



Orbital Biosciences®

## USER GUIDE

### Apollo® 7mL

## High-Performance Centrifugal Concentrators

*Note: This product is offered for research use only. Not for clinical use, diagnostic procedures, or for preparation of fluids to be used for human injection.*

Apollo 7 mL UF concentrators are disposable ultrafiltration devices for the concentration or purification of protein solutions. They are far superior to alternatives in combined simplicity, speed, capacity and recovery. This is due to their unique conical design (US Patent 6,269,957, US Patent 6,357,601, PCT patents pending), providing a high ratio of membrane area to sample size. This, in turn, provides a high degree of concentration in a single spin as well as better control of polarization and fouling at the membrane surface. Apollo has the largest available sample volumes for a given centrifuge tube size.

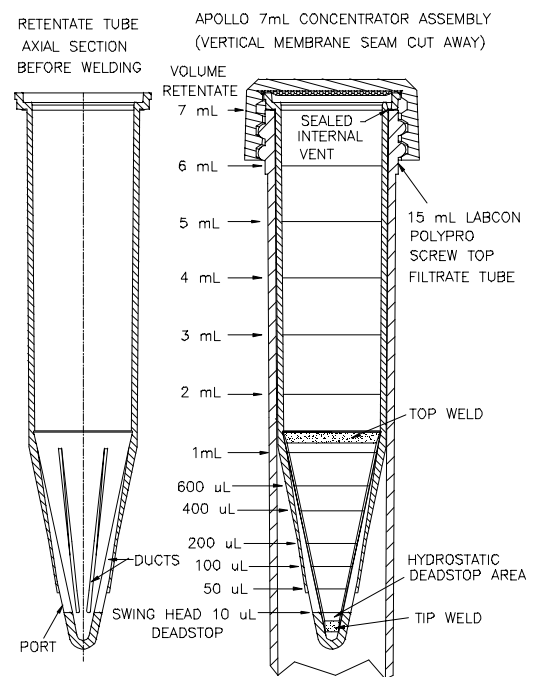
## SPECIFICATIONS

### Volumes

	<u>Maximum Initial Sample</u>	<u>Deadstop</u>
With 35° angle rotor:	5 mL	3 $\mu$ L
With swing-head rotor:	7 mL by decanting filtrate 6 mL without decanting	10 $\mu$ L 10 $\mu$ L

### Total Volume Added to Sample + Filtrate Tubes

<u>Swing Head</u>	<u>35°</u>	<u>Deadstop</u>
NA	$\leq$ 5.7 mL	3 $\mu$ L
$\leq$ 6.2 mL	6.1 mL	10 $\mu$ L
6.45 mL	6.25 mL	20 $\mu$ L
6.85 mL	6.6 mL	50 $\mu$ L
7.2 mL	6.9 mL	100 $\mu$ L
7.6 mL	7.35 mL	200 $\mu$ L
8.25 mL	8.05 mL	500 $\mu$ L
9.0 mL	8.75 mL	1000 $\mu$ L



### Maximum Centrifugal Force

35° angle rotor: 8,500 rcf (200 psi with 5 mL)

Swing-head rotor: 4,500 rcf typical rotor maximum, not to exceed 8,500 rcf

### Dimensions

Active membrane area: 5.2 cm<sup>2</sup>

Tube: Diameter, OD: 16.8 mm, 0.66 in (typical)

Length incl. cap): 123.4 mm, 4.86 in (typical)

Filter: Diameter: 14.3 mm, 0.56 in (typical)

Length (filter tip to top): 73.4 mm, 2.89 in (typical)

### Materials

Membrane: Regenerated cellulose skin on polyethylene microporous support

Sample reservoir, vial and cap: Polypropylene copolymer

### Environmental Resistance

Temperature: 34.7 °C, 120 °F, max. Do not autoclave

Limit of pH: 1 to 14

## Chemical Compatibility

Common chemicals (√ = acceptable; **X** = *not recommended*)

### Acids and Bases

Acetic acid (10%)	√	Hydrochloric acid (1.0N)	√	Sodium hydroxide (0.1N)	√
Ammonium hydroxide (10%)	√	Lactic acid (50%)	√	Sodium hydroxide (2.5N)	<b>X</b>
Formic acid (70%)	√	Perchloric acid (5%)	√	Trichloroacetic acid (10%)	√
		Phosphoric acid (30%)	√		

### Organic Solvents, Miscellaneous Chemicals

Acetone	<b>X</b>	Dithiothreitol ((0.1 M)	√	Propanol (70%)	√
Acetonitrile (40% in 1% TFA)	√	Ethanol (70%)	√	Pyridine	√
Acetonitrile	√	Ethyl acetate	√	PyroCLEAN™	√
Alconox™ (1%)	√	Formaldehyde (5%)	√	Sodium carbonate (20%)	√
Ammonium sulfate (50%)	√	Formamide	√	Sodium chloride (2M)	√
Benzene	<b>X</b>	Glycerin	√	Sodium deoxycholate (5%)	√
n-Butanol	√	Guanidine HCl (6M)	√	Sodium dodecyl sulfate (0.1M)	√
		Guanidine thiocyanate	√	Sodium thiocyanate (3M)	√
CAPS (250 mM, pH 11.0)	√	Imidazole (1M)	√	Terg-A-Zyme™ (1%)	√
Carbon Tetrachloride	<b>X</b>	Lubrol PX (0.1%)	√	Tetrahydrofuran	<b>X</b>
CHAPS (100 mM)	√	Mercaptoethanol (0.1M)	√	Toluene	<b>X</b>
Chloroform	<b>X</b>	Methanol	√	Tris buffer (1M, pH 8.2)	√
Diethyl pyrocarbonate (0.2%)	√	Nonidet P-40® (2%)	√	Triton X-100™ (0.002M)	√
Dimethyl formamide	√	Phenol (1%)	√	Tween-20™	√
Dimethyl sulfoxide	√	Phosphate buffer (1M, pH 8.2)	√	Urea (8M)	√
Dioxane	√	Polyethylene glycol (PEG400, 10%)	√		

Some of the recommended chemicals listed above may affect membrane performance, thereby altering the recoveries, passage, and /or spin times. Alconox is a registered trademark of Fabric Chemicals, Co. Nonidet P-40 is a registered trademark of Shell Oil Co. Terg-A-Zyme is a registered trademark of Rohm and Haas Co. Tween is a registered trademark of Atlas Powder Co.

## HOW TO USE THIS PRODUCT

### Preparations

#### ***Make sure it will fit in your centrifuge***

Prepare a 15 to 17 mL carrier accepting a 124 mm length tube in centrifuge, either fixed angle or swing head rotors can be used. Check clearance of tube to both swing mechanism and rotor cover or centrifuge lid.

#### ***Make sure you have chosen the right device for your application***

Use the color code to select a device with a retention rating equal to or smaller than the MW of the macromolecule to be concentrated (see Table I). The membrane Quantitative Molecular Weight Limit (QMWL) rating is engraved near the top lip. Insert the device into the filtrate collection tube.

#### ***If glycerin removal is required***

Add 5 mL clean water or buffer. Place device assembly into the rotor and counterbalance with a similar device or tube of the same weight. Spin at 8500 or maximal permitted rotor rcf to produce 2-3 mL filtrate. Shake water out of device and collection tube, and then replace the device in the tube.

### Operation

#### **1. Add sample and cap tube snugly.**

An internal vent hole near the lip permits air from the collection tube to pass into the filter to maintain maximal flow without release of aerosols.

#### **2. Place assembly into rotor.**

Counterbalance with a similar device or tube of the same weight and spin. Note specified centrifugal force limits and observe max. relative centrifugal force rating for the rotor.

### 3. Spin for the required time (see Table II)

Spin at the suggested speed to achieve the desired concentration factor. To exchange microsolute by diafiltration, decant filtrate, and refill with buffer, mixing retentate by repeated aspiration with the pipette tip held near the top of the cone to avoid scraping the membrane. Concentrate and dilute until desired solute removal is achieved. If your application will allow a concentration factor of greater than 500x, 100% salt or solute removal is possible in a single spin.

### 4. Harvest retentate

Use a pipette tip small enough to reach the bottom of the device. Remove Apollo from the collection tube and hold it up to a light. The meniscus may be seen in the conical section through the viewing port formed between the vertical membrane edges. The tip of the recovery pipette is easily seen when it touches the bottom of the device retentate chamber.

## Precautions

- **Avoid scraping membrane skin** with pipette tip when adding or decanting. Exceeding the maximum centrifugal force limits specified above may cause retentate leakage. With linear nucleic acids, maximal selectivity is obtained at filtration velocities <1mm/min. In Apollo 7 mL, this corresponds to filtration rates <0.5 mL/min. For most selective retention of nucleic acids and removal of primers and oligonucleotide when concentrating and diafiltering DNA and RNA, reduced rcf should be used.
- For best recovery, **remove retentate in <10 min**. Upon standing, wicking can cause it to spread upward and continue to filter, further reducing retentate volume. For retentate volumes <10  $\mu$ L, mass recovery is improved by adjusting volume with buffer to about 10  $\mu$ L before recovery, and/or by subsequently adding 20-100  $\mu$ L of buffer to the device, mixing into and out of the tip several times and recovering the wash as well.
- **To clean devices, vortex or sonicate them** with 2 – 3 mL of surfactant. Discard. Vortex then rinse several times with water or buffer. Refrigerate, filled with several mL of buffer, water, or alcohol and tightly capped to avoid drying of the membrane skin and permanent loss in flow rate.

## TYPICAL PERFORMANCE

Table I: Membrane Retention

QMWL (Quantitative Molecular Weight Limit) >95% retention of globular proteins, Daltons		Retention of diafiltered solute				
		5,000	10,000	30,000	70,000	150,000
Equivalent Nominal Molecular Weight Limit ("Cutoff") >90% Rating		5,000	8,000	10,000	30,000	100,000
Challenge Solute	Molecular Wt.					
1.0 A <sub>270</sub> d(pC) <sub>21</sub> oligonucleotide	10k Da, linear	n.a.	77%	15%	3%	2%
1.0 A <sub>270</sub> d(pC) <sub>24-34</sub> oligonucleotide	11-16k Da, linear	n.a.	93%	71%	50%	14%
200bp DNA	130k Da, linear	99%	99%	98%	n.a.	n.a.
0.25 mg/mL bovine cytochrome-c	12k Da, globular	99%	99%	10%	n.a.	n.a.
1 mg/mL alpha-chymotrypsinogen	25k Da, globular	99%	99%	94%	4%	n.a.
1 mg/mL bovine carbonic anhydrase	29k Da, globular	99%	99%	98%	n.a.	n.a.
1 mg/mL ovalbumin	46k Da, globular	99%	99%	98%	17%	n.a.
1 mg/mL bovine serum albumin	67k Da, globular	99%	99%	99%	98%	29%
1 mg/mL alcohol dehydrogenase, yeast	150k Da, globular	n.a.	n.a.	n.a.	97%	n.a.
1 mg/mL bovine IgG	150k Da, globular	n.a.	n.a.	n.a.	91%	n.a.
1 mg/mL bovine $\gamma$ globulin	175-900k Da, globular	n.a.	n.a.	n.a.	96-99%	n.a.
1 mg/mL apoferritin, horse heart	443k Da, globular	n.a.	n.a.	n.a.	>99%	97-99%
0.5 mg/mL bovine thyroglobulin	669k Da, globular	n.a.	n.a.	n.a.	n.a.	97-99%

All protein dissolved in pH 7.4, 0.01M Phosphate buffered saline solution (PBS).

## Table II: Time to Concentrate

Actual conditions will vary with details of initial solution temperature, concentration, and protein characteristics, but the table below can be used to provide an estimate of spin time (more detailed data is available at [www.orbio.com](http://www.orbio.com) ).

Device	Solution	Vol.	Rotor	RCF	Time (min)	Conc. factor
5k Da	0.25 mg/mL bovine cytochrome-c, 0.01M TrisCl, pH 8	5 mL	35 ° fixed	8,500	35	550x
5k Da	0.25 mg/mL bovine cytochrome-c, 0.01M PBS	6 mL	Swing head	4,500	35	180x
5k Da	0.25 mg/mL bovine cytochrome-c, 0.01M PBS	6 mL	Swing head	4,500	52	250x
5k Da	0.01M PBS only	6 mL	Swing head	4,000	29	180x
10k Da	0.25 mg/mL bovine cytochrome-c, 0.01M TrisCl, pH 8	5 mL	35 ° fixed	8,500	25	450x
10k Da	0.25 mg/mL bovine cytochrome-c, 0.01M PBS	6 mL	Swing head	4,500	20	220x
10k Da	0.01M PBS only	6 mL	Swing head	4,500	29	550x
30k Da	0.5 mg/mL bovine serum albumin, 0.01M PBS	6 mL	Swing head	4,500	15	300x
30k Da	0.01M PBS only	6 mL	Swing head	4,500	15	550x
70k Da	0.5 mg/mL bovine serum albumin, 0.01M PBS	6 mL	Swing head	4,500	16	600x
70k Da	0.01M PBS only	6 mL	Swing head	4,500	16	600x
150k Da	0.5 mg/mL bovine thyroglobulin, 0.01M PBS	5 mL	Swing head	2,000	20	500x

## Ordering Information

Product Name	QMWL*	Identification	Qty/Pk	Order No.
5k Apollo 7 mL	5k Da	Sample pack	2ea.	AP0700500
5k Apollo 7 mL	5k Da	Rack of filters in capped tubes	25 ea.	AP0700510
5k Apollo 7 mL	5k Da	10 racks, bulk bags of filters, tubes, caps	250 ea.	AP0700520
5k Apollo 7 mL	5k Da	Bulk bags of filters only	1000 ea.	AP0715031
10k Apollo 7 mL	10k Da	Sample pack	2ea.	AP0701000
10k Apollo 7 mL	10k Da	Rack of filters in capped tubes	25 ea.	AP0701010
10k Apollo 7 mL	10k Da	10 racks, bulk bags of filters, tubes, caps	250 ea.	AP0701020
10k Apollo 7 mL	10k Da	Bulk bags of filters only	1000 ea.	AP0715031
30k Apollo 7 mL	30k Da	Sample pack	2ea.	AP0703000
30k Apollo 7 mL	30k Da	Rack of filters in capped tubes	25 ea.	AP0703010
30k Apollo 7 mL	30k Da	10 racks, bulk bags of filters, tubes, caps	250 ea.	AP0703020
30k Apollo 7 mL	30k Da	Bulk bags of filters only	1000 ea.	AP0715031
70k Apollo 7 mL	70k Da	Sample pack	2ea.	AP0707000
70k Apollo 7 mL	70k Da	Rack of filters in capped tubes	25 ea.	AP0707010
70k Apollo 7 mL	70k Da	10 racks, bulk bags of filters, tubes, caps	250 ea.	AP0707020
70k Apollo 7 mL	70k Da	Bulk bags of filters only	1000 ea.	AP0715031
150k Apollo 7 mL	150k Da	Sample pack	2ea.	AP0715000
150k Apollo 7 mL	150k Da	Rack of filters in capped tubes	25 ea.	AP0715010
150k Apollo 7 mL	150k Da	10 racks, bulk bags of filters, tubes, caps	250 ea.	AP0715020
150k Apollo 7 mL	150k Da	Bulk bags of filters only	1000 ea.	AP0715031
		Rack of 25 tubes and caps for Apollo 20 mL	25 ea.	AP0700000
		Case of tubes & caps for Apollo 20 mL	500 ea.	AP07TC

\*Minimum protein molecular weight that has been found to be quantitatively (>95%) retained by the membrane when tested in an Apollo device, as determined by filtrate optical density.

## Technical Assistance

Either call, fax, or e-mail us at the numbers below for help. Or visit us on the Internet at our World Wide Web site ([www.orbio.com](http://www.orbio.com)) for the most up-to-date technical information on the Apollo 7 family of products.

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