Single-use technologies

Bench-scale solutions

Flexible bioreactor and control systems for laboratory applications

thermo scientific

Robust bioprocessing solutions for small-scale applications

Thermo Scientific™ bioprocessing systems are designed to optimize your process, from the laboratory bench to full current good manufacturing practice (CGMP) manufacturing. Select from our full range of bioreactors, including glass, rocker, and single-use bioreactors. Streamlined bioprocess controllers, sensors, and pumps complete the system.

Thermo Scientific™ HyPerforma™ and DynaDrive™ bench-scale products offer robust management of both cell culture and fermentation processes. The architecture helps provide process flexibility, and dedicated hardware control allows for expansion. Thermo Scientific™ TruBio™ software is designed to support easy process control and scaling.

Complete your workflows with cell culture media, bioprocessing containers, and gene editing reagents to take your project from a few cells to commercial scale.

Standard system components for benchtop solutions

- Thermo Scientific™ DynaDrive™ Single-Use Bioreactor (S.U.B.)
- Thermo Scientific™ HyPerforma™ Glass and Rocker Bioreactors
- Thermo Scientific™ HyPerforma™ G3Lab™ Bioprocess Controller
- Thermo Scientific™ Gas Mass Flow Controllers (MFCs)
- Thermo Scientific™ TruBio™ Bioprocess Control Software solutions powered by the Emerson™ DeltaV™ Distributed Control Platform
- Sensors and pumps
- Cell culture media, plastics, and bioprocessing containers

5 L DynaDrive Single-Use Bioreactor

Scale from 1 L up to 5,000 L with the family of **DynaDrive Single-Use Bioreactors** (S.U.B.s). Equipped with a 5:1 turndown ratio, the 5 L DynaDrive S.U.B. has a minimum working volume of just 1 L. It features a similar design and the same film as other DynaDrive bioreactors in the portfolio to enable efficient scale-up. Like all DynaDrive bioreactors, the 5 L S.U.B. is engineered to maximize cell density and support fed-batch and perfusion processes.

S.U.B.s have several advantages over glass bioreactors, including lower capital costs. Single-use bioprocessing containers (BPCs) arrive sterile and ready to use, significantly reducing setup and turnaround times. BPCs are made from Thermo Scientific™ Aegis™ 5-14 film, which has demonstrated biocompatibility and low cytotoxicity.

The BPC for the 5 L DynaDrive S.U.B. includes 14 total line sets and a bottom-mounted sample drain that enables complete drainage of the BPC without manipulation. Connections are secured with the unique **Thermo Scientific™ BioTitan™ Retention Device**. The retention device forms a 360° seal to prevent leaks. Unlike sharp cable ties, it does not need to be bubble wrapped and helps eliminate tedious unpackaging. The BPC drive shaft includes three impellers along its length for efficient mixing.

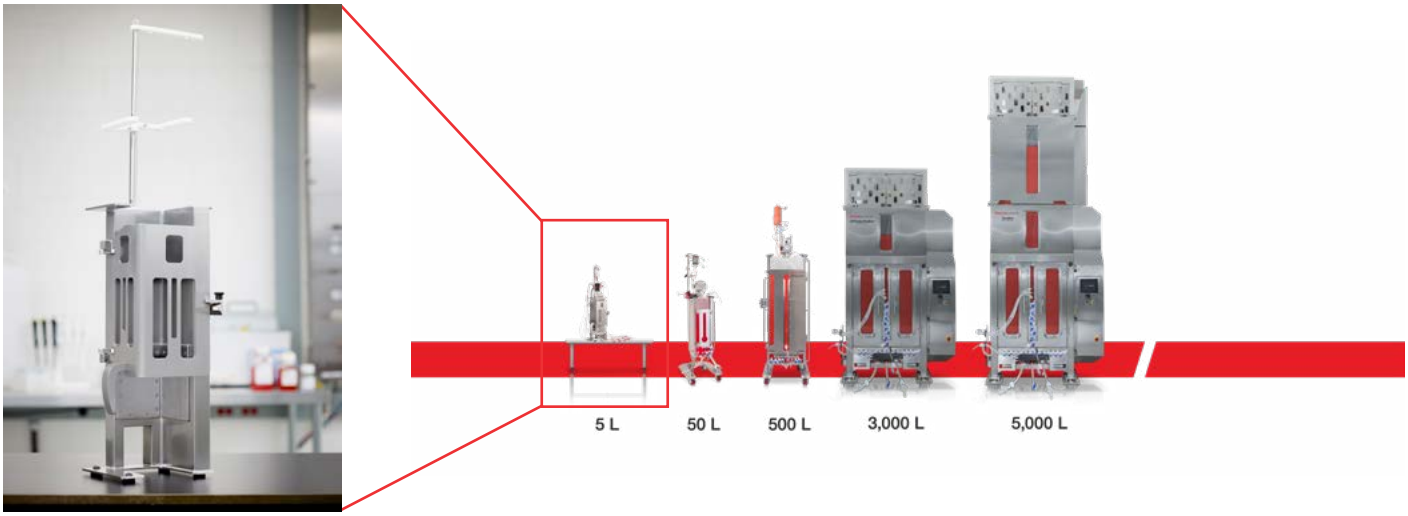


Figure 1. Go all the way from 1 L up to 5,000 L with the DynaDrive system. If your lab is using HyPerforma S.U.B.s to scale up, the process can still be simplified since both systems use the same BPC film and controllers.

5 L DynaDrive S.U.B. specifications	
Electrical power supply requirements (voltage, phase, current)	120 V or 240 V, Single Phase, 20 A
Impeller configuration (quantity × blade count)	3 x 2 modified pitch blade
Agitation speed range	0–500 rpm
Overall width	23.4 cm
Overall depth	20.1 cm
Overall height	57.5 cm (vessel) 98.7 cm (vessel with tubing management)
Dry skid weight	16.2 kg (stand, pressure reader, tubing management arms, motor, dry BPC)

Standard system components for benchtop solutions

Product	Product type	Cat. No.
Bioprocess Container for 5 L DynaDrive Bioreactor for Traditional Single-Use Sensors BPC	BPC	PROSUT00181
Bioprocess Container for 5 L DynaDrive Bioreactor for BPC Sensor Puck BPC	BPC	PROSUT00180-I
DynaDrive 5 L Bioreactor Vessel, standard, 120 V, BPC sensor puck option	Vessel	DDB0005.1010
DynaDrive 5 L Bioreactor Vessel, standard, 120 V, traditional probe option	Vessel	DDB0005.1011
DynaDrive 5 L Bioreactor Vessel, standard, 240 V, BPC sensor puck option	Vessel	DDB0005.1020
DynaDrive 5 L Bioreactor Vessel, standard, 240 V, traditional probe option	Vessel	DDB0005.1021
BPC Sensor Puck Kit, 5 L DynaDrive Bioreactor for Standardized HyPerforma G3Lab Controllers	Sensor kit	F110-2751-001
Traditional Probe Kit, 5 L DynaDrive Bioreactor for Standardized HyPerforma G3Lab Controllers	Sensor kit	F110-2759-001
HyPerforma G3Lab Controller Upgrade Kit	Controller upgrade kit	F110-2752-001

HyPerforma Glass Bioreactors

Thermo Scientific™ HyPerforma™ Glass Bioreactors are available in 1 L, 3 L, 7 L, and 15 L sizes. They offer easy operation and rapid assembly and are manufactured with the highest standards for materials and surface finish. Developed using a computational fluid dynamics (CFD) simulator, the HyPerforma Glass Bioreactor impellers facilitate maximum mixing with minimum shear force, resulting in a higher average kLa.

Key features

- The motor adapter uses coupling windows and an alignment marker for easy assembly
- Ergonomic head plate design allows easy assembly and disassembly of components for rapid reconfiguration

Accessories

- Kits to easily configure the vessel for mammalian or microbial applications
- Heating blanket designed for rapid thermal transfer; a bimetallic temperature-limiting switch embedded in the blanket helps protect against overheating or fires
- Common accessories kit, including blind stoppers for vessel reconfiguration
- Full portfolio of sensors and related components for process monitoring and control

HyPerforma Glass Bioreactor specifications

	1 L	3 L	7 L	15 L
Inner tank height	200 mm (8.1 in.)	250 mm (9.8 in.)	380 mm (14.9 in.)	455 mm (17.9 in.)
Vessel stand + motor height	412 mm (16.2 in.)	473 mm (18.6 in.)	600 mm (23.6 in.)	720 mm (28.3 in.)
Inner tank diameter	100 mm (3.94 in.)	130 mm (5.1 in.)	160 mm (6.3 in.)	222 mm (8.7 in.)
Vessel stand diameter	160 mm (6.3 in.)	190 mm (7.5 in.)	240 mm (9.5 in.)	340 mm (13.4 in.)
Total volume	1.5 L	3.2 L	7.4 L	17.2 L
Working volume	1 L	2 L	5 L	15 L
Minimum working volume*	~0.3 L	~0.9 L	~3.0 L	~4.0 L
Weight	8.6 lb	11.6 lb	17.4 lb	51.4 lb
Drilled hole sparger	5 holes (0.8 mm)	7 holes (0.8 mm)	13 holes (0.8 mm)	23 holes (0.8 mm)
Ring sparger	N/A	18 holes (0.85 mm)	42 holes (0.85 mm)	90 holes (0.85 mm)
Frit pore sparger	Pore size: 12–15 µm Length: 7 mm Diameter: 7.9 mm	Pore size: 12–15 µm Length: 7 mm Diameter: 7.9 mm	Pore size: 12–15 µm Length: 18 mm Diameter: 7.9 mm	Pore size: 12–15 µm Length: 25.4 mm Diameter: 12.7 mm
Material	Borosilicate Glass, 316 L Stainless Steel			
Agitator kit	Teknic™ NEMA 23 Single to HyPerforma Glass Bioreactor, Cable assembly: 2 m (6 ft)			
Agitator speed	30–1,250 rpm			

* Minimum working volume may vary based on the length of probes used in the system.

Package options

Glass vessel bundles will include a vessel, headplate, marine impeller, modified Rushton impeller, drilled hole sparger, agitator motor assembly, foam level sensor, temperature sensor assembly, and heating blanket. Microbial upgrade kits and cold finger solenoid assembly will need to be added for microbial applications. Spare heating blankets and impellers can be added upon request.

All bioreactors listed below are manufactured according to GMP standards. Each bench-scale bioreactor needs to be operated using a HyPerforma Bioprocess Controller and appropriate automation platform. Please contact your Thermo Fisher Scientific sales representative for more information on standard package options suitable for your requirements.

HyPerforma Glass Bioreactor ordering information			
Description	**Size**	**Voltage**	**Cat. No.**
1 L HyPerforma Glass Vessel Assembly	1 L	120 V / 240 V	F100-2458-001
Heating Blanket	1 L	120 V	F130-2724-002
Heating Blanket	1 L	240 V	F130-2724-001
Microbial Upgrade Kit	1 L	120 V / 240 V	F110-2405-001
Cold Finger Solenoid Valve Assembly	1 L	120 V / 240 V	F110-2103-004
Segment Blade Impeller	1 L	120 V / 240 V	F110-2396-002
Radial Blade Impeller (Mammalian Applications)	1 L	120 V / 240 V	F110-2396-001
Rushton Impeller	1 L	120 V / 240 V	Contact us
3 L HyPerforma Glass Vessel Assembly	3 L	120 V / 240 V	F100-2431-001
Heating Blanket	3 L	120 V	F130-2593-001
Heating Blanket	3 L	240 V	F130-2593-002
Microbial Upgrade Kit	3 L	120 V / 240 V	F110-2406-001
Cold Finger Solenoid Valve Assembly	3 L	120 V / 240 V	F110-2103-004
Segment Blade Impeller	3 L	120 V / 240 V	F110-2396-004
Radial Blade Impeller (Mammalian Applications)	3 L	120 V / 240 V	F110-2396-003
Rushton Impeller	3 L	120 V / 240 V	F130-3102-001
7 L HyPerforma Glass Vessel Assembly	7 L	120 V / 240 V	F100-2461-001
Heating Blanket	7 L	120 V	F130-2725-002

HyPerforma Glass Bioreactor ordering information (cont.)			
Description	**Size**	**Voltage**	**Cat. No.**
Heating Blanket	7 L	240 V	F130-2725-001
Microbial Upgrade Kit	7 L	120 V / 240 V	F110-2407-001
Cold Finger Solenoid Valve Assembly	7 L	120 V / 240 V	F110-2103-004
Segment Blade Impeller	7 L	120 V / 240 V	F110-2396-006
Radial Blade Impeller (Mammalian Applications)	7 L	120 V / 240 V	F110-2396-005
Rushton Impeller	7 L	120 V / 240 V	F130-3102-002
15 L HyPerforma Glass Vessel Assembly	15 L	120 V / 240 V	F100-2491-001
Heating Blanket	15 L	120 V	F130-2905-002
Heating Blanket	15 L	240 V	F130-2905-001
Microbial Upgrade Kit	15 L	120 V / 240 V	F110-2408-001
Cold Finger Solenoid Valve Assembly	15 L	120 V / 240 V	F110-2103-004
Segment Blade Impeller	15 L	120 V / 240 V	F110-2396-008
Radial Blade Impeller (Mammalian Applications)	15 L	120 V / 240 V	F110-2396-007
Rushton Impeller	15 L	120 V / 240 V	Contact us
Sensors	All	120 V / 240 V	Contact us
Temperature control units (TCUs)	All	120 V / 240 V	Contact us

HyPerforma Rocker Bioreactors

Strategic gas management

Thermo Scientific™ HyPerforma™ Rocker Bioreactors bring control and measurement to rocking bioreactor applications. The rocker is controlled by a HyPerforma G3Lab Controller and TruBio software, providing a complete solution for research, process development, or seed train production applications.

The HyPerforma Rocker Bioreactors use BPCs with working volumes of 5 L, 10 L, and 25 L. They are available with or without the novel Thermo Scientific™ pH+DO^2 sensor and reader. They are made with the same Aegis5-14 film with low leachable and extractables as our commercial-scale S.U.B.

Key features

- Compatible with most cell culture applications, including those with cell lines that are sensitive to shear stress
- Rocking motion is customizable to your specific workflow—from a smooth waveform that minimizes shear forces for sensitive cell lines, through four intermediate steps, to an aggressive motion that maximizes oxygen transfer for robust cells with high oxygen demands
- Quick, simple setup with a HyPerforma Bioprocess Controller and TruBio software
- Mounting adapter allows the use of 10 L and 20 L BPCs
- Each HyPerforma Rocker BPC is available in 10 L, 20 L, and 50 L sizes and is delivered with all relevant certificates, gamma-irradiated (25 to 40 kGy) and conforming to USP Class 6 specifications
- Standard service packages
- CGMP-compliant capabilities
- Load cell for weight control

HyPerforma Rocker and BPC specifications			
	10 L	**20 L**	**50 L**
Rocker BPC dimensions	549.4 x 330.2 mm (21.6 x 13.0 in.)	549.4 x 660.1 mm (21.6 x 26.0 in.)	711.2 x 723.9 mm (28.0 x 28.5 in.)
Working volume	5 L	10 L	25 L
Minimum working volume	1 L	2 L	5 L
HyPerforma Rocker Bioreactor	Rocker bioreactor assembly, load cell, GMP, stainless steel (rocker base, tray base, 50 L tray)		
Bag adapter	10 L / 20 L BPC mounting adapter for 50 L rocker tray		
Heat only	BPC filter heater (quantity: 2)		
Dimensions (H x W x D)	264 x 782 x 701 mm (10.4 x 30.8 x 27.6 in.); 490 x 835 x 712 mm (19.3 x 32.9 x 28.0 in.) with cover		
Weight (base + tray)	38.5 kg (85 lb)		
Rocking angle	2° to 12° per side		
Rocking rate	2 to 40 cycles per minute		
Electrical power	110–120 V, 220–240 V, 50 / 60 Hz, powered by the 23 HyPerforma G3Lab Controller		
Operating temperature	0°C to 45°C (32°F to 113°F)		
Storage temperature	–40°C to 70°C (–40°F to 158°F)		
Humidity	5% to 95%, noncondensing		
Acoustic noise level	<70 dBA		
pH sensor range	pH 5.5 to 8.5		
pH sensor relative accuracy	±0.1 pH units over calibration range after a 2-point calibration having 0.3 to 0.8 pH units of separation		
DO sensor range (percent saturation)	0% to 250%		
DO sensor limit of detection	0.03% O_2		
DO accuracy	At 37°C: ±1.1% at 20.95% O_2		
Temperature	10°C to 45°C (50°F to 113°F)		
Temperature accuracy	±0.5°C between 15 and 45°C (59 and 113°F) ±0.2°C between 35 and 40°C (95 and 104°F)		

HyPerforma Rocker BPC ordering information	Cat. No.
HyPerforma Rocker Bioreactor, with load cells	F100-2569-513
HyPerforma Rocker Bioreactor, without load cells	F100-2568-503
10 L HyPerforma Rocker BPC, Aegis5-14 film, CGMP, with sensor	SUT00011
20 L HyPerforma Rocker BPC, Aegis5-14 film, CGMP, with sensor	SUT00010
50 L HyPerforma Rocker BPC, Aegis5-14 film, CGMP, with sensor	SUT00009
10 L HyPerforma Rocker BPC, Aegis5-14 film, CGMP, without sensor	SH31187.01
20 L HyPerforma Rocker BPC, Aegis5-14 film, CGMP, without sensor	SH31187.02
50 L HyPerforma Rocker BPC, Aegis5-14 film, CGMP, without sensor	SH31187.03

TruBio Bioprocess Control Software

Automation software and control platforms

Technology and data transfer during the life cycle of drug development, from bench-scale laboratory applications to large-scale production, is often challenging and time-consuming, involving many different user requirements. The **Thermo Scientific™ TruBio™ Bioprocess Automation and Control Software** helps reduce tech transfer time and validation costs by running on a consistent data model from R&D to commercial production.

TruBio software can be used for pilot, clinical, and production scale; in addition, considerable savings can be achieved in risk mitigation by helping reduce costs like training and validation. Standardizing with open-architecture controllers simplifies data transfer and storage, resulting in the introduction of new products to the market, faster. This software can be used with S.U.B.s, single-use mixers, single-use fermenter systems, and other third-party bioreactors.

For research and process development solutions

The TruBio software platform provides a streamlined solution to meet the needs of research and process development labs. The platform supports R&D applications with automation technology that seamlessly transitions to commercial operations. This helps eliminate the need for programming expertise and helps accelerate scale-up.

For production-scale solutions

TruBio software offers many features to enable flexible and easy scale-up for production-scale processes, including redundant pH and dissolved oxygen (DO) sensors, multiple liquid dosing strategies, and gas control functionality. These features support a straightforward process control platform that spans from research through to commercial manufacturing.

For upstream and downstream solutions

Create control strategies for media mixing and buffer preparation using TruBio software. Thermo Scientific™ TruChrom™ and TruPur™ automation software options are built on the TruBio platform and designed specifically to control chromatography and purification skids, allowing integration and control of processes.

HyPerforma G3Lab Controller

Reliable process control

The **HyPerforma G3Lab Bioprocess Controller** can control most brands of single-use or autoclavable bioreactors and fermenters that are ≤50 L. The enclosure contains advanced transmitters along with power supplies, pumps, I/O modules, and the hardware required to connect to the control network, providing maximum control capability.

Key features

- Scalability: up to 50 L
- Open architecture capabilities to integrate with vessels from other suppliers
- Coupling with TruBio software and the DeltaV control platform allows for data transfer and scalability through R&D, production, and manufacturing
- The ability to build and manage complex, multi-feed dosing strategies
- Allows for third-party peripheral integration as needed
- Specifically designed to meet the Ingress Protection IP54 standard; this indicates that the device is protected from limited dust ingress and from the impact of water splashes

Ordering information

HyPerforma G3Lab Controller*	Cat. No.
HyPerforma G3Lab Controller for the use with DeltaV and TruBio software licenses with 4 Watson-Marlow™ 114 series pumps, suitable for glass and benchtop single-use bioreactors	F100-2277-303

* Each HyPerforma G3Lab Controller needs to be operated using the TruFlow MFC and appropriate automation platform. Please contact your Thermo Fisher Scientific sales representative for more information on standard package options suitable for your requirements.

HyPerforma G3Lab Controller specifications

Feature	Specification
General	
Utility tower (H x W x D)	44.0 x 24.0 x 53.0 cm (17.32 x 9.45 x 20.87 in.)
Operating temperature	5°C to 40°C (41°F to 104°F)
Storage temperature	5°C to 40°C (41°F to 104°F)
Relative humidity	5% to 95% (noncondensing)
Certifications	EN/IEC 61326-1 and EN/IEC 61010-1
Weight/shipping weight	16.4 kg/21.4 kg (36.5 lb / 47.0 lb)
Hardware and peripherals	
Thermal control	Heater blanket, chilled water source
External pumps	2 Watson-Marlow™ pumps on a Thermo Scientific™ pump tower
Cable types	
pH	K8 and VP
Dissolved oxygen (DO)	D4, VP6, and VP8
Agitator	Thermo Scientific™ agitator (adapters available for equipment from other suppliers)
Heater	IEC-5-15 receptacle
Vessels	
Glass	1–20 L
Single-use	1.3–14 L
Rocker	10–50 L
Components	
Agitation	Thermo Scientific™ agitator or rocker supported by the SmartMotor controller; third-party agitator or rocker connected to vessel adapter; or Cytiva WAVE™ Bioreactor 20/50EHT Rocker connected through serial port
pH transmitter (selected by user with order)	Thermo Scientific™ TruSens™ transmitter blade (electrochemical sensor) or pH transmitter (rocker, single-use vessel)
DO transmitter (selected by user with order)	TruSens transmitter blade (electrochemical sensor) or DO transmitter (rocker, single-use vessel)
Temperature	TruSens transmitter blade (resistance temperature detector)
Foam level	Conductivity input
Liquid control	4 variable-speed peristaltic smart pumps, Watson-Marlow 114 series
Cold finger solenoid	Digital solenoid valve
Gas control	Thermo Scientific™ TruFlow™ gas manifold
Auxiliary	Analog input via scale port
Digital input	7 analog inputs (4–20 mA) and 4 analog control loops (0–10 V)
Digital output	24 V DC (2)

Watson-Marlow 114 series variable-speed peristaltic pump specifications

Power supply	24 V DC
Max. current (at 25°C)	0.25 A
Average current (at 25°C)	0.2 A
Speed	5–160 rpm
Accuracy	±2 rpm or ±2% of setpoint
Tubing (thickness, ID)	1.6 mm wall thickness, ID range: 0.8 mm (min.) to 4.8 mm (max.)

Gas mass flow controllers (MFCs)

Strategic gas management

MFC for the HyPerforma G3Lab Bioprocess Controller

The Thermo Scientific™ TruFlow™ gas MFC is designed to work with all of the HyPerforma bioreactor control systems. Its compact assembly provides up to six standard mass flow controllers and three associated solenoid valves. When connected, the TruFlow gas MFC is instantly recognized by TruBio software to help provide precise control of gas flow, without requiring any configuration, even at extremely low flow rates.

Features

- A variety of flow rate options
- Flow range configurability
- Plug-and-play connectivity

Specification	Details
Enclosure dimensions (H x W x D)	9.1 x 7.4 x 6.2 in.
Rating	NEMA 1, IP 51 (liquid wipedown)
Maximum gas flow rate	Configurable up to 50 L/min*
Weight/shipping weight	5.8 kg / 9.1 kg (12.8 lb / 20 lb)
Operating temperature	5ºC to 40ºC (41ºF to 104ºF)
Storage temperature	–25ºC to 70ºC (–13ºF to 158ºF)
Relative humidity	5% to 95% (noncondensing)
Certifications	CE: EN 61010-1 and EN 61326-1
Inlet pressure	1.6 bar to 2.3 bar/25 psig to 35 psig
Outlet pressure	0 bar to 1.38 bar/0 psig to 20 psig
Accuracy	±0.8% of flow rate and ±0.3% full scale (Bürkert)
Repeatability	±0.1% full scale (Bürkert)
Cable assembly	2 m (6 ft.) standard

* MFCs with flow rates above 50 L/min are mounted as individual units and are not part of the main MFC block. May require additional configuration for specific flow rates. Please consult with your local Thermo Fisher Scientific sales representative for more information.

Recommended maximum agitation rates

Working volume (L)	Recommended maximum agitation rate (rpm)
10	600
5	900
2	1,200
1	1,500

TruSens transmitter blade

The Thermo Scientific™ TruSens™ transmitter blade is a combined technology designed to monitor all conventional pH and DO sensors. It allows the connection of a resistance temperature detector (RTD) or a thermistor input to suit the user's preferred sensor technology in upstream processes.

This transmitter blade with TruBio software allows for temperature compensation and is compatible with electrochemical sensors and digital sensors that output nAmp or mV signals.

Features

- Compatible with most single-use or reusable sensors
- Designed to easily integrate with TruBio Bioprocess Control Software
- Easily incorporated into the HyPerforma Bioprocess Controllers
- Minimal maintenance

TruSens transmitter blade specifications	
Physical	
Case material	Aluminum bracket
Rating	NEMA 1 (when mounted, same rating as enclosure)
Dimensions (H x W x D)	130 x 35 x 128 mm (5.1 x 1.4 x 5.0 in.)
Weight/shipping weight	0.1/0.3 kg (0.2/0.6 lb.)
Mounting	Enclosure mounted within utility tower
Display	TruBio Bioprocess Control Software (GAMP™ 5 framework)
RFI/EMI	EN 61326-1
Operating temperature	5°C to 45°C (41°F to 113°F) ambient
Storage temperature	0°C to 65°C (32°F to 149°F)
Relative humidity	10% to 90% (noncondensing)
Electrical	
Power supply	24 VDC at 150 mA
Signal outputs*	6 analog 4–20 mA (1 electrochemical pH, 1 electrochemical dissolved oxygen, 2 PT100 RTD, 2 thermistor)
Signal inputs	pH (–520–520 mV), DO (0–500 nA) , PT100 RTD (0–100°C), thermistor (0–100°C for 10KΩ, 15–130°C for 22kΩ)
Output accuracy	Analog: ±0.1 mA Digital: NA
Transmitter diagnostics	Internal diagnostics for sensor and loop*

* If a sensor loop is activated but no sensors are attached, the following errors will be seen: The DO current will drop and produce a low "%SAT" reading, the pH will be unstable and indeterminate, RTD channels will read "maximum temperature", and the thermistor channels will read "minimum temperature".

Cell culture products and containment solutions for bioprocessing

Thermo Fisher Scientific offers a complete range of solutions to support your bioprocessing needs now and into the future.

Many of our products are available in both research and CGMP grades to support different stages of product development. Key examples include **Gibco™ CTS™ TrueCut™ Cas9 Protein** for genome editing and **Gibco™ CTS™ Synth-a-Freeze™ Medium** for cryopreservation.

Learn more about key cell culture and biocontainment solutions below.

Cell culture media are available in a wide variety of formulations and packaging formats, including custom configurations, to support your needs from R&D through commercialization. With over 60 years of experience, we continue to develop new tools for healthier cells and better product yields.

Gibco™ Efficient-Pro™ Feed 3 and Gibco™ Efficient-Pro™ Feed Enhancer significantly help improve protein yields. Part of the chemically defined and animal origin–free Gibco™ Efficient-Pro™ media and feed family, this system is compatible with CHO-K1 GS cell lines and is proven to support the production of monoclonal antibodies, bispecifics, and novel protein therapeutics.

Trusted for over 75 years, **Thermo Scientific™ Nalgene™ single-use bioprocessing containment solutions** offer a wide variety of carboys and bottles with standard and custom assembly system options.

Containers are available in sterile and non-sterile formats with low and ultralow particulate options. Assemblies are available that feature the novel **BioTitan Retention Device,** which helps prevent leaks.

Increase adherent cell production with Nunc Cell Factory systems

Thermo Scientific™ Nunc™ Cell Factory™ systems offer a simple and convenient method for increasing yields of adherent cells without the need to adapt to microcarriers. Nunc Cell Factory systems are available in a variety of formats for different workflow stages:

- **Research and development**—Thermo Scientific™ Nunc™ EasyFill™ Cell Factory™ System
- **Process development**—Thermo Scientific™ Nunc™ Standard and Standard Closed Cell Factory™ systems
- **Manufacturing**—Thermo Scientific™ Nunc™ High Density Cell Factory™ systems

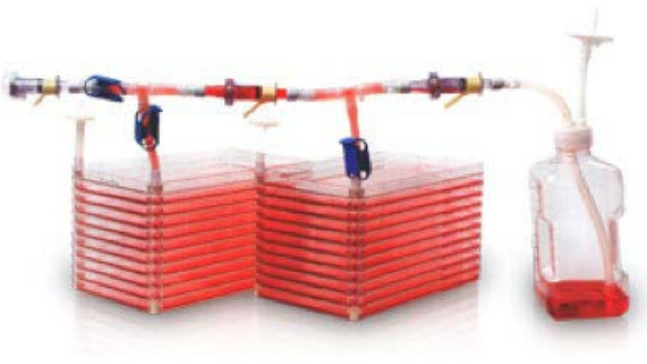
Nunc Cell Factory systems feature the Thermo Scientific™ Nunclon™ Delta cell culture surface, which is tested for monolayer formation and cloning efficiency across multiple cell lines.

Nunc High Density Cell Factory systems with 3, 13, and 52 layers.

The Thermo Scientific™ Nunc™ Cell Factory™ incubator.

To support scale and automation we offer **true configured Nunc Cell Factory systems** and equipment. Our team can help you design a closed system with the necessary tube sets pre-attached and ready for use in CGMP processes.

Thermo Scientific™ Nunc™ Cell Factory™ automation equipment includes specialty racks, carts, manipulator and shaker systems, and an incubator to increase productivity and consistency. All equipment is compliant with CGMP standards.



Example of a true configured Nunc Cell Factory system.

The right benchtop solution for your needs

Bioreactor model type	HyPerforma Glass Bioreactors	HyPerforma Rocker Bioreactors	DynaDrive S.U.B.	HyPerforma S.U.B.*
Description	Small-scale reusable bioreactors	Provides gentle mixing ideal for shear-sensitive cultures	Scalable S.U.B. family with high turndown ratios	S.U.B. family for process development and commercial scale
Applications	Batch Fed-batch Continuous	Batch Seed train Shear-sensitive cultures Adherent (microcarriers)	Batch Fed-batch Continuous Perfusion	Batch Fed-batch Continuous Perfusion Adherent (microcarriers)
Size range	1 L, 3 L, 7 L, 15 L	10 L, 20 L, 50 L	5 L, 50 L, 500 L, 3,000 L, 5,000 L	50 L, 100 L, 250 L, 500 L, 1,000 L, 2,000 L
Mixing technology	Rushton and/or Marine impellers	Rocking	3 angled impellers	1 angled impeller
Max mixing speed	1,250 rpm	Rocking rate 2 to 40 cycles per minute	500 rpm**	200 rpm**
Single-use	No	Yes	Yes	Yes
BioTitan device	No	No	Yes	Yes
Recommended controller	HyPerforma G3Lab Bioprocess Controller	HyPerforma G3Lab Bioprocess Controller	HyPerforma G3Lab controller (5 L, 50 L); HyPerforma G3Lite or G3Pro BioProcess Controller (50 L, 500 L)	HyPerforma G3Lite or G3Pro Bioprocess Controller
Compatible with TruBio software	Yes	Yes	Yes	Yes

* Not available in bench scale.

** Varies by size.

Learn more at **thermofisher.com/sub**

thermo scientific