



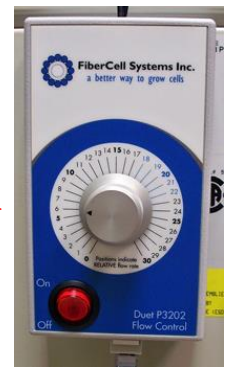
FIBERCELL SYSTEMS DUET PUMP

Thank you for purchasing a FiberCell Systems Duet pump. The Duet is designed to work with either one or two cartridges. The following cartridges are compatible: C2025, C2003, C2008, C2011, C2018, C5011, and C3008. The Duet will deliver a maximum of 220 mL/min flow rate utilizing a unique positive pressure displacement mechanism that produces no wear on the pump tubing. Low voltage power (24 volts, single phase AC) is delivered to the unit inside the incubator via a thin cord that is designed to fit through the rubber incubator door gasket. Operation of the duet is simple.

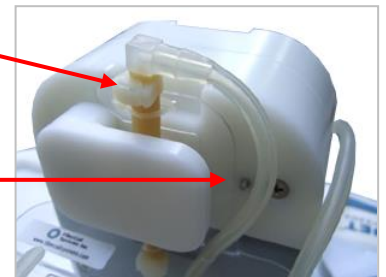
OPERATING INSTRUCTIONS

1. Flow rate is controlled by position of the electronic speed control knob.

- A position of 15-20 should be used for pre-culture and the first few days of culture, 20-26 for culture and production and 26-30 for highest density culture with the C2018 and C2003 cartridges.

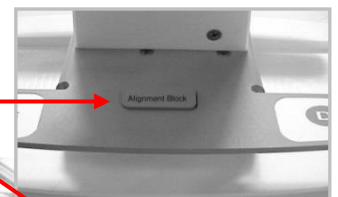


2. Ensure that the brown pump tubing is aligned vertically in the area between the pump piston and pump platen. For maximum flow rate it is essential that this tubing be inserted properly. The flowpath should be inserted so that the pin holds it in place.



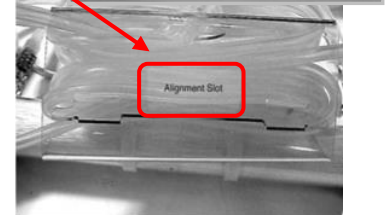
3. The cartridge can be inserted more easily while the pump is operating.

4. Check to see that the rectangular alignment slot in the bottom of the flow path is inserted over the alignment block on the base of the Duet. It will click into place. Proper alignment is essential for optimum performance.



5. Up to a 2 liter plastic bottle can be placed into the indentation on the base of the Duet.

6. The cartridge can be inserted and removed more easily while the pump is in operation. It is also easier to leave the Duet pump in the incubator and simply remove the cartridges rather than take the Duet pump into the incubator.



FiberCell Systems® Inc., A Better Way To Grow Cells

www.FiberCellSystems.com, To Order Call 301-471-1269 or 435-512-8658

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PRECAUTIONS

- Do not insert fingers or delicate objects between the pump pistons and pump platens.
- Do not leave the pump inside an incubator unless the motor is running or rust may occur.
- Do not wipe the unit with anything stronger than 70% ethanol. Do not use bleach or other strong solvents. Do not autoclave the unit.
- Keep the unit plugged in to a surge protector or battery back-up power source.
- Do not put the flow rate controller into the incubator. It will attach to the side of most incubators using the magnets on the back of the control box.



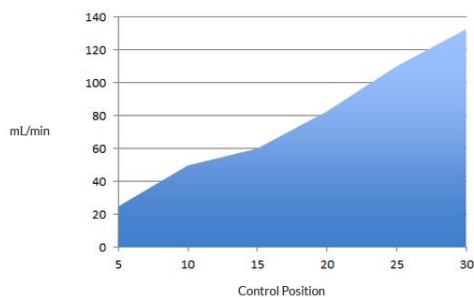
FLOW RATE AND HOLLOW FIBER CELL CULTURE

The rate limiting factor for most cells cultured in a hollow fiber bioreactor is the oxygenation level. Oxygenation is provided by recirculation of medium through the loop of silicone tubing on the back of the flow path, silicone tubing is quite gas permeable and FiberCell Systems uses a thin wall silicone tubing for optimum gas exchange. Nutrition delivery is not flow rate dependent to the degree that gas exchange is. It really is not possible to have too high a flow rate though there can be too low of a flow rate. It is best to start the cultures at a flow rate of 15, this will provide plenty of flow rate and gas support without generating such a high pressure wave that cells will not attach to the fiber. After three days of culture increase the flow rate to 25. Flow rates higher than that should only be used at glucose uptake rates of 2 grams per day or higher.



Your Duet comes with a two-year full warranty when registered using the FiberCell Systems web site. For technical support, contact FiberCell Systems at (301) 471-1269 or e-mail at info@fibercellsystems.com.

Flow Rate for Cartridges C2025, C2008, and C2011



Flow Rate for Cartridges C2018, C2003, and C5011

