

Single-Use customised bioreactor

Scalable platform for
mammalian cell cultivation



World first configurable Single-Use-Bioreactor

Choose your own design =
fully configurable SUB

Scalable platform =
choose from 2 to >75 litre Vessel Volume

Outstanding performance =
>superior mixing capability

Manufactured entirely from
mono-component rigid plastics



- CellVessel comes standard in OD110, OD130, OD150, OD200, OD250 for Magnetic-Stirrer-Table (MST) drive accepting most servo motors
- CellVessel is optionally available in OD110, OD130, OD150, OD200, OD250 with Head-Plate-Drive (HPD) accepting most servo motors
- CellVessel will soon be available in serious size, such as OD400

Configuration



Shown a few of the 4,000 different components from the **Configurator Tool** able to satisfy any request



Customised 5.7 litre SUB for Head-Plate-Drive next to the Re-Usable-Jacket for heating prior the installation.

CellVessel

Specification

Basic specifications for CellVessel are:

- Polycarbonate and Nylon components (no multi-component plastic foil!)
- Number of standard PG13.5 ports according to the SUB diameter
- 6 different diameters and 5 different heights
- Impeller(s) for bi-directional rotation / up-flow combined axial / radial fluid circulation
- The SUB bearings design for <500 rpm for two month cultivation process

Fully configurable CellVessel's are created by selecting various optional components via the Configurator Tool

- A range of impeller(s), any rotation or up-flow / down-flow / axial / radial fluid circulation for any application
- MST drive or HPD for connection to most servo motors
- Temperature controlled with electrical heating blankets
- Temperature controlled liquid jacket (RUJ or SUJ)
- Various aeration methods; such as micro pore spargers, hole spargers, L-spargers, head space gas exchange
- Tube stator with baffles for axial vortex mixing, donut shape flow pattern for improved mass transfer and increased productivity
- Several different fluid In&Out and exhaust methods
- A range of sensors, Single-Use-Sensor (SUS), liquid level / foam sensors
- Various connectors like from Colder, VP and others
- Delivered high precision E-beam (32 kGy) irradiated in dual polyester foil bags
- All components in media contact are ISO10993, FDA approved or USP class VI certified mono component plastics materials.

**Customised identical
5.7 litre CellVessel
OD150 x 320 mm**
integrating, L-sparger,
45 degree twin blade
Marine impeller, Single-
Use-Jacket. Individual
components illustrated
on page 2.



Agitation in CellVessel

Impellers

Impellers are axial fluid directing rotating elements for delivering or absorbing energy. These elements with in general few and large helicoidal shaped blades give very high degree of swirling in a vessel or tube. The flow pattern generated in the fluid resembles helixes. Impeller dynamics can be CFD modelled by both Bernoulli's principle and Newton's third law.

Impellers are designed with individual blades attached to the central core. Described via principle, diameter, blade angle, number of blades. Principles are: Pitch, Kidney, Marine, Helical

- Outside Diameter, OD mm: 40, 50, 60, 70, 80, 90, 100, 120 and 150
- Blade angle, degree to horizontal plane: 15, 30, 45
- Number of blades: 2, 3, 4

In practice more than 500 different impellers are available from the **Configurator Tool**

**Unlimited
range of
impellers**





Stators

Stators combined with baffles are obstructing vertical arranged plates needed to stop the radial swirl inside the bioreactor and convert the rotational flow to efficient axial mixing. Without stators/baffles, the tangential velocities coming from any impeller(s) causes the entire fluid mass to spin creating a central vortex. The combination of the circular stator tube and outer baffle plates, so to speak, increase the friction to the vessel inner wall surface. CellVessel baffles are straight flat plates vertically and perpendicular oriented external from the central stator tube to the inner side of the vessel.

Two identical 3.0 litre VV CellVessel via Configurator Tool equipped with stator/baffles, 100 µm pore size membrane equipped harvest line and SUJ. Designed for connection to Biostat PCS via HPD drive and GL18 connections for temperature control.



Tube stator with integrated external baffles convert the otherwise low efficiency radial mixing to axial mixing for improved mass transfer and increased productivity.



Tube stator further supports, grips all the vertically arranged tubes and sensors beneficial in tall SUBs. Typical one of many difference between traditional radial mixing and CellVessel CFD designed axial mixing is 30% better mass transfer.

Aeration in CellVessel

**Top class
kLa values**

Gas in

Selected from Configurator Tool section 5 classical L-sparger mounted horizontal under impeller or straight down vertical oriented spargers. Both design equipped with E-beam/Gamma tolerant polyethylene (PE), Hydrophobic membranes: Select from:

- Micro-porous bodies with 15 µm pores
- Macro-porous bodies with 100 µm pores
- Macro-porous bodies with 250 µm pores
- Super macro-porous bodies with 500 µm holes



A 3 litre CellVessel packed with five different sparger bodies allow the end user to perform advanced aeration testing

Ring sparger



Ring sparger with multiple drilled 0.8 mm holes integrated in the bottom is one of many options.

**Order a
customized
Test Kit**





Gas out

Single-Use Gas-Coolers combines inner borosilicate glass tube for excellent heat transfer and outer PC tube and cooling liquid connections. The transparent construction allow the user to inspect the functionality.

- **Small size** – ID/OD 8/12 x 270 mm glass tube, lower end inlet and opposite outlet end fitted with ID/OD 10/14 mm silicone hose, outlet holding one or more 26 cm² surface area sterile filter. Cooling area of 68 cm² suitable for max 120 litre/hour/37° gas volume capacity.
- **Medium size** – ID/OD 24/30 x 300 mm glass tube, lower end inlet ID/OD 18/22 mm silicone hose, and outlet fitted with ID10/14 mm silicone hose piece and 400 cm² surface area filter. Glass tube filled with Raschig 6x6 mm glass tube elements. Cooling area 500 cm² suitable for max 1200 litre/hour/37° gas volume capacity. Cooling liquid in/outlet being G1/8" for ID 6 mm hose connection.

Selected via the **Configurator Tool**



An impeller/sparger test kit assembled from a range of components could be a guide for the direction to take in a new SUB design.

**Order a
customized
Test Kit**

Sensors and sampling

Unlimited possibilities in connections

The photo show 10 customised CellVessel bioreactors. In this case the In&Out system is equipped extensively with weldable hoses. Via the Configurator Tool you can choose any combination of hoses, connectors for fluids passing In&Out of the CellVessel head plate. As In&Out range of accessories is based on the PG 13.5 plug any wish is possible to fulfill



Configurable CellVessel bioreactor use the same In & Out system specification as the BactoVessel fermenter.

Here shown two customised 3.0 litre OD130x225 for MST drive. For small CellVessel the MST solution is slightly cheaper, very fast to install on the MST and offer a very stable operation.

In general there is room in the head plate for 3 PG13.5 size sensors and 8 selectable liquid/gas ports from the In&Out system with hose connections.



Sampling



Much more information available on www.cercell.com

Single-Use-Sensors

Single-Use-Sensors (SUS) offer many advantages

Benefits:

- Integrated SUS reduce contamination risk
- Save hours of prep time and labor, as no autoclaving or sterilisation is needed
- Enables SUS setup right on the bench top – no biosafety cabinet / hood needed
- No autoclaving facility is required
- Choose SUS via **Configurator Tool**

Express installation



DO Single-Use-Sensor

- Non-invasive DO well for VisiFerm™. Pre-installed with SUS cap integrated to transparent PC tube.
- Extends DO sensor life, as sensor is never autoclaved
- DO sensor designed with digital signal communication that fits most PCS

pH Single-Use-Sensors

- Pre-installed 6 month dry storage tolerant pH SUS such as OneFerm or FermProbe
- Classical dimension pH sensor with extended shelf lifetime offering months of operation
- Classical pH signal fits any PCS
- Available combined with °C analogue output for dual digital signal communication via ARC module

ARC module for SUS

- Pre-installed pH SUS OneFerm VP6 designed for connection to ARC analogue/digital module
- Available combined with °C analogue output for dual digital signal communication via ARC

Bio mass sensors

- Capacitive sensing technology allows precise on-line monitoring of the cell mass, viable cell density as well as cell physiological state.
- Users can also track cell cycle changes, model apoptosis, and predict protein titer all in real time

Weigh is an important factor



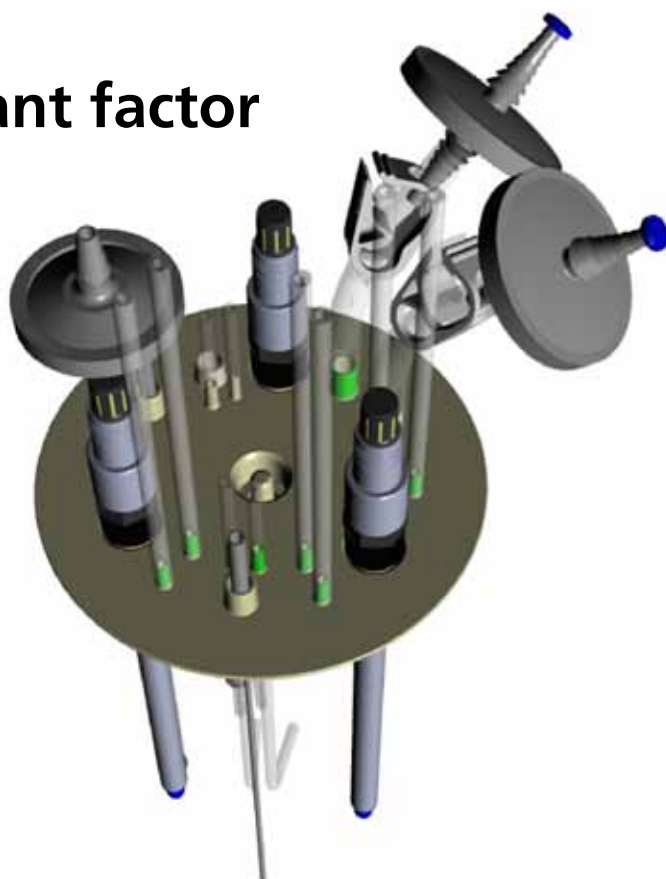
Carry the 18 kilo heavy autoclaved traditional glass/steel 5 litre STR requires a strong man. Where the less than 2 kilo Single-Use-Bioreactor CellVessel 5.7 litre SUB is much more appropriate for a woman.

Numbers is an important factor

We recommend that you test the opportunities with the configurable CellVessel SUB.

After you have found the best design and shown ability to bring along all your historical data. Then a frozen design can be offered in numbers and lifted to the cover design shown here.

This injection moulded cover presently available in size OD130 and OD150 offer 3 PG13.5 sensor ports, one gas in, dual exhaust, one level detection, a max of 10 liquid/gas in/out ports.



CellVessel heating options



Two identical 2 litre SUB on Magnetic-Stirrer-Tables equipped with 50x380 mm silicone heating blanket. Power rated at 110 watt from 230 VAC supply.

**Electrical
heating**



CerCell offer slim line 50x380 mm silicone heating blanket, which fits OD130, 150, 200 mm CellVessel and BactoVessel. Power rated at 110 watt from 48, 110 or 230 VAC supply.



CerCell offer from stock 150x350 mm silicone heating blanket which fits OD130, 150, 200 mm CellVessel and BactoVessel. Power rated at 110 watt from 230 VAC supply. The blanket has steel hugs at each ends and preferably a spring for tight attachment to the circumference of the SUB/SUF. If you give us information about the connector your PCS require we can even supply the heating element with connector.



The use of two or more heating blankets allow end user to favor either visibility or vessel inner wall temperature according to needs.

**Reduced
turn-
around
time**



Heating with Re-Usable-Jacket

For water conveying Process-Control-System (PCS) CerCell offer a stand-alone Re-Usable-Jacket (RUJ) accessory to insert the SUB. For HPD drive only.

Specifications for RUJ:

- Operating temperature 5-60°C
- Max jacket operating pressure 400 mBar – RUJ equipped with a spring loaded over-pressure, system protection valve set at 500 mBar
- Recommended water flow 1 litre/min per litre/WV (Working Volume)
- Two G3/8" female thread for In/Out adapters:
- Weight ranging 5-10 kilo depending on size, the weight facilitates stable arrangement on desktop.
- The transparent rigid plastic tube material gives excellent process view.

One of many CellVessel's new concepts are to move weight from the STR, Stirred-Tank-Reactors made from glass / Stainless Steel to stationary components. The traditional jacketed Stirred-Tank-Reactors has with 5.7 litre VV (Vessel Volume) typically the weight of 18 kilo. Not really easy to handle! The CellVessel SUF is kept as light as possible at less than 2 kilo as all weight is moved into fixed component – the RUJ!



Water connections

Much more information available on www.cercell.com



Heating with Single-Use-Jacket

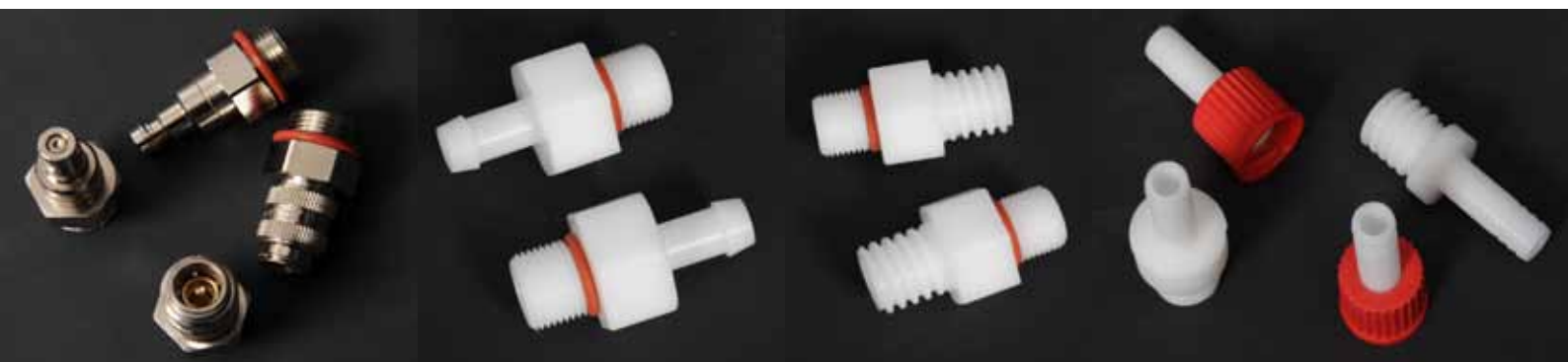
For water conveying Process-Control-System (PCS) the optional integrated Single-Use-Jacket (SUJ) heat exchanger is an efficient option for the CellVessel family of bioreactors for MST drive.

Specifications for SUJ:

- Selected via the **Configurator Tool**
- **Very well suited for MST drive**
- Operating temperature 5-60°C heating / cooling water
- Recommended max operating pressure is 500 mBar
- Burst pressure at 20°C is <1 Bar
- Recommended cooling flow 1 litre/min/WV
- Standard two G3/8" female thread connectors
- The transparent rigid self supportive plastic material gives excellent process view.



16.4 litre VV CellVessel (OD250x320) via **Configurator Tool** equipped with SUJ. The two female threaded G3/8" connections are visible on the right side of the SUJ.



From left to right:
Rectus 21 to G3/8" coupled kit, G3/8" to OD10 barb kit,
G3/8" to GL18 glass thread kit, hose adapters to GL18 kits



CellVessel equipped with Single-Use-Jacket and female G3/8" threaded connections for a variety of adapters. Photo shown here with G3/8" on SUB to GL18 adaptor (in white) for red Biostat hose connection.

HPD drive

- Head-Plate-Drive (HPD) for CellVessel SUB offer coupling / adapter kits to servo motors from Applikon®, Biostat®, DASGIP®, BJ, NBS, Solaris, Finesse®, BBI-biotech and other PCS servo motors
- Re-usable servo motor adapters easily attached to the OD30 mm HPD centre bearing on the CellVessel head plate
- For high loads or small SUB a servo motor support is helpful

Agitation methods

Use your own PCS



CellVessel 5.7 litre with two Marine impellers operating at 500 RPM mounted in Re-Usable-Jacket, equipped with servo motor support, Sky-Support for the gas-cooler and exhaust filter, digital sensor package.



Kollmorgen AKM23D servo motor driving via HPD in Biostat PCS setup a 5.7 litre CellVessel submerged in a RUJ. Hot stuff to comprehend the sometimes very warm water supplied from water heating PCS!



**You get
drive
options**



Kollmorgen AKM23D servo motor driving MST in Biostat setup driving a 11.6 litre CellVessel with stator for high efficiency axial mixing.

Most servo motors facilitate these adapters.



MST drive

- Magnetic-Stirrer-Table (MST)
Stainless Steel construction featuring long life and silent running toothed rubber belt on aluminium sprockets, two lifetime sealed double-row ball bearings
- MST rotor is equipped with 12 permanent magnets and able to transfer >100 watt power depending on the particular servo motor capacity. Far sufficient for any size CellVessel
- Dim: 390x180x50 mm, weight is 5,7 kilo
- MST most suitable for all CellVessel with electrical heating blanket or with Single-Use-Jacket (SUJ) for liquid heating

This particular MST is equipped with the B adapter for the variety of servo motors taking advantage of ID39-B adapter (late Model Biostat). Its worth to mention that working with MST is very fast and a convenient setup. The most economical choice for endurance work.

SUB products

The "Configurator Tool" can help you design a SUB to your User-Requirement-Specification

CellVessel sizes to select from						
Vessel diameter, OD mm	110	130	150	200	250	400
Number of PG13.5 ports	7	7	9	10	10	10
Impeller diameter, OD mm	40-50	50-60	50-70	80-100	100-120	100-150
Vessel Volume, litre						
225 mm	2.1	3.0	4.1			
320 mm		4.2	5.7	11.6	16.4	
420 mm		5.4	7.3	13.3	21.0	
500 mm			8.6	15.7	24.8	
600 mm			10.2	18.6	29.5	75.6

Thank you for your time browsing this leaflet

Much more information available on www.cercell.com



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