THOMSON
Solutions At Work™

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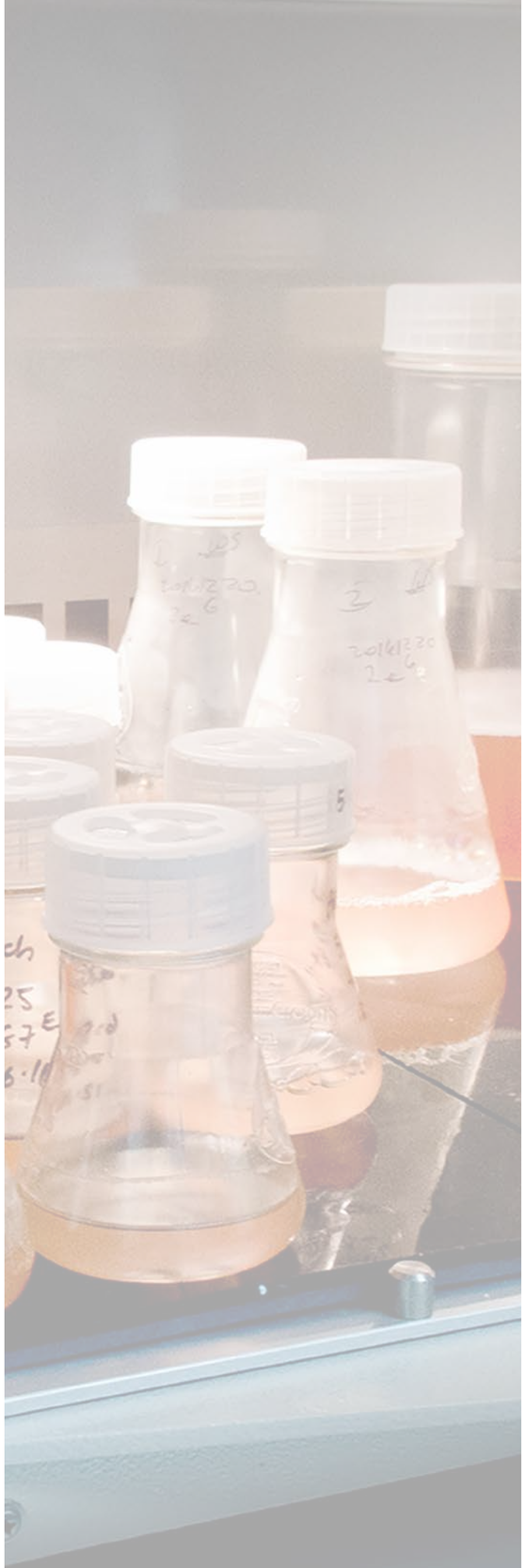
TIC-PL-082-301 Rev. E

THOMSON Solutions At Work™

Cell Culture Solutions Optimum Growth® System

Insect & Mammalian Cell Growth



Optimum Growth® System

Insect & Mammalian Cell Growth

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A Little About Thomson

Thomson Instrument Company has been positioned as a key contributor in the life sciences industry. We have successfully preserved our core values and commitment to innovation over decades. We have maintained our production facilities in the **United States**, ensuring that quality and product design remain at the forefront of our operations.

Our products remain at the forefront of innovation & utility

Our products are designed to meet the rigorous demands of scientific research, providing reliable, efficient solutions that support a wide range of applications. Thomson addresses the growing need for sustainability, offering solutions that enhance operational efficiency and reduce waste. One of our strategies for success is the collaborative approach with customers. Solving customer challenges by integrating unique design features into our offerings, Thomson has consistently enhanced the functionality of our products, setting us apart in the industry.

Our proactive approach ensures that Thomson remains at the cutting edge of innovation, capable of delivering solutions that meet the ever-evolving needs of our customers.

Solutions At Work™

Thomson's slogan **Solutions At Work**™ embodies our commitment to innovation and practical application. This range of single-use products designed to address the needs of various scientific fields, including pharmaceuticals, biotechnology, environmental sciences, food safety, toxicology, forensics, and contract manufacturing.

Thomson is known for developing disposable solutions that are crucial in life sciences: Cell Growth, Clarification, & Purification

Open to Collaboration

Thomson has been able to improve existing products by engaging with scientists and researchers, ensuring they remain indispensable tools in scientific research.

Customized Solutions

Whether modifying existing products or developing innovative solutions, we are committed to delivering products that provide practical solutions to meet the custom needs of our clients. This knowledge informs product development and helps inform research efforts in alignment with industry trends.

Product Quality

At Thomson, we have high standards of quality and excellence. Our products are rigorously tested and meet stringent quality criteria. Thomson has a state-of-the-art quality assurance process to test and validate our products.

Continuous Improvement

Thomson is committed to refining our products and processes to enhance performance and customer satisfaction.

Product Support

Recognizing the importance of effective product use, Thomson offers support to our customers by ensuring users are equipped with the knowledge and skills needed to maximize the benefits of Thomson's products.

As Thomson looks to the future, we aim to continue developing products that find solutions to your challenges in research experiments and contribute to meaningful advancements in life sciences.

ISO 9001 Certified by NSF-ISR

NSF-ISR
Registered to ISO 9001

Thomson Instrument Company is ISO 9001 certified by NSF-ISR for The procurement, sales, and distribution of labware, labware accessories, and ready prepared cell culture media to research, clinical, diagnostic, and testing laboratories for the pharmaceutical, biotech, healthcare, food and beverage industries. The products provided are supplied in sterile or non-sterile condition.

An Introduction to the Optimum Growth® System

The Optimum Growth® System consists of a broad range of working volumes for shake flasks, specialty shake flasks, transfer caps and the Rapid Clear® Cap for cell culture clarification prior to protein purification. The modular design of the Optimum Growth® System allows components to be used interchangeably and assures that small scale bioprocessing projects can remain GMP-compliant.

SHAKE FLASKS

Higher working volumes and improved aeration increase efficiency for expansion of mammalian cells

SPECIALTY SHAKE FLASKS

Feed / transfer and sampling ports enable our speciality flasks to serve as an aseptic system and mini-bioreactor, while also increasing working volume, aeration and mixing rates

TRANSFER CAPS

For seeding larger bags and fermenters, as well as filling flasks with media from a bulk source, providing time and cost savings to keep your lab operations running smoothly

RAPID CLEAR® CAP

Quickly and efficiently clarify cell culture media directly from the Thomson 5L Optimum Growth® shaker flask without the need for centrifugation

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Optimum Growth® Flasks

Thomson Optimum Growth® Flasks are designed for mammalian and insect cell culture, available in 125mL, 250mL, 500mL, 1.6L, 2.8L, 5L, and 7L volumes.

They are superior to traditional shake flasks due in part to the fact that they support a 40-50% fill volume, versus traditional flasks which have a fill volume of 25%.

By holding up to 2x more media, Optimum Growth Flasks greatly increase shaker cabinet efficiency.

Key Features

- Baffles designed for high aeration and low shear to maintain cell viability
- Same footprint as comparable Fernbach flask but with a 40-50% fill volume
- Less foaming than disposable Fernbach potentially eliminates additives
- 0.2µm Vented Cap simultaneously maintains high gas exchange and sterility
- Transfer Cap option connects directly to cell bags or bioreactors with multiple connection options
- Scalable flask line allows more flask sizes to be shaken on the same shaker, improving efficiency and flexibility versus other products
- Individually packaged and sterilized for immediate use

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All Sizes Shake At The SAME Optimal Shake Speed

Maximize Shaker Space Efficiency

Thomson Optimum Growth® Flasks in all sizes shaking at an optimal shake speed of 140-150 rpm on a 1” (2.54cm) throw shake platform.

Virtually every square inch of platform space is utilized

Space Saving More Volume

Optimum Growth® shake flasks combine conditions for excellent cell growth with space saving capability

18 x Optimum Growth® 1.6L Flasks Total Volume
16.2L/Shaker

12 x Optimum Growth® 2.8L Flasks Total Volume
16.8L/Shaker

7 x Optimum Growth® 7L Flasks Total Volume
35L/Shaker

Fill Volumes & Shake Speeds For Optimum Growth® Flasks

125mL - 5L
Best Working Volume 40-50%

Mammalian, Hybridoma, Insect & Microbial

Flask Size	Working Volume	RPM in 1" I 2"	Vol./Size ratio
125mL-LE*	20-40mL	100-120 I 90	16-32%
125mL	50-63mL	140-150 I 110	40-50%
250mL	100-125mL	140-150 I 110	40-50%
500mL	200-250mL	140-150 I 110	40-50%
1.6L	400-900mL	140-150 I 110	40-56%
2.8L	1.0-1.4L	140-150 I 110	40-50%
5L	2.0-2.5L	140-150 I 110	40-50%

*LE = Low Evaporation, small volume applications

7L Flask
Best Working Volume 40-70%

Mammalian, Hybridoma, & Microbial

Flask Size	Working Volume	RPM in 1" I 2"	Vol./Size ratio
7L	2.8-5L	140-150 I 110	40-70%

Insect

Flask Size	Working Volume	RPM in 1" I 2"	Vol./Size ratio
7L	6L	35	86%

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Optimum Growth® Flask FAQs

How to successfully change vessels from spinner flasks & roller bottles to Optimum Growth® Flasks?

Cells adapted to Spinner Flasks and Roller Bottles can be easily transitioned to Optimum Growth® Flasks. Adjusting existing cultures from different formats to Optimum Growth® Flasks requires reducing the volume and shake speeds of the first 1-2 passages. The addition of up to 1% of surfactant** to the media may be needed due to spinner flasks and roller bottles having lower shear than shake flasks. Once the cells have adjusted to the Optimum Growth® shake flasks utilize the recommended shakes speeds*.

* See chart with fill volumes and shake speeds.

** Thermo Fisher Scientific, P/N 24040032, or Sigma Aldrich®, P/N 59920C

Why do Optimum Growth® Flasks perform better than other disposable flasks for mammalian cell lines (CHO, HEK293, etc.) & insect cell lines (SF-9, SF-21, High Fives, Trichoplusia ni)?

Optimum Growth® Flasks are designed for high aeration and low shear. Optimum Growth® Flasks achieve high aeration due to a unique baffle design that has been optimized for mammalian and insect cell lines. They provide enhanced gas exchange with low shear mixing, which can increase yields significantly when combined with both nutrient enriched media and proper pH balance.

Are the Optimum Growth® Flasks single-use?

Yes, the Optimum Growth® Flasks are designed for single-use and are not autoclavable.

High cell death and a large amount of foam and/or cell clumping issues?

Experiencing high cell death and foaming in the Optimum Growth® Flasks is usually due to cell shearing. Adding up to 1% surfactant will reduce foaming and increase cell viability without stressing the cells.

What can I do if the doubling time for my cell culture is longer than expected when using the Optimum Growth® Flasks?

This varies between cell types and strains, as well as with environmental conditions. If the doubling time for your culture is taking longer than expected or desired in the Optimum Growth® Flasks, we recommend increasing the shake speed beyond our recommended speeds by 10 to 20 RPM. The reason for the increased doubling time is that the oxygen transfer rate (OTR) may be lower with higher fill volumes, and the increase in speed will increase the OTR.

What clamps and shakers work best with the Optimum Growth® Flasks?

Optimum Growth® Flasks are designed to shake in 1" or 2" orbit shakers. Recommended shakers include, Eppendorf®, INFORS HT®, Kuhner®, Fisher Scienfitic®, and VWR®. Utilizing a sticky mat or rug gripper pad is recommended for the 7L Flask and for under 170RPM. Clamps made for 5L Flasks may fit, check the flask clamp chart on page 10.

Clamp Compatibility Chart

Flask	Eppendorf®	Infors Ht®	Kuhner®	Fisher Scientific®	VWR®
125mL	M1190-9001	12202	SM310125	11-676-013	57019-676
250mL	M1190-9002	12203	SM310250	11-676-014	57019-678
500mL	M1190-9003	12204	SM310500	11-676-015	57019-682
1.6L	n/a	12205	SM311600	n/a	n/a
2.8L	ACE-2000S	12251	SM312800T	11-676-018	57019-686
5L	ACE-5000S	12209	SM313000F	236028	57019-696
7L	ACE-6000S	31282	101420 U5000	TBD	TBD

Experiencing difficulty removing the shake flasks from the sticky mat?

We recommend:

1. Spray ethanol on the sticky mat until you reach the desired stickiness. Ethanol will lower the bonding strength, as will any alcohol.
2. Use a rug gripper pad on top of the sticky pad.

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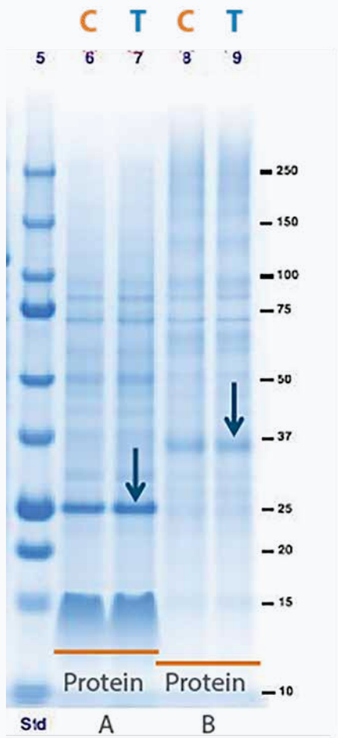
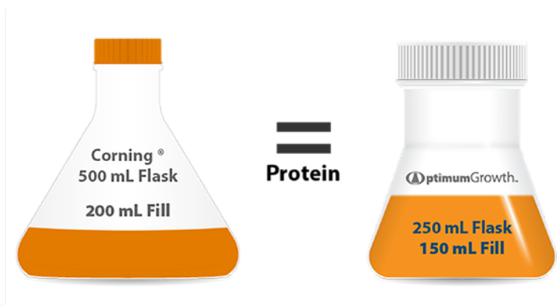
Traditional vs Optimum Growth® Flasks

Comparison of Two Expressed Membrane Proteins

- Corning® – 500mL flask, 200mL culture
- Thomson – 250mL flask, 150mL culture
- 4mL samples purified over Ni-NTA
- Protein A – Membrane protein of moderate expression, 34kDa
- Protein B – Membrane protein of low expression, 45kDa
- 12µL of elution resolved on a coomassie gel





Genentech
A Member of the Roche Group

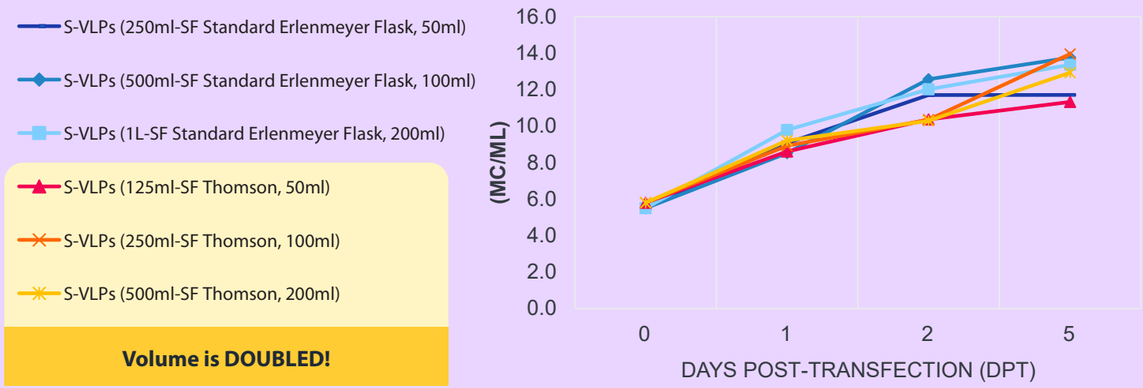
Conclusion

Thomson Optimum Growth® Flasks are equivalent to Corning® standard flasks in terms of expressed protein purity. However, with 40-50% fill volume, Optimum Growth® flasks can generate a far greater total protein yield per flask.

Thomson Solutions At Work™ is not affiliated with Corning® Life Sciences or Genentech

Thomson Flasks Consistently Maximize Expression Across 125mL, 250mL, & 500mL Flask Sizes

Thomson vs Standard Erlenmeyer Flask S-VLP Production by Transient Growth in C2



Production Details:

Cells seeded 2 days before transfection. Cells diluted on transfection day with 25% fresh media. Transfection density= 5.65 mc/ml. Cells were feed 1 day post transfection. On day 5 cells were harvested for analysis

Volumetric Titer Comparison (µg/ml)

Production Flask & Volume	Standard Erlenmeyer Flask	Thomson
20mL	25.0	31.8
100mL	20.9	25.0
200mL	25.7	29.0

National Research Council Canada NRC·CNRC

Data from CNRC

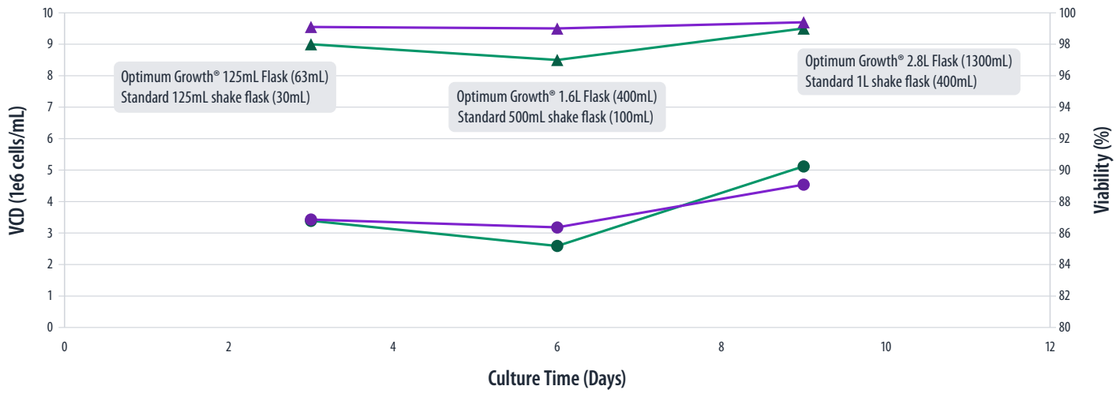
Thank you to YVES durocher group.

Thomson Instrument Company is not affiliated with Corning® Life Sciences or their products.

Optimum Growth® Flasks Offer Ease of Use With Consistent Growth During Scale Up

CHO-K1 Transient Cell Line

Scale Up Performance



● = VCD

Δ = Viability

Optimum Growth® Flask

Standard Flask

Optimum Growth® Shake Flask:

63mL → 400mL → 1300mL

Standard Shake Flask:

30mL → 100mL → 400mL → 2.5L

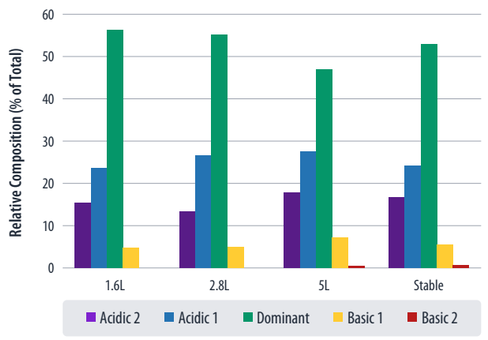
- Consistently high viability and VCD in Optimum Growth® flasks assures quick scale up to high volumes at an accelerated rate.
  - We have the capabilities to scale up much quicker (skipping intermediate scale up steps with traditional flasks).
  - Higher fill volumes aids in less consumables being used and better growth leads to less media being required for large scale up.

Fill Volume & Shake Speed Were Optimized to Assist With Low Survivability Post-Transfection

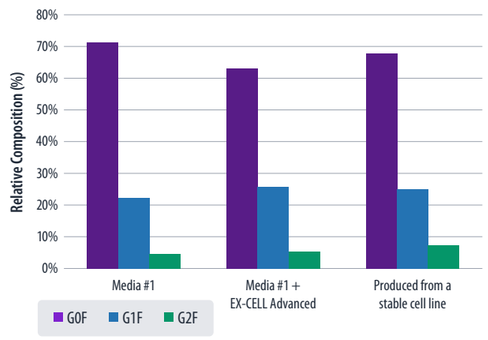
Vessel Sizes	Growth Recommendations	Transfection Recommendations	Assay Recommendations
10.4mL square well round bottom – 24 deep well plate	12.5mm throw 320rpm shake 4.5mL fill volume	12.5mm throw 300rpm shake 3mL fill volume	12.5mm throw 300rpm shake 3.5mL fill volume
125mL Optimum Growth® Flask	50mm throw 110rpm shake 63mL fill volume	50mm throw 90rpm shake 47mL fill volume	50mm throw 90rpm shake 55mL fill volume
1.6L Optimum Growth® Flask	50mm throw 10rpm shake 900mL fill volume	50mm throw 90rpm shake 675mL fill volume	50mm throw 110rpm shake 780mL fill volume
2.8L Optimum Growth® Flask	50mm throw 110rpm shake 1.4L fill volume	50mm throw 90rpm shake 1.05L fill volume	50mm throw 110rpm shake 1.21L fill volume
5L Optimum Growth® Flask	50mm throw 90rpm shake 2.5L fill volume	50mm throw 90rpm shake 1.9L volume	50mm throw 90rpm shake 2.19L fill volume

Protein Quality

Charge Variants of Vessel Sizes - Average



Glycosylation Profiles



Summary

- High levels of transient production can be obtained using a combination of off the shelf products:
  - CHO-K1 derived cell line
  - Thomson Instrument Company Optimum Growth® Flasks
  - Two separate transient transfection kits
- Optimum Growth® flasks support seamless scale up from 24 deep-well plates through 5L flasks with consistency in growth, productivity, and protein quality, enabling transient work for biotherapeutic applications

Comparison - Traditional vs Optimum Growth® Flasks

Data provided by Curia Global formally Lake Pharma

Background Information

The purpose of this study was to compare cell growth, cell viability and subsequent protein yields between traditional and Optimum Growth® shake flasks

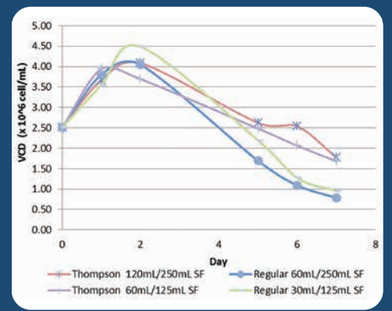
Conditions

Case 1: HEK-293 Transient production- seeded at 2.5x106 cells/mL and incubated at 37°C, 5% CO2. Supplemented with feed on day 1. Cells were harvested on day 7.

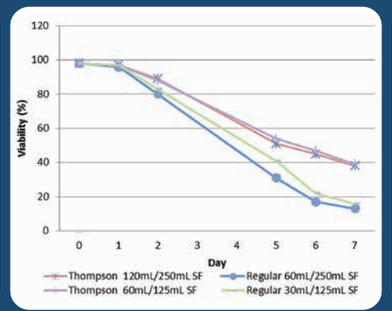
Case 2: CHO Stable pool production- seeded at 0.8x106 cells/mL and incubated at 37°C, 5% CO2. Supplemented with feed and glucose as needed. Temperature shift to 32°C on day 5. Cells were harvested on day 14.

HEK-293 Transient Production Results

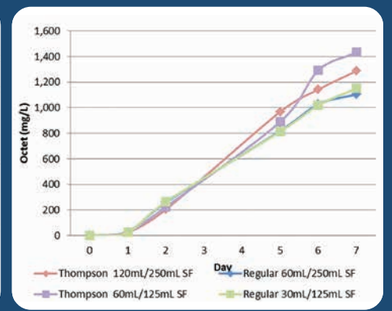
Optimum Growth® Flasks show better cell viability, a higher protein concentration and, due to having 2X greater volume, a higher total protein yield.



VCD



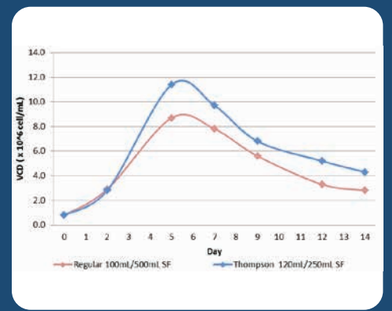
Viability



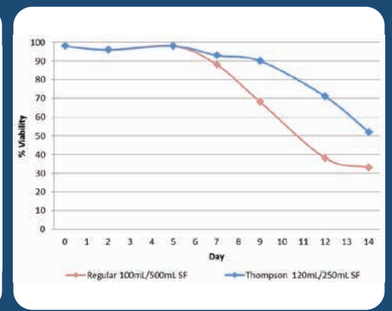
Protein Titer

CHO Stable Pool Production Results

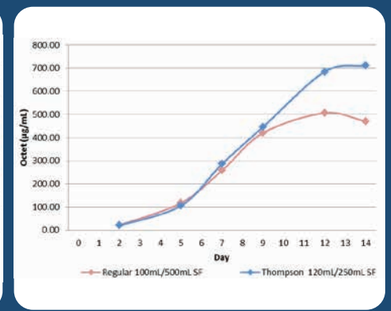
Optimum Growth® Flasks show better cell viability and a higher protein concentration in a smaller footprint shake flask.



VCD



Culture Viability



Protein Titer

curia

Data provided by Curia Global formally Lake Pharma, Thomson is not affiliated with Curia

Replace TPP Tubes

Mid-Scale Bioprocessing Solutions

The design of Thomson 6-well plates provides a mid-scale volume for suspension cell growth and optimizes production yields. The sterile 6-well plates have been tested for their uniformity and reliability, ensuring consistent results across experiments, which is essential for reproducibility in production settings. These plates are specifically engineered for better gas exchange and nutrient flow, which can significantly increase productivity and growth.

Key Features

- 20-50mL working volumes, optimize conditions to your experiments
- Contributes to consistent cell growth & viability by promoting uniform aeration & nutrient distribution
- Results scalable from Optimum Growth® 6-well plate to our 7L Flasks

Universally Compatible

The Thomson 6 Well Plates work seamlessly with Infors™ Peg Tray Adapter (Part# 12653.2.2 for 4 plates; Part# 12654.2.2 for 6 plates), universally compatible with any shaker for stable 50 mL volumes under recommended agitation. Alternatively, the Kuhner™ Spring Tray F (Part #104825) offers precise positioning and efficient handling, enhancing stability and performance.

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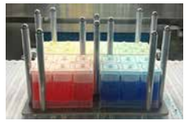
Working Volumes Ranging From 20ml to 50mL Per Well

Optimum Growth® Integrated Lid (patent pending)



Infors™ Peg Tray Adapter
(Part# 12653.2.2 for 4 plates)
(Part# 12654.2.2 for 6 plates)

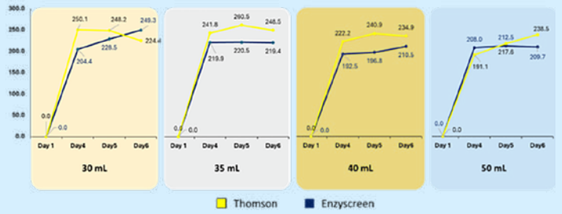
Kuhner™ Spring Tray F system
(Part# 104825)

CHO Transient & Expi293F Cell Line Data

CHO Transient

CHO Transient Expression of mAb Up to 50mL

Titer (µg/mL) over time

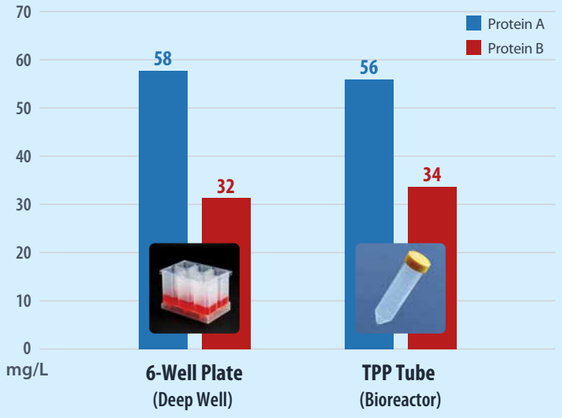


Study 1 | Large Pharma Customer

In collaboration with a major pharmaceutical manufacturer, we evaluated the platform's performance using a CHO transient expression system for monoclonal antibody production. The study examined immunoglobulin G (IgG) titer across multiple working volumes up to 50mL. Analysis of protein expression data demonstrated consistent IgG titers regardless of culture volume, validating the system's capability to maintain optimal production conditions throughout the working range. These results confirm the platform's ability to support reliable process scaling while preserving critical quality parameters, enabling efficient transition from development to production scales.

Expi293F™ Cells

User-Friendly Format for Maximizing Throughput



Study 2 | Biopharma Customer

A comprehensive evaluation conducted by a biopharma company compared protein expression efficiency across multiple culture formats using Expi293F™ cells. The study systematically assessed protein production and the study systematically assessed protein production in Thomson 6-well plates, and conventional 50mL spin tubes under standardized conditions. Thomson 6-well plates, and conventional 50mL spin tubes under standardized conditions. Quantitative analysis of purified protein yields demonstrated that 6-well plate systems achieved equivalent or superior production levels compared to traditional spin tube methods. These results validate the platform's capability to maintain high-level protein expression while offering enhanced throughput capacity and operational flexibility for advanced bioprocessing applications.

Thomson | Solutions At Work™ is not affiliated with enzyscreen, or TTP Tube.

Mammalian & Insect Cell Lines

Well Count	Working Vol.	Shake Speed	Throw
6	20-50mL	225RPM	25mm
24	4-5mL	350RPM	12.5mm
96	500µL	900RPM	3mm

Optimum Growth® Special Flasks

Components For Closed Systems

Thomson Optimum Growth® Special Flasks were designed for the unique needs of small-to-medium-scale bioprocessing applications.

Sampling Flasks

Optimum Growth® Sample Flasks with one-way sampling valves that help reduce viable cell count sampling times

Key Feature

- Eliminate the need to remove flask caps & allow aseptic sampling on the benchtop

Multiport Flasks

Optimum Growth® Multiport Flasks serve as closed systems with feed/transfer and sampling ports

Key Features

- Feature feed/transfer ports for seeding larger bioreactors or for batch feeding medium sized cultures
- Both aseptic sampling valves & feed/transfer ports make the 1.6L, 2.8L and 5L flasks a closed system that does not need to be opened

Sampling Flasks

Four Optimum Sizes

125mL

250mL

500mL

5L

Sampling In the Shaker

Thomson's improved sampling method allows you to sample directly in the shaker without the need to remove caps or use a deteriorating needle septum.

1. Open shaker
2. Attach syringe to sampling port and withdraw the sample
3. Remove syringe & close shaker

Several Options for Aseptic Sampling

Optimum Growth® Flasks provide several options for aseptic sampling in all flask sizes. The 125mL, 250mL, and 500mL Optimum Growth® Flasks have an optional 1-way valve in the vented sample cap. The 5L Optimum Growth® Flask has an optional 1-way valve in the side of the flask.

Vented Sampling Caps

The Vent Cap of the Optimum Growth® Sampling Flask incorporates a 1-way valve that only allows media to flow out of the flask. This eliminates contamination and allows for aseptic sampling of cells while the flasks remain in the shaker or on the benchtop, eliminating the need for transfer to the hood from the shaker.

Optimum Growth® Sampling Flasks come with a 0.2µm PTFE vented cap for optimum aeration during cultivation. The Thomson vented caps create a safe aseptic barrier from harmful contaminants, while the large surface area creates an optimum air exchange for cell growth.

Multiport Optimum Growth®
Transfer & Feed Flasks

Developed as a Custom Product

The Multiport Optimum Growth® Flask was developed out of the need for biopharmaceutical companies to ensure the elimination of contamination risk. The multiport flasks allows for completely closed system aseptic processing.

Steps Include:

1. Addition of media to the flask
2. Inoculation
3. Feeding
4. Sampling

Sized From 125mL to 7L

125mL

250mL

500mL

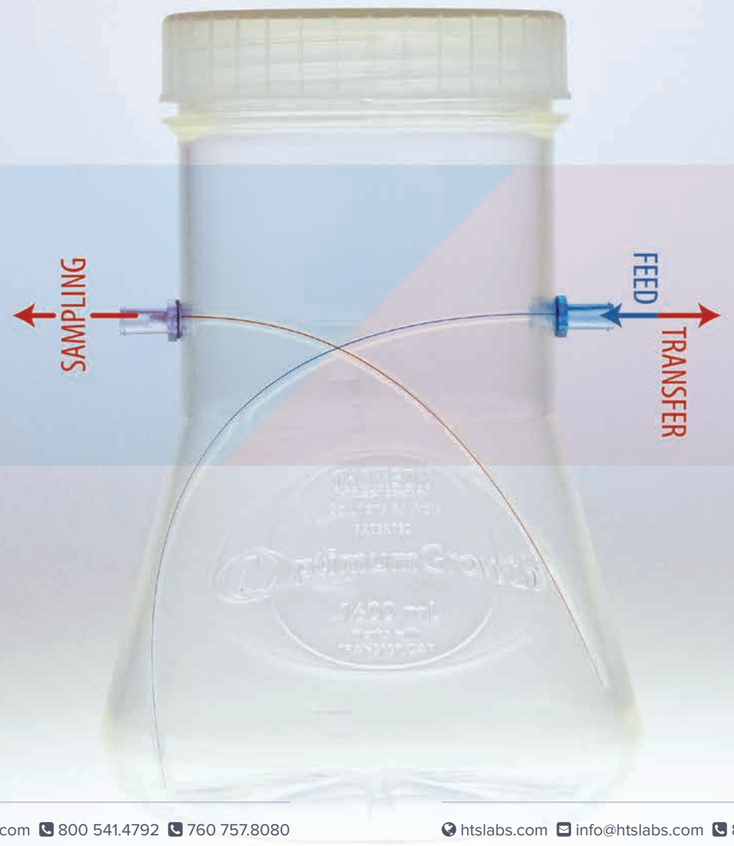
7L (1/8" I.D.)

1.6L

2.8L

5L

7L (1/4" I.D.)



Sample Port Side

- Allows viable cell count sampling while the flask remains in shaker or on benchtop
- No need to decontaminate and open the flask cap
- Ensures contamination-free processing

Transfer/Feed Side

- Tube fusing for media addition, inoculation, feeding
- Transfer to larger vessel maintaining sterility
- Eliminates the need to inoculate using expensive and awkward cell bags
- Contamination-free processing by never needing to open the flask cap

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An Introduction to Transfer Caps & How They Work

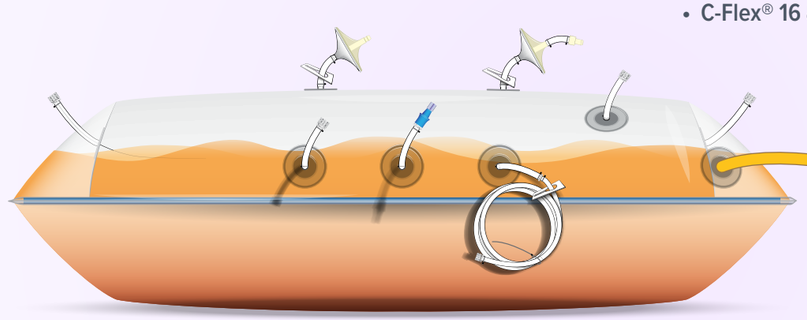
Thomson Transfer Caps are used with our Optimum Growth® 1.6L, 2.8L & 5L flasks for aseptic transfer of cells or media into any vessel. Transfer Caps eliminate the need to move cells to an intermediate vessel for scale-up or to seed cultures. Transfer caps enable reagent addition, seeding of larger bioreactors or cell bags, and media transfer.

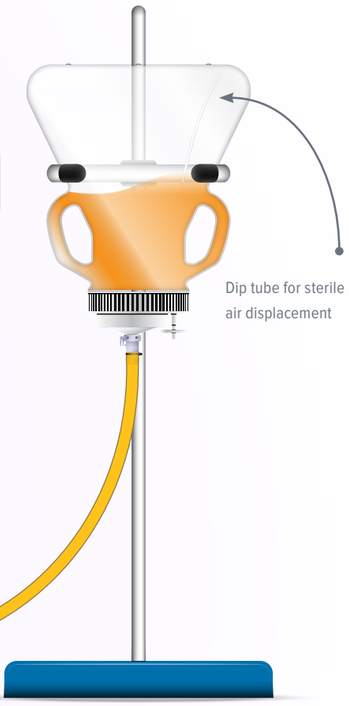
Inversion Transfer Caps

Utilize Gravity Feed for Simple Aseptic Transfer of Media or Cells

Key Features

- Gravity feed keeps cells stress free
- Dip tube attached to 0.2µm syringe filter provides aseptic air displacement
- Configurations include with & without attached tubing to accommodate a variety of vessel connections
- C-Flex® 16 & 24 tubing sizes available for tube fusing





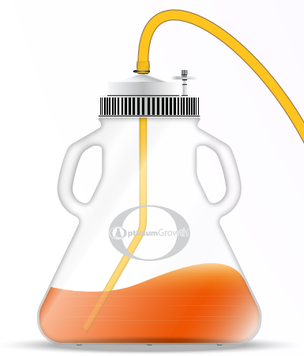
Stand & ring sold separately

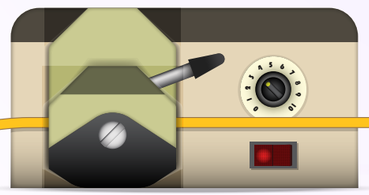
Bidirectional Transfer Caps

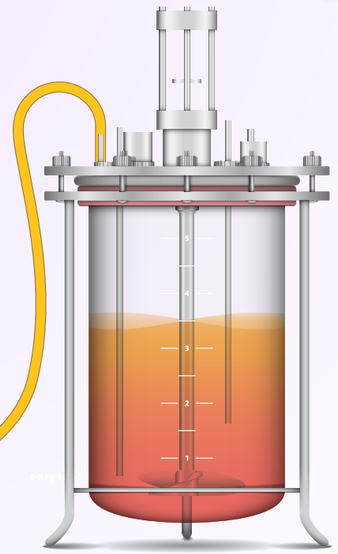
Utilize a Peristaltic Pump for Easy Aseptic Bidirectional Transfer of Media or Cells

Key Features

- Equipped with 2’ of 1/4” OD C-Flex® 16 tubing for pumping, ending with either a plug or male Luer lock
- Downstem allows for bidirectional transfer
- 0.2µm PTFE syringe filter provides aseptic air displacement while pumping







C-Flex® 16 ID: 1/8” (3.1mm), OD: 1/4” (6.35mm)

C-Flex® 24 ID: 3/16” (4.76mm), OD: 7/16” (11.1mm)

0.2µm PTFE filter allows aseptic air displacement with dip tube during inversion transfer

Works with 1.6L, 2.8L, & 5L Flasks

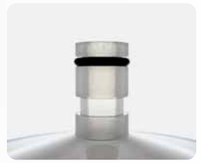
Connecting a Vessel to an Inversion Transfer Cap

Inversion Transfer Caps are available in two configurations:

- Without tubing
- With tubing in either C-Flex® 16 or 24

For Vessels That Include Their Own Tubing and Connections

1/4” OD Barb Quick Connect



7/16” OD Male Quick Connect

For Vessels That Include a Female Luer Lock Connection

Male Luer Lock

For Vessels That Include C-Flex® 16 or 24 for Tube Fusing

Tube Fuse

C-Flex® 16 ID: 1/8” (3.1mm), OD: 1/4” (6.35mm)

C-Flex® 24 ID: 3/16” (4.76mm), OD: 7/16” (11.1mm)

Connecting A Vessel to a Bidirectional Transfer Cap

Bidirectional Transfer Caps configurations:

- C-Flex® 16 with plug on terminus for tube fusing
- C-Flex® 16 with male luer lock on terminus

Tube Fuse

For Vessels That Already Include C-Flex® 16 for Tube Fusing

Male Luer Lock

For Vessels That Already Include a Female Luer Lock Connection

Works with 1.6L, 2.8L, 5L, & 7L Flasks

C-Flex® 16 ID: 1/8” (3.1mm), OD: 1/4” (6.35mm)

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Rapid Clear® Cap

Revolutionary Technology in Downstream Processing

The Thomson Optimum Growth® System of products expanded into downstream processing with a revolutionary new technology that allows high speed clarification of cellular material. Thomson developed the Rapid Clear® Cap to address the needs of scientists to quickly and efficiently clarify cell culture media directly from the Thomson 5L Optimum Growth® shaker flask without the need for centrifugation.

Clarify 3L of Cell Culture In < 30 Minutes with No Centrifugation Required

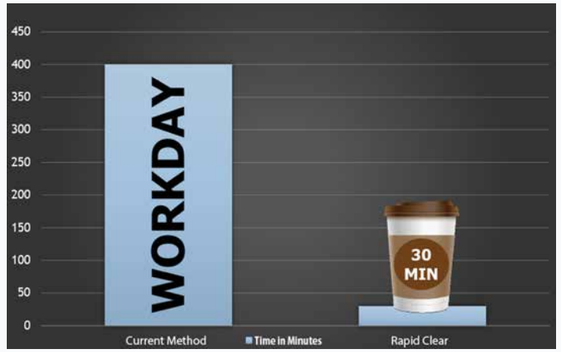
Key Features

- Depth filtration with a 0.2µm final pore size eliminates multiple filtration steps and in most cases centrifugation
- Significant time savings versus traditional spin down technique
- Cell culture clarification of low or high density cultures of CHO stable, CHO transient, HEK293, hybridoma, and other mammalian cell lines
- Eliminates transfer steps: The Rapid Clear® Cap screws directly onto the Optimum Growth® Flask
- Secondary cap attaches to a new Optimum Growth® Flask or to a storage container with a Luer lock
- Solid Caps are also available for long-term storage of clarified media in the 2.8L or 5L receiving flask

Key Benefits

- Save time, clarify 3L of cell culture in less than 30 minutes – with no centrifugation required!
- Reduce consumables used by up to 90%
- Walk away convenience and safety – minimize endotoxin exposure

Win Your Day Back
With Faster Filtration!



Time In Minutes
Clarify your cultures in under 30 minutes

CHO & Hek293 Filtration
Quick cell harvest for mammalian cells

Less Components
Equals Less Waste

Current Method
- 4 x filter funnels
- 6 x containers
- Centrifugation Needed

New Method
- 1 x Optimum Growth® Flask
- 1 x Rapid Clear® Cap

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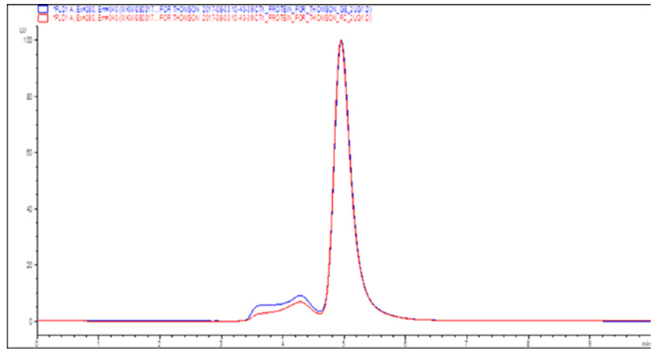
A Comparison
Rapid Clear® Cap to GE® Capsule Filters

HPLC was utilized to quantitate intact protein for each of the purified solutions. The Rapid Clear® System yielded a slightly higher quantity of intact IgG, than the GE® capsule columns.



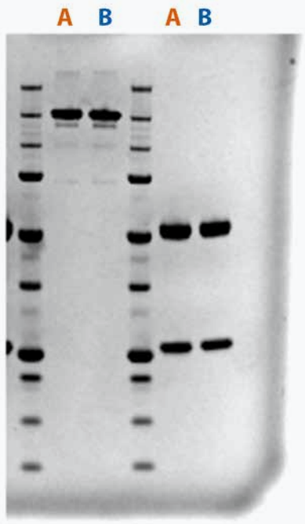
HPLC comparison of the purified IgG. The Rapid Clear® Cap 3000 is the red line and GE® the blue line

Both GE® and Rapid Clear® clarified IgG were run on an SDS Page gel for comparison: Lanes 1 & 4 are molecular weight standard ladder; Lanes 2&3 are non-reduced; lanes 5&6 are reduced.

- 1 ug of post proA protein per lane
- Both Reduced and Non-reduced samples
- 4-12% Bis Tris Gel from Life Tech
- Run in MES buffer @ 200 V for 30 minutes
- Stained with Safe Stain
- Ladder is Precision Plus from Biorad

A= GE® filtered material

B= Rapid Clear®filtered material



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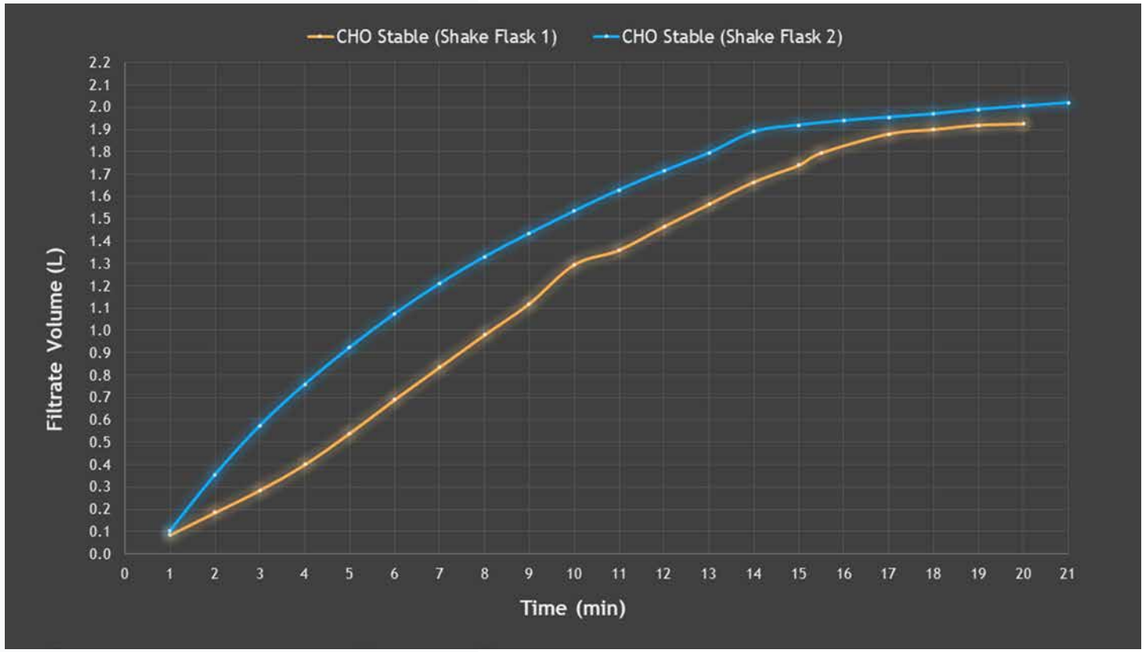
Reduce Operating Costs by Increasing Efficiency & Minimizing the Number of Consumables Used

When producing biologics, cell yield, viability and effective clarification are critical. Thomson's patented Optimum Growth® Flask design facilitates good mixing and high gas exchange rates to produce high density yields of viable cells. Thomson has used its expertise in filtration to develop the Rapid Clear® Cap 3000 to speed up the clarification process. This innovation reduces operating costs by increasing efficiency and minimizing the number of consumables used.



Duplicate 3L CHO Stable cell cultures were clarified using the Rapid Clear® 3000. This graph compares the volume clarified over 21 minutes.

Quick & Easy To Use

Using the Rapid Clear® Cap 3000 is quick and easy. Once the mammalian or insect cell culture is ready for clarification, simply remove the vent cap and replace it with the Rapid Clear® Cap 3000. The chart provides the approximate time*** to clarify cell cultures based on cell type, viability and volume to be filtered. The higher the viability the faster the filtration.

- Grow cells in a 2.8L or 5L Optimum Growth® Flask
- Transfer the flask to a hood to replace the Vent Cap with the Rapid Clear® Cap
- Replace the Vent Cap on the receiving 1.6L, 2.8L, or 5L Optimum Growth® Flask with the receiving cap that comes with the Rapid Clear® Cap
- Remove from hood and place tubing in the pump head, see pump recommendations***
- Tilt the flask slightly and run the pump at maximum speed until only a few hundred mL remain
- Add 400mL of PBS to the Optimum Growth® Flask to ensure all the culture has been filtered and transferred to the new flask

CELL LINE VIABILITY	99%-70%		69%-50%		49%-40%		39%-0% SPIN FOR 7MIN @ 4000G*	
CELL TYPE	VOLUME (L)	TIME (MIN)	VOLUME (L)	TIME (MIN)	VOLUME (L)	TIME (MIN)	VOLUME (L)	TIME (MIN)
CHO Stable without Feed	3.0	18	2.5	18	2.0	20	3.5****	35****
CHO Stable, 1 to 2 Feeds	2.0	18	2.0	18	1.5	35		
CHO Stable, 2+ Feeds	Spin for 7 min @ 4000g; ≤3L volume ****							
HEK293 (FreeStyle™ & Expi293)	3.0	18	3.0	23	3.0	25	3.5****	35****
CHO Transient	3.0	18	2.5	18	1.5	35		
ExpiCHO	3.0	18	2.5	18	1.0	18		

* For low viability cultures, (< 39%), centrifuge for 7 minutes prior to clarifying with the Rapid Clear® Cap.
** This chart was created from results generated in customer labs.
*** All data was generated using a Cole-Parmer pump (pump drive p/n EW-07554-90, pump head p/n EW-77200-62)
**** Cell cultures that received 2+ feeds will require spinning to minimize potential clogging

Flask Accessories

Caps For Sealing, Breathing & Exhaust

Bioreactor Exhaust Cap

When used with the Optimum Growth® 1.6L flask and connected to your bioreactor this cap provides a dry aseptic pressure release system.

Solid, Vented, & Low Evaporation Caps

Available for all Optimum Growth® flasks. Solid storage and vented caps keep your clarified media sterile until ready for processing.

Laboratory Accessories

Fixtures For Handling Optimum Growth® Flasks & Transfer Caps In The Lab

Ring Stands & Rings

For suspending your Optimum Growth® Flask and Inversion Transfer Cap at the correct height above the receiving vessel.

Optimum Growth® Flask Carriers

For the Optimum Growth® 125mL and 250mL flasks, carriers hold up to 8 flasks at a time and aid in transport to and from the shaker, while sampling in the hood and when left in the shaker to maximize spacing efficiency between flasks.

Accessories

Thomson carries a number of accessories for the Optimum Growth® Flask series. Accessories add to the ease-of-use and functionality of Optimum Growth® Flasks and Transfer Caps

Part Numbers

Optimum Growth® Flask

Image								
Flask Size	125mL-LE*	125mL	250mL	500mL	1.6L	2.8L	5L	7L
Part #	931110-11	931110	931111	931112	931113	931114	931116	931117
Top Style	threaded	threaded	threaded	threaded	threaded	threaded	threaded	threaded
Top	low evap cap	vent cap	vent cap	vent cap	vent cap	vent cap	vent cap	vent cap
Working Vol.	20-40mL	50-63mL	100-125mL	200-250mL	400-900mL	1.0-1.4L	2.0-2.5L	2.8-5L
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	50	50	50	25	12	6	4	4

* LE = Low Evaporation, small volume applications

Double Bagged Optimum Growth® Flask

Image						
Flask Size	125mL	250mL	500mL	1.6L	2.8L	5L
Part #	931110-DB	931111-DB	931112-DB	931113-DB	931114-DB	931116-DB
Top Style	threaded	threaded	threaded	threaded	threaded	threaded
Top	vent cap	vent cap	vent cap	vent cap	vent cap	vent cap
Working Vol.	50-63mL	100-125mL	200-250mL	400-900mL	1.0-1.4L	2.0-2.5L
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	50	50	20	8	6	4

Optimum Growth® Sampling Flasks

Image				
Flask Size	125mL	250mL	500mL	5L
Part #	931110-SP	931111-SP	931112-SP	931116-PORT-E
Working Vol.	50-63mL	100-125mL	200-250mL	2.0-2.5L
Sample Connection	Male Luer Lock	Male Luer Lock	Male Luer Lock	Male Luer Lock
Top Style	Threaded	Threaded	Threaded	Threaded
Top	Sampling Vent Cap	Sampling Vent Cap	Sampling Vent Cap	Vent Cap
Sample Tubing Vol.	163µL	218µL	313µL	381µL
Air Filter Ventilation	0.2µm PTFE	0.2µm PTFE	0.2µm PTFE	0.2µm PTFE
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	50	50	25	4

Optimum Growth® 6-Well Plate

Image	Vol. Well	Well Shape	Sterility (SAL)	ANSI-SLAS	Ind. Wrap	Compatible with Capmat/Seal	Case/Qty	Part#
	82mL		10^{-6}	Yes	Yes	931167 , 981648, 899410, 899405-1, 899403, 899406	10	931167

Optimum Growth® Integrated Lid for 6-Well Plate

Image	Well Count	Air Filter Ventilation	Sterility (SAL)	ANSI-SLAS	Ind. Wrap	Compatible with Capmat/Seal	Case/Qty	Part#
	6	0.2µm PTFE	10^{-6}	Yes	Yes	931167	20	981648

Optimum Growth® Multiport Flasks

Image					
Flask Size	125mL	250mL	500mL	1.6L	2.8
Part #	931110-DP	931111-DP	931112-DP	931113-PORT-TRT	931114-PORT-TRT
Working Vol.	50-63mL	100-125mL	200-250mL	400-900mL	1.0-1.4L
Top Style	Threaded	Threaded	Threaded	Threaded	Threaded
Top	dual port vent cap	dual port vent cap	dual port vent cap	vent cap	vent cap
Sample Connection	Male Luer Lock	Male Luer Lock	Male Luer Lock	Male Luer Lock	Male Luer Lock
Sample Tubing Volume	163µL	218µL	313µL	326µL	358µL
Transfer Tubing	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable
Transfer Connection	Tube Fuse	Tube Fuse	Tube Fuse	Tube Fuse	Tube Fuse
Tubing Diameter	C-Flex® 16	C-Flex® 16	C-Flex® 16	C-Flex® 16	C-Flex® 16
Tubing Length	24" (609.6mm)	24" (609.6mm)	24" (609.6mm)	24" (609.6mm)	24" (609.6mm)
Air Filter Ventilation	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	30	40	15	12	6

C-Flex® 16 ID: 1/8" (3.1mm), OD: 1/4" (6.35mm)

Optimum Growth® Multiport Flasks

Image			
Flask Size	5L	7L	7L
Part #	931116-PORT-TRT-F	931117-55-18	931117-55-14
Working Vol.	2.0-2.5L	2.8-5L	100-125mL
Top Style	Threaded	Threaded	Threaded
Top	vent cap	vent cap	vent cap
Sample Connection	Male Luer Lock	Male Luer Lock	Male Luer Lock
Sample Tubing Volume	381µL	306.42µL	306.42µL
Transfer Tubing	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable
Transfer Connection	Tube Fuse	Male Luer Lock	Male Luer Lock
Tubing Diameter	C-Flex® ID: 1/8" (3.1mm), OD: 1/4" (6.35mm)	C-Flex® ID: 1/8" (3.1mm), OD: 1/4" (6.35mm)	C-Flex® ID: 1/4" (6.35mm), OD: 7/16" (11.1mm)
Tubing Length	24" (609.6mm)	24" (609.6mm)	24" (609.6mm)
Air Filter Ventilation	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}
Qty/Case	4	4	4

Rapid Clear® Cap

Image	Flask Compatibility	Part #	Tubing Connection	Tubing Diameter	Tubing	Tubing Length	Material	Sterility (SAL)	Qty/Case
	2.8L & 5L	788116	Transfer Cap	Size 15 silicone tubing, ID: 3/16" (4.76mm), OD: 7/16" (11.1mm)	Chemically resistant, flexible	48" (1219.2mm)	PP (polypropylene)	6-Oct	4

Inversion Transfer Cap Accessories-Ring & Stands

Image				
Flask Compatibility	1.6L & 2.8L Optimum Growth®	1.6L & 2.8L Optimum Growth®	5L Optimum Growth®	5L Optimum Growth®
Part #	931609	931700	931606	931607
Stand Height	22”	n/a ring only	22”	n/a ring only
Ring Diameter	5”	5”	7”	7”
Qty/Case	1	1	1	1

Optimum Growth® Flask Carriers

Image		
Flask Compatibility	125mL	250mL
Part #	1212900	1212905
Flask Capacity	8	8
Dimensions	10.75” x 5”	13.4” x 6”
Qty/Case	1	1

Optimum Growth® Caps

Image						
Flask Compatibility	125mL & 125mL-LE	125mL	250mL	500mL	1.6L, 2.8L & 5L	1.6L, 2.8L & 5L
Part #	TBD	899110	899111	899112	899116	899600-B
Membrane	PTFE Low Evaporation	PTFE	PTFE	PTFE	PTFE	Solid Cap
Pore Size	0.2µm PTFE	0.2µm PTFE	0.2µm PTFE	0.2µm PTFE	0.2µm PTFE	n/a
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	50	50	50	25	24	24

Inversion Transfer Caps

Image				
Flask Compatibility	1.6L & 2.8L Optimum Growth®	1.6L & 2.8L Optimum Growth®	1.6L & 2.8L Optimum Growth®	1.6L & 2.8L Optimum Growth®
Part #	931706-4	931710-4	931705-4	931708-4
Tubing Included	no	yes	yes	yes
Connection	7/16” (11.1mm) Male Quick Connect	Male Luer Lock	Tube Fuse (plug on terminus)	Tube Fuse (plug on terminus)
Tubing Diameter	n/a	C-Flex® 16	C-Flex® 16	C-Flex® 24
Tubing	n/a	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable
Tubing Length	n/a	24” (609.6mm)	24” (609.6mm)	24” (609.6mm)
Style	Threaded	Threaded	Threaded	Threaded
Material	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)
Air Filter Ventilation	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	4	4	4	4

Inversion Transfer Caps

Image					
Flask Compatibility	5L Optimum Growth®	5L Optimum Growth®	5L Optimum Growth®	5L Optimum Growth®	5L Optimum Growth®
Part #	931594-4	931596-4	931616-4	931595-4	931598-4
Tubing Included	no	no	yes	yes	yes
Tubing Connection	1/4” (6.35mm) Barb	7/16” (11.1mm) Quick Connect	Male Luer Lock	Tube Fuse (plug on terminus)	Tube Fuse (plug on terminus)
Tubing Diameter	n/a	n/a	C-Flex® 16	C-Flex® 16	C-Flex® 24
Tubing	n/a	n/a	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable
Tubing Length	n/a	n/a	24” (609.6mm)	24” (609.6mm)	24” (609.6mm)
Style	Threaded	Threaded	Threaded	Threaded	Threaded
Material	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)
Air Filter Ventilation	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	4	4	4	4	4

Bidirectional Transfer Caps

Image						
Flask Compatibility	1.6L Optimum Growth®	1.6L Optimum Growth®	2.8L Optimum Growth®	5L Optimum Growth®	5L Optimum Growth®	7L Optimum Growth®
Part #	931702-8	931704-8	931804-8	931618-8	931614-8	931470-8
Tubing Included	yes	yes	yes	yes	yes	yes
Tubing Connection	Male Luer Lock	Tube Fuse (plug on terminus)	Male Luer Lock	Male Luer Lock	Tube Fuse (plug on terminus)	Male Luer Lock)
Tubing Diameter	C-Flex® 16	C-Flex® 16	C-Flex® 16	C-Flex® 16	C-Flex® 16	C-Flex® 16
Tubing	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable	Chemically resistant, heat sealable
Tubing Length	24” (609.6mm)	24” (609.6mm)	24” (609.6mm)	24” (609.6mm)	24” (609.6mm)	24” (609.6mm)
Style	Threaded	Threaded	Threaded	Threaded	Threaded	Threaded
Material	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)	PP (polypropylene)
Air Filter Ventilation	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter	0.2µm PTFE vent filter
Sterility (SAL)	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}	10^{-6}
Qty/Case	8	8	8	8	8	8

C-Flex® 16 ID: 1/8” (3.1mm), OD: 1/4” (6.35mm)
C-Flex® 24 ID: 3/16” (4.76mm), OD: 7/16” (11.1mm)