BioProcess Containers, S.U.B., Aegis5-14 Film		
	50 L	SH31073.01
	100 L	SH31103.01
	250 L	SH31075.01
Bioprocess Container, S.U.B., 5:1, Aegis5-14, DHS/crossflow sparger	500 L	SH31077.01
	1,000 L	SH31133.01
	2,000 L	SH31135.01
Bioprocess Container, S.U.B., 5:1, Aegis5-14, DHS/crossflow sparger, with condenser	2,000 L	SH31136.01
Accessories		
Bioreactor Probe Assembly (nonsterile)		SH30720.01
Sterile Sampling Manifold, with luer-lock (individual)		SH30845.01
Sterile Sampling Manifold, with luer-lock (10 count)		SH30845.02
Heavy Duty Tubing Clamp (individual)		SV20664.01
Heavy Duty Tubing Clamp (10 count)		SV20664.03
S.U.B. Temperature/Sample Port		SV20750.01

Integrated solutions for bioproduction

Single-Use Mixers (S.U.M.s)

A variety of Thermo Scientific™ HyPerforma™ S.U.M.s up to 5,000 L for both upstream and downstream applications



Liquid- and dry-format media

We offer both custom manufacturing and a full range of chemically defined performance media and supplement products



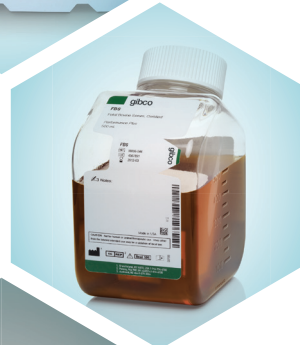
BioProcess Containers (BPCs)

A variety of configurations up to 2,000 L for liquid harvest, storage, and transportation



Sera

Our sera are well known for consistent quality and reliability



Single-Use Bioreactors (S.U.B.s)

50–2,000 L bioreactors capable of integrating with an existing control system



Buffers and process liquids

Custom and standard buffers and process liquids, including Gibco™ Water For Injection (WFI) quality water



Integrity testing systems

A true point-of-use integrity testing system to confirm the integrity of BPCs before use



Find out more at thermofisher.com/sub