

# HyPerforma G3Lite Controller

The Thermo Scientific™ HyPerforma™ G3Lite™ Controller is an open architecture control system that can be integrated with any single-use bioreactor such as the Thermo Scientific™ HyPerforma™ Single-Use Bioreactor (S.U.B.). Available in sizes ranging from 50 L to 2,000 L. The system consists of a control tower that leverages intelligent transmitters, mass flow controllers (MFCs), pumps, sensors, and Thermo Scientific™ TruBio™ software, which facilitates easy, reliable, and repeatable process development and commercial cell culture processes. HyPerforma G3Lite Controllers are fully self-contained, movable units that can be operated as stand-alone (for 1 vessel) or networked for multiple vessels. They are engineered to optimize capital cost for use in non-GMP and cGMP-certified production facilities.



## Benefits

- Open architecture capabilities to integrate and communicate with vessels from other suppliers\* (Sartorius, Millipore, and GE)
- Return on investment (ROI)—help increase productivity and minimize downtime

## Features

- Stand-alone or networked (for multiple vessels)—enabled by distributed control system (DCS)
- Flexible upstream TruBio software powered by Emerson™ DeltaV system
- Includes up to six MFCs with air, O<sub>2</sub>, N<sub>2</sub>, CO<sub>2</sub> for direct sparge, cross-flow, and overlay
- Probe configuration options—flexibility to connect electrochemical, single-use, or both for pH and dissolved oxygen (DO) measurements

- Foam level, load cell, and Thermo Scientific™ TruTorr™ II pressure transmitters included in controller
- Scalability—transfer any process from 50 L to 2,000 L
- Modularity—predefined configurations available for 50, 100, 250, 500, 1,000, and 2,000 L bioreactors
- Scales and pumps available for multifeed purpose, including four peristaltic pumps for acid, alkali, antifoam, and feed
- Includes vent filter heater controller
- Touchscreen interface for easy data entry and control when necessary
- Temperature control unit (TCU) integration options available for implementing a temperature control strategy

\* Depending on the vessel type and model, an engineered-to-order (ETO) product may be needed.

## HyPerforma G3Lite Controller specifications

Cart dimensions (H x W x D)	160 x 68 x 54 cm (63 x 27 x 21 in.)
Enclosure rating	Cart: NEMA 12/IP52, HMI-NEMA 4X
Operating temperature	5°C to 40°C (41°F to 104°F)
Storage temperature	-25°C to 70°C (-15°F to 158°F)
Relative humidity	5% to 95% (noncondensing)
Certifications	CE specifications EN-60101 and EN-61325
Weight/shipping weight	68 kg/136 kg (150 lb/300 lb)
pH	TruSens Transmitter (electrochemical), TruFluor pH Transmitter (single-use)
DO	TruSens Transmitter (electrochemical), TruFluor DO Transmitter (single-use)
Temperature	TruSens Transmitter (RTD)
Pressure	TruTorr Transmitter
Load cells*	Transmitter (vessel has built-in load cells)
Foam level	Transmitter and cable assembly
Agitator	Variable frequency drive (VFD) included to control agitator motor

\* Please refer to the HyPerforma S.U.B literature for more information on load cells.

## HyPerforma G3Lite Controller and S.U.B. specifications

S.U.B.	50 L	100 L	250 L	500 L	1,000 L	2,000 L
Tank style	Jacket	Jacket	Jacket	Jacket	Jacket	Jacket
Vent filter heater (VFH)	VFH for Pall KA3 vent filter	VFH for Pall KA3 vent filter	VFH for Pall KA3 vent filter	VFH for Pall KA3 vent filter	VFH for Meissner 10 in. vent filter (quantity of 2)	VFH for Meissner 10 in. vent filter (quantity of 2)
Acid/alkali/antifoam/media feed control	<p><b>3 ultralow-flow pumps</b> (114 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>1 low-flow pump</b> (313 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p>	<p><b>3 ultralow-flow pumps</b> (114 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>1 low-flow pump</b> (313 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p>	<p><b>3 ultralow-flow pumps</b> (114 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>1 low-flow pump</b> (313 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p>	<p><b>1 ultralow-flow pump</b> (114 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>2 low-flow pumps</b> (313 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>1 pump assembly</b> (digital 520 standard, 2 rollers, tubing with 2.4 mm wall thickness)</p>	<p><b>1 ultralow-flow pump</b> (114 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>2 low-flow pumps</b> (313 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>1 pump assembly</b> (digital 520 standard, 2 rollers, tubing with 2.4 mm wall thickness)</p>	<p><b>2 ultralow-flow pumps</b> (114 Watson-Marlow head, 3 rollers, tubing with 1.6 mm wall thickness)</p> <p><b>2 pump assemblies</b> (digital 520 standard, 2 rollers, tubing with 2.4 mm wall thickness)</p>
TCU (air-cooled)	Lauda VC1200 D model (Cat. No. SV50239.80)	Lauda VC1200 D model (Cat. No. SV50239.80)	Lauda VC2000 D model (Cat. No. SV50239.82)	Lauda VC5000 D model (Cat. No. SV50239.84)	Lauda VC10000 D model (Cat. No. SV50239.86)	Lauda VC10000 D model (Cat. No. SV50239.86)*
TCU (water-cooled)	Lauda VC1200 D model (Cat. No. SV50239.81)	Lauda VC1200 D model (Cat. No. SV50239.81)	Lauda VC2000 D model (Cat. No. SV50239.83)	Lauda VC5000 D model (Cat. No. SV50239.85)	Lauda VC10000 D model (Cat. No. SV50239.87)	Lauda VC10000 D model (Cat. No. SV50239.87)

Note: The controller is configured for additional scales and pumps, which are not included in the quote and need to be purchased separately. For more information on scale and additional pump model options, please contact your sales representative.

\* The standard model for the 2,000 L HyPerforma S.U.B. is the water-cooled version.

Automation packages	1	2	3	4	5
Cat. No.	F100-2697-001	F100-2697-002	F100-2698-001	F100-2699-001	F100-2700-001
Number of HyPerforma G3Lite Controllers*	1	1–2	3	4	5–8**
TruLogic Base Cabinet (NEMA 12/IP54, stainless steel cabinet)		1	1	1	1
TruLogic Base Panel (inside G3Lite)	1				
DeltaV MQ Controller, M-Series, VE3008	1	1	1		
DeltaV MX Controller				1	1
Serial Card	1	1	2	2	3–4
TruBio Media Version 13, Release 5.0.X	1	1	1	1	1
DeltaV Software Media Pack	1	1	1	1	1
ProPlus 25 Device Signal Tag (DST)	1				
Analog Control Output 25 DST	1				
Guardian Support, 1 Year, 100 DST	1				
Thermo Fisher Scientific remote support services (requires customer to be current on annual service contract; otherwise, daily rates will apply)	1	1	1	1	1
Microsoft™ Excel™ software, one license	1	1	1	1	1
ProPlus Workstation, Precision Minitower, No Monitor, DeltaV Dual and Quad Monitor, English or Non-English Microsoft™ Windows™ 10 Enterprise IoT 2016, RAID 1	1				
Small Form Factor Tower, Single Monitor, Windows 10 Enterprise IoT 2016; Quad-Core CPU, 1 x 500 GB SATA Drive (monitor not included)		1	2	3	4–7
Base Station License			1	2	3–6
Base Station Scale-Up License, 100 DST			1	2	3–6
Process History View License			1	2	3–6
TruBio Slave Dongle (or software key), Permanent		1	2	3	4–7
PlantWeb Experience 100 DST, v12.3 or Newer Software—one operator station/250 pt OPC-DA on ProPlus/1 year foundation support included		1	1	1	1
ProPlus Workstation (PowerEdge tower server, RAID 1, Windows Server 2016 for DV 13.3)		1	1	1	1
Cable Assembly, cat5e, Yellow Boot, TruLogic, PRI Network, 20 ft (6 m)		2	3	4	8
Cable Assembly, cat5e, Black Boot, TruLogic, SEC Network, 20 ft (6 m)		2	3	4	8
22 in. Wide-Screen Monitor (required for TB 5.0 batch)	1	2	4	5	6–9
Application/Base Station License (250 DeltaV for OPC-DA plus 250 DeltaV Historian Parameters) (required for Application Station use)			1	1	1
Application Station/Historian License Scale-Up (1000 DeltaV Historian Parameters)			1	1	1
Application Station (PowerEdge tower server, RAID 10, Windows Server 2016)			1	1	1
DeltaV equipment crating/packaging (FSVR-CRA-DLV)		1	1	1	1
Audit Trail	1	1	1	1	1

\* One HyPerforma G3Lite Controller per bioreactor. Controllers are sold separately.

\*\* The quantity depends on the number of HyPerforma G3Lite Controllers purchased.

# HyPerforma G3Lite Controller accessories



## pH+dO<sub>2</sub> single-use sensor and reader

The Thermo Scientific™ pH+dO<sub>2</sub> Sensor contains single-use sensors for dissolved oxygen (DO), pH, and temperature, in a compact assembly that is welded securely into a Thermo Scientific™ HyPerforma™ Single-Use Benchtop Bioreactor and Rocker Bioreactor.

- USP Class 6 compliant, free of animal-derived components
- Leverages TruFluor™ pH and DO sensor technology in a compact, precalibrated assembly
- Incorporates TruFluor 316L stainless steel thermal window for highly accurate readings



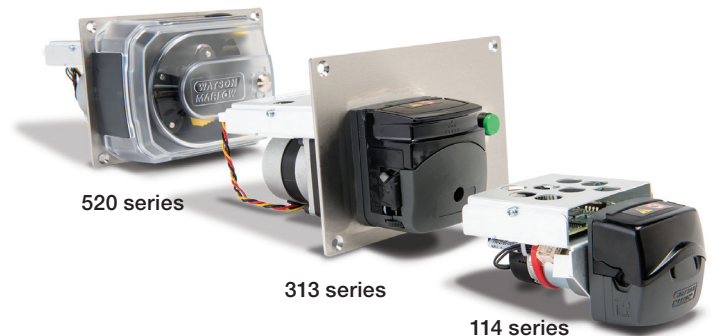
## TruBio upstream software

TruBio upstream software, a configurable system, provides easy-to-use process control. It can be configured by the user through its visual interface, eliminating the need to learn automation control programming. TruBio software is powered by the Emerson DeltaV system, has been developed according to GAMP™ 5 methods, and conforms to regulatory requirements for use in cGMP-compliant processes. Developed for use with HyPerforma controllers, TruBio software is designed to support easy scaling and technology transfer, and enable building of sophisticated process control strategies. It also provides the flexibility to incorporate a wide range of cell culture, fermentor, or mixing vessels, and manage multiple data streams from several unit operations.



## TruDO and TrupH sterilizable sensors

We provide reusable sensors with high reliability and superior performance for cell culture and fermentation process monitoring. Thermo Scientific™ TruDO™ and TrupH™ sensors have been specifically designed to minimize drift in bioprocess environments, undergo sterilization cycles, and help ensure measurement consistency from batch to batch. We also provide material certificates and lot traceability for cGMP applications.



## Precision for dosing, feeding, mixing, transferring, and harvesting

Suitable controller pump heads are utilized to meet high-precision liquid delivery requirements in upstream (with controller) and downstream (external pumps) bioprocess applications. The pumps combine industry-known Watson-Marlow™ pump heads with electronic boards. This pairing offers optimized control of dosing, feeding, product transfer/harvest, buffer mixing (gradient or step), or general liquid management. These pumps are standard in the HyPerforma G3 Controllers and can be easily exchanged if the process flow rate requirements change. In HyPerforma G3 Controllers, all of the pumps' communications are aggregated by a master communication board; this board reads process values from and sends instructions to the pumps.

Note: MFCs with flow rates higher than 50 L/min are mounted as individual units and are not part of the main MFC block.

\* May require additional configuration for specific flow rate. Please consult with your local Thermo Fisher Scientific sales representative for more information.

# Single-use sensors, readers, and transmitters



## TruTorr II single-use pressure sensor

### High-accuracy single-use headspace pressure sensor

The Thermo Scientific™ TruTorr™ II single-use pressure sensor is a single-use solution for measuring headspace pressure and preventing rupture of a BioProcess Container (BPC). A TruTorr II loop consists of a disposable pressure sensor, a cable, and a transmitter blade that are seamlessly integrated into a bioreactor controller.



## TruFluor pH and TruFluor DO sensors

### Accurate and reliable sensors for better process control

Thermo Scientific™ TruFluor™ pH and TruFluor™ DO single-use measurement solutions each consist of an optical probe with an embedded temperature sensor. A TruFluor loop consists of a disposable sheath welded in the BPC, an optical reader, a cable, and a transmitter (blade).



## Readers minimize drift and photodegradation

Thermo Scientific™ TruFluor™ pH and TruFluor™ DO optical smart readers utilize a patented design that minimizes photodegradation of the active sensing element. The design has been optimized to provide accurate *in situ* measurement of pH and dissolved oxygen using phase fluorometric detection in real time. The temperature measurement leverages a 316L stainless steel thermal plate embedded in the sheath, and provides accurate results that can also be used as a process variable. TruFluor DO sensors are based on oxygen quenching of fluorescence, whereas TruFluor pH sensors are based on dual lifetime referencing. There is no detectable photoinduced drift for either of these sensors in a 3-week period of sampling at 2-second intervals.



## Blade transmitters

Thermo Scientific™ TruFluor™ pH and DO blades are panel-mounted instruments that have plug-and-play capabilities with any TruFluor pH or DO reader. The blades provide the output from the sensors to the controller in a digital format.

TruFluor and TruTorr blades are rail mounted in a controller and do not have a display or keypad. All blades require a 2-point calibration for accuracy specs and provide data from sheaths containing a chip, and detailed diagnostics to the bioreactor control system.

## TruFlow gas MFC specifications

Enclosure dimensions (H x W x D)	Six mass flow controllers: 9.1 x 7.4 x 6.2 in.
Rating	NEMA 5, IP 51 (liquid wipedown)
Maximum gas flow rate	Configurable up to 30 slpm*
Weight/shipping weight	5.8 kg/9.1 kg (12.8 lb/20 lb)
Operating temperature	5°C to 40°C (41°F to 104°F)
Storage temperature	-25°C to 70°C (-15°F to 158°F)
Relative humidity	5% to 95% (noncondensing)
Certification	CE: EN-61326 and EN-61010
Inlet pressure	1.6 to 2.3 bar (25 to 35 psig)
Outlet pressure	0 to 1.38 bar (0 to 20 psig)
Accuracy	±0.8% of flow rate and ±0.3% full scale (Burkert)
Repeatability	±0.1% full scale (Burkert)
Mass flow controllers	Up to six per vessel (standard)
Solenoid valves	Three per gas
Outlet headers/spargers	Three total
Cable assembly	2 m (6 ft) standard

Note: MFCs greater than 50 L/min are mounted as individual units and are not part of the main MFC block.

\* May require additional configuration for specific flow rate. Please consult with your local sales representative for more information.

## Range of operating parameters

Volume	50 L			100 L			250 L			500 L			1,000 L			2,000 L			
	DHS	Cross-flow	Overlay	DHS	Cross-flow	Overlay	DHS	Cross-flow	Overlay	DHS	Cross-flow	Overlay	DHS	Cross-flow	Overlay	DHS	Cross-flow	Overlay	
Recommended maximum gas flow rates (slpm)																			
Air	5	5	5	10	9	9	25	13	13	50	25	25	100	40	40	200	60	60	
O <sub>2</sub>	5	-	-	10	-	-	25	-	-	50	-	-	100	-	-	200	-	-	
CO <sub>2</sub>	1	-	-	2	-	-	2	-	-	2	-	-	5	-	-	5	-	-	
N <sub>2</sub>	1	-	-	2	-	-	5	-	-	5	-	-	10	-	-	10	-	-	
Total	5	5	5	10	9	9	25	13	13	50	25	25	100	40	40	200	60	60	
Exhaust load	20			20			90			90			180			360			

## Pump specifications

Pump series	114	313	520
Power supply	24 V DC	24 V DC	24 V DC
Max current (at 25°C)	0.25 A	0.95 A	1.5 A
Average current (at 25°C)	0.2 A	0.75 A	1 A
Speed	5 to 160 rpm	1 to 300 rpm	1 to 300 rpm
Accuracy	±2 rpm, or ±2% of set point	±1 rpm, or ±2% of set point	±1 rpm, or ±2% of set point
Tubing (thickness, ID)	0.8 mm, 4.8 mm	0.8 mm, 8.0 mm	1.6 mm, 9.6 mm
Operating temperature	5°C to 50°C (41°F to 122°F)		
Storage temperature	-10°C to 70°C (14°F to 158°F)		
Humidity	10% to 90% (noncondensing)		
Certifications	CE: EN-60101 and EN-61326		
Pump speed	Minimum/maximum flow rates		
1	0.16 mL/3 min	0.05 mL/3.1 min	0.4 mL/10.6 min
10	0.3 mL/6 min	0.5 mL/31.4 min	4.2 mL/106.8 min
50	1.7 mL/30 min	3.2 mL/179.8 min	21.2 mL/536.9 min
100	3.4 mL/57.5 min	6.3 mL/335.4 min	42.6 mL/1,102.6 min
160	5.5 mL/104 min	NA	NA
250	NA	15 mL/630 min	105.6 mL/2,879.7 min
300	NA	17.7 mL/808.1 min	123.2 mL/3,400.0 min

## Ordering information

HyPerforma G3Lite Controller	Cat. No.	
Description	Non-GMP	GMP
<p><b>HyPerforma G3Lite Controller (120/240 V) for the 50 L S.U.B.</b> (Configured to optionally connect: two 15 kg scales and two Watson-Marlow 313 external pumps, one 6 in. VFH)</p> <ul style="list-style-type: none"> <li>Licenses: Delta V (latest version), TruBio</li> <li>6 x 3 TruFlow gas MFCs</li> <li>4 pumps (Watson-Marlow three 114 and one 313)</li> <li>Transmitter for TruFluor sensor, TruSens transmitter, RTD, and all necessary cables</li> <li>HMI and foam-level cable assemblies</li> <li>NEMA rating: 4X</li> <li>22 in. touchscreen monitor with KVM with keyboard/pointing devices</li> <li>One 6 in. vent filter heater (Cat. No. SV50191.62)</li> </ul>	F100-2701-001	F100-2701-002
<p><b>HyPerforma G3Lite Controller (120/240 V) for the 100 L S.U.B.</b> (Configured to optionally connect: two 30 kg scales and two Watson-Marlow 313 external pumps, one 6 in. VFH)</p> <ul style="list-style-type: none"> <li>Licenses: Delta V (latest version), TruBio</li> <li>6 x 3 TruFlow gas MFCs</li> <li>4 pumps (Watson-Marlow three 114, one 313)</li> <li>Transmitter for TruFluor sensor, TruSens transmitter, RTD, and all necessary cables</li> <li>HMI and foam-level cable assemblies</li> <li>NEMA rating: 4X</li> <li>22 in. touchscreen monitor with KVM with keyboard/pointing devices</li> <li>One 6 in. vent filter heater (Cat. No. SV50191.62)</li> </ul>	F100-2702-001	F100-2702-002
<p><b>HyPerforma G3Lite Controller (120/240 V) for the 250 L S.U.B.</b> (Configured to optionally connect: two 30 kg scales and two Watson-Marlow 313 external pumps, one 10 in. VFH)</p> <ul style="list-style-type: none"> <li>Licenses: Delta V (latest version), TruBio</li> <li>6 x 3 TruFlow gas MFCs</li> <li>4 pumps (Watson-Marlow two 114, two 313)</li> <li>Transmitter for TruFluor sensor, TruSens transmitter, RTD, and all necessary cables</li> <li>HMI and foam-level cable assemblies</li> <li>NEMA rating: 4X</li> <li>22 in. touchscreen monitor with KVM with keyboard/pointing devices</li> <li>One 10 in. vent filter heater (Cat. No. SV50191.64)</li> </ul>	F100-2703-001	F100-2703-002
<p><b>HyPerforma G3Lite Controller (120/240 V) for the 500 L S.U.B.</b> (Configured to optionally connect: two 60 kg scales and two Watson-Marlow 313 external pumps, one 10 in. VFH)</p> <ul style="list-style-type: none"> <li>Licenses: Delta V (latest version), TruBio</li> <li>6 x 3 TruFlow gas MFCs</li> <li>4 pumps (Watson-Marlow one 114, two 313, one 520)</li> <li>Transmitter for TruFluor sensor, TruSens transmitter, RTD, and all necessary cables</li> <li>HMI and foam-level cable assemblies</li> <li>NEMA rating: 4X</li> <li>22 in. touchscreen monitor with KVM with keyboard/pointing devices</li> <li>One 10 in. vent filter heater (Cat. No. SV50191.64)</li> </ul>	F100-2704-001	F100-2704-002
<p><b>HyPerforma G3Lite Controller (120/240 V) for the 1,000 L S.U.B.</b> (Configured to optionally connect: two 60 kg scales and two Watson-Marlow 313 external pumps, one 10 in. VFH)</p> <ul style="list-style-type: none"> <li>Licenses: Delta V (latest version), TruBio</li> <li>4 x 3 and two 1 x 1 TruFlow gas MFCs</li> <li>4 pumps (Watson-Marlow one 114, two 313, one 520)</li> <li>Transmitter for TruFluor sensor, TruSens transmitter, RTD, and all necessary cables</li> <li>HMI and foam-level cable assemblies</li> <li>NEMA rating: 4X</li> <li>22 in. touchscreen monitor with KVM with keyboard/pointing devices</li> <li>One 10 in. vent filter heater (Cat. No. SV50191.64)</li> </ul>	F100-2705-001	F100-2705-002
<p><b>HyPerforma G3Lite Controller (120/240 V) for the 2,000 L S.U.B.</b> (Configured to optionally connect: two 150 kg scales and two Watson-Marlow 313 external pumps, two 10 in. VFH Programmable SV50191.33)</p> <ul style="list-style-type: none"> <li>Licenses: Delta V (latest version), TruBio</li> <li>4x 3 and 2, 1 x 1 TruFlow gas MFCs</li> <li>4 pumps (two 313, two 520)</li> <li>Transmitter for TruFluor sensor, TruSens transmitter, RTD, and all necessary cables</li> <li>HMI and foam-level cable assemblies</li> <li>NEMA rating: 4X</li> <li>22 in. touchscreen monitor with KVM with keyboard/pointing devices</li> <li>Two 10 in. vent filter heaters (Cat. No. SV50191.64)</li> </ul>	F100-2706-001	F100-2706-002

Find out more at [thermofisher.com/controllers](https://thermofisher.com/controllers)