Customized Perfusion-SUB's Tight controlled, customizable, and scalable – from 250 ml and up

Keywords: Perfusion, Continuous, Single-Use-Bioreactor, customized, scalability

Author: Per Stobbe, email per.stobbe@perfusecell.com - ver 2.0 - 2024

Equipment market for continuous cultivation of mammalian cells for expression of Mabs is dominated by just a few suppliers. Quite surprising only one supplier offers ready to use Perfusion-Single-Use-Bioreactor (P-SUB) from 250 ml Vessel Volume (VV) size and up. The latest innovative solution for continuous processing is described here.

Speeding up process development and smallscale manufacturing benefit from ready-to-use

P-SUB solutions minimising facility space and capital investment in sterilization equipment. Even continuous processing is known for decades an important innovative step forward was Jerry Shevitz input in year 2000 with what became known as the ATF system. Since then, this now more than 20-yearold ATF technology package lack innovative input. Even introduction of SUBs into the marked almost 10 years ago newer reached the point of customized

ready-to-use complete P-SUB packages. The important diaphragm pump not changed over the last 100 years. Needed innovative input must be improved functionality, in particular accurate operation, highly wanted ability to control mass flow and velocity through the HFF for sequential cleaning / avoiding fouling and reliable data acquisition. This major improvement is the LASER guided diaphragm pump operating like the mammalian heart.



• First photo (at left) shows a 3.2 liter P-SUB incl SUSs, SUPs, HFFs and Clotho Drive Units incl air/vacuum pump units. • Second photo illustrate scalability of the Thalia Single-Use-Pump (SUP) with some Hollow-Fibre-Filters (HFF) in front. • Third photo is a screen dump from dual channel Clotho Drive Unit for programming the LASER guided SUP with options not available from any other perfusion SUP Drive Unit. • Fourth photo show a 500 ml VV P-SUB with Thalia M60 SUP thermally controlled by a Heating-Support-Foot (HSF). • Fifth photo close-up with the 3.2 liter P-SUB equipped with InCyte bio-mass SUS and in Heating-Support-Foot for also small Vessel Volumes.

The innovative solution for continuous processing by Perfusion-SUBs will benefit form:

- Fully pre-assembled P-SUBs, customized as to process needs, incl all hoses and connectors
- Scalable Working Volume (WV) within the limits of rigid plastics SUB sizes 250 ml to 30 liter Vessel Volume
- Pre-installed Single-Use-Sensor's (SUS) high quality Hamilton DO, pH, capacitance bio-mass
- Integrated electronically controlled positive displacement LASER guided diaphragm Single-Use-Pump (SUP) with selectable operation parameters such as: 0-100 % mass flow, selectable pulse width and pulse sequences, selectable velocity to flush out fouling inside the HFF.
- Preinstalled membrane filter or Hollow-Fibre-Filter (HFF) modules as required
- Fully assembled and ready to use (including abbreviations like SUBs, SUSs, SUPs, HFFs)
- Combine existing Process-Control-Systems (PCS) with Clotho SUP Drive Unit running appropriate software like Lucullus, DeltaV or DASware via OPC-UA



We are allowed to show photo from the Merck Darmstadt facility (# 1 from left). This dual setup combines PerfuseCell P-SUBs controlled by combining DasGip PCS and Clotho Drive Unit operating 2 x 4 P-SUBs in size 150 ml WV (Working Volume) in parallel. The 8 x SUPs are controlled by Clotho via OPC-UA to-and-from DASware. • Second photo show size M80 and M140 Thalia SUPs mounted with Meissner HFFs. • Third photo illustrate complete (extensive 300 ml VV P-SUBs incl hose assembly ready to use. Fourth photo illustrates the SUS package from Hamilton and Sipylus sensor amplifier from Cronus-PCS.com. • Fifth examples of various customizable PCS units.

Can the advanced Clotho Drive Unit be integrated with other PCSs - yes, Cronus-PCS offer a complete customizable PCS package running Lucullus or DeltaV or DASware. This new P-SUB technology package covers both ATF and TFF processes and so far, scalable up to 25 litre WV. Integrated Single-Use-Sensor's (SUS) for process control, data acquisition is based on current advances in SUS from Hamilton.



• Various examples of end-user customized P-SUBs - from left: two 250 ml AMBR connected to Thalia M80 SUP controlled by Clotho Drive Unit for the Sartorius Modular PCS. • Second photo one (of two optional) 3.2 liter P-SUB with HFF connected to a Thalia M80, Incyte bio-mass, VisiFerm, OneFerm and on the left side air/vacuum pumps and Clotho SUP Drive Unit - on the right side a complete customizable Cronus-PCS. • Third photo illustrate much better connection of HFF to SUP dome eliminating shear stresses from not needed TRI-clamp and Luer-Lok. • Fourth photo show perfect outlet from SUP dome to HFF inlet with NO restriction for no shear forces for optimum fluid conditions and cell life. • Fifth photo show scalability from M80 to at present largest M200 Thalia and Clio SUP sizes. Check out much more information on www.perfusecell.com

Our group are the world only supplier of the above shown products. No one else offer customized complete Perfusion-SUBs, PCS and their accessories.





www.pumpcell.com



www.perfusecell.com





www.cronus-pcs.com

www.prolifecell.com

www.cercell.com