SYSTEMS SPECIFICATIONS COPAS™ XL

1. INTRODUCTION

The COPAS™ XL (Complex Object Parametric Analyzer and Sorter) is an instrument for analyzing and sorting objects from 100 microns to 1.5 millimeters in diameter. Applications include beads, seeds, *Zebrafish* embryos, third instar *Drosophila* larvae and other like sized model organisms and large cells / cellular clusters. This continuous flow system is capable of quickly analyzing small and large quantities of objects using five parameters: size, optical density, and up to three spectrums of fluorescence. Objects are passed axially, one by one, through the focus of a laser beam; the resulting signals are then detected and recorded by a forward scatter detector and fluorescence detectors. Relative size is measured by an axial light-loss detector, which records the time that the light blockage signal remains above a pre-set threshold level; this parameter corresponds to the time of flight (TOF). The optical density of the object is determined by the total integrated signal of the light blockage; this parameter is the object's extinction (EXT). The fluorescence intensity (FLU) can be simultaneously determined at three different wavelengths by the excitation and emission filters in the system. TOF is related to an object's axial length, EXT is related to how dark or transparent an object is, and FLU is related to the amount of fluorescing compound that is present. Sorting and dispensing decisions are based on user-selected ranges of EXT, TOF and FLU that are entered through our COPAS software. Objects can be dispensed into microtiter plates or stationary receptacles. Using a unique, pneumatic sorting mechanism, the COPAS is gentle enough to sort and dispense live organisms without affecting the viability. The COPAS XL applies High Throughput Screening features including liquid level sensors, leak detectors, status lights and automatic sample and pressure control for walk-away operation.

2. GENERAL PERFORMANCE SPECIFICATIONS

The objects referred to in the specifications below are specifically for zebrafish embryos, with broad application for other objects of similar size and shape. A selected region refers to operator specified ranges in EXT, TOF and FLU.

Analysis and Counting Rate:

Maximum 20 objects per second, based on maximum sample concentration and nominal sample flow rates. (Note: Advanced Acquisition Software is standard on this platform).

Automated Dispensing Fill Time for 96 Well Microtiter Plates:

1.5-2 minutes per plate with 1 object per well selected, coincidence check software operating, nominal sample concentrations, and an acquisition rate of 1-5 objects per second in a selected region.

Automated Dispensing Accuracy:

Greater than 95% of wells filled have one or more objects. Of the filled wells, less than 5% may have 2 or more objects.

Sample Viability after Sorting and Dispensing:

There is no decrease in the viability of a live organism after having passed through our machine.

3. FLUID/ MECHANICAL SPECIFICATIONS

Sample Capacity:	Two sample containers: 1 liter and 40 ml
Sample Concentration:	Adjustable, maximum 100 objects per milliliter
Sample Flow Rate:	Adjustable, nominally 15 milliliters per minute
Sample Mixing:	Magnetic stirrer bars for mixing in sample cups
Sheath:	Proprietary Union Biometrica sheath. The sheath contains non-toxic, non-ionic surfactant. For zebrafish, 0.006% saline added.
Sheath Capacity:	10 liters
Sheath Flow Rate:	Adjustable, nominally 60 milliliters per minute
Cleaner Capacity:	1 liter
Waste Capacity:	10 liters
Sorter Mechanism:	Air jet fluid diverter

4. OPTICAL ASSEMBLY DESIGN SPECIFICATIONS

Laser:	Typical laser choices include: 405, 488, 488/514, 561, 635, 640, 670, Ar-Kr multi-line. New lasers are being introduced all the time: please contact us if you need something different
Laser Optics:	Lens assembly creates an elliptical analysis beam at the plane of the flow cell. The $1/e^2$ dimensions of approximately 2mm x 20μm, are measured in air with the flow cell absent.
Flow Cell:	Square cross-section quartz flow cell with 2mm square cross-section inner bore.
Detectors:	PIN Photodiode tube for measuring forward scatter (EXT) and time of flight (TOF). Photomultiplier tube for measuring fluorescence.
Ambient Light:	Optical assembly is sealed and unaffected by normal room light.

5. ELECTRONICS SPECIFICATIONS

Processors:	Three microprocessors controlling XY-stage motion, sorting/acquisition and fluidic control valves.
Analog:	5 acquisition channels with software settable gain, integrator scaling, triggering threshold and 14 bit A/Ds, 32-bit processing. Variable voltage control for fluorescence PMT gain, waste pump speed, and mixer speeds.
Computer:	IBM compatible PC with color monitor

6. INSTALLATION SPECIFICATIONS

Workspace: Permanent, open, level, vibration free space with a recommended work area of 2m Wide x 0.6m Deep. Actual instrument is 0.7m W x 0.6m D x 0.75m H (1.3m with the lid up).

System Weight: 133lbs (60 kg) not including computer

Power: Place the COPAS system within 6 feet (2 meters) to the power outlets.

- **For USA and Canada**: Two single phase, 120VAC, 20 amps, 50/60 HZ, on separate dedicated lines with protective earth grounds, using the detachable cords supplied. *If the optional Air Compressor is used, it is recommended that a third dedicated line (100-120VAC, 15 Amp, 50/60 HZ, single phase on a dedicated line with protective earth ground) is provided, although it may be connected to the line with the COPAS instrument. Always ensure that local electrical codes are followed.

- **For Continental Europe:** Two, single phase, 220/240VAC, 16 amp, 50/60 HZ, on separate dedicated lines with protective earth grounds using the detachable power cords provided or CE7/VII approved equivalent detachable cords. *If the optional Air Compressor is used, it is recommended that a third dedicated line (220/240VAC, 10 Amp, 50/60 HZ, on separate dedicated lines with protective earth ground) is provided, although it may be connected to the line with the COPAS instrument. Always ensure that local electrical codes are followed.

Pressurized Air: 40-100 psi of filtered, at 2 CFM, non-condensing, water and oil free supplied by house air or optional UBI supplied compressor

Temperature: 60^{o}F (15^{o}C) to 85^{o}F (30^{o}C) environmental temperature limits. Temperature should not vary more than +/- 1 degree C from the time of experimental setup through completion. The system generates approximately 3800 BTU/Hr.

Humidity: 0 to 85% non-condensing environmental relative humidity limits.