



## Increase Productivity Using Tangential Flow Filtration

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Page: [1](#) | [2](#) | [3](#) | [4](#) | [5](#) | [6](#) | [7](#) | [8](#) | [9](#) | [10](#) | [Table of Contents](#) | [Download PDF](#) | [Proteomics Overview](#)



Tangential Flow Filtration (TFF) is a rapid and efficient method for separating and purifying biomolecules. Pall's TFF products combine low protein binding ultrafiltration or microfiltration membranes with optimized flow path design to quickly concentrate samples while achieving high concentration factors for sample volumes from 10 mL to thousands of liters. Systems are designed for easy set up and use. By incorporating the same path length and materials of construction throughout our TFF product line, conditions established during pilot-scale trials can easily be applied to process-scale applications.

### Special Features

#### Easy Set Up and Use

Simply connect the TFF device to a pump and pressure gauge(s), add sample, and process.

#### High Concentration Factors

Low hold-up volumes allow high concentration factors to be achieved from small starting volumes.

#### Fast and Efficient Processing

Higher concentrations can be achieved in less time than with centrifugal devices or stirred cells. Sample concentration and diafiltration can be achieved on the same system, saving time and avoiding product loss.

#### Scale Up or Down

Identical fluid path lengths and materials of construction allow precise linear scale-up to larger systems. The membrane area of a smaller device can be increased simply by connecting multiple devices or adding cassettes. Assuring predictable performance saves time when scaling a process from pilot to production.

#### Economical

TFF devices and cassettes can be cleaned and reused, or disposed of after a single use. A simple integrity test can be performed to confirm that membrane and seals are intact.

### Optimize Performance by Selecting the Proper Device

Choosing the appropriate cassette or device size depends on the total sample volume, the required process time, and the desired final sample volume. Performance parameters for Pall's laboratory TFF devices are presented below.

### General Product Selection Based on Starting Sample Volume

TFF Capsule or Cassette*	Membrane Area/ Capsule or	Typical Filtrate Flow Rate**	Recommended Retentate Flow Rate/ Capsule or Cassette for Screen Channel	Starting Sample Volume	Minimum Concentrated Volume***
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	Cassette	at 50 LMH 20°C		Range	
Lab Scale / Scale Up					
Minimate™	50 cm <sup>2</sup> (0.05 ft <sup>2</sup> ) 4 mL	4 mL/min	30 - 80 mL/min	25 - 1000 mL	< 10 mL
LV Centramate™	0.01 m <sup>2</sup> (0.1 ft <sup>2</sup> )	8 mL/min	60 - 80 mL/min	40 - 2000 mL	10 mL
LV Centramate™	0.02 m <sup>2</sup> (0.2 ft <sup>2</sup> )	15 mL/min	120-160 mL/min	60 - 4000 mL	15 mL
Process Development and Small-Scale Production					
Ultrasette™	0.084 m <sup>2</sup> (0.9 ft <sup>2</sup> )	4 L/hr	1200 - 1500 mL/min	0.2 - 5 L	100 mL
Centramate™	0.093 m <sup>2</sup> (1.0 ft <sup>2</sup> )	4.6 L/hr	600 - 800 mL/min	0.2 - 25 L	100 mL

\* Data is per unit or cassette. Centramate holder can hold five cassettes. Other column data can be calculated by multiplying table values by the number of cassettes installed in the holder.

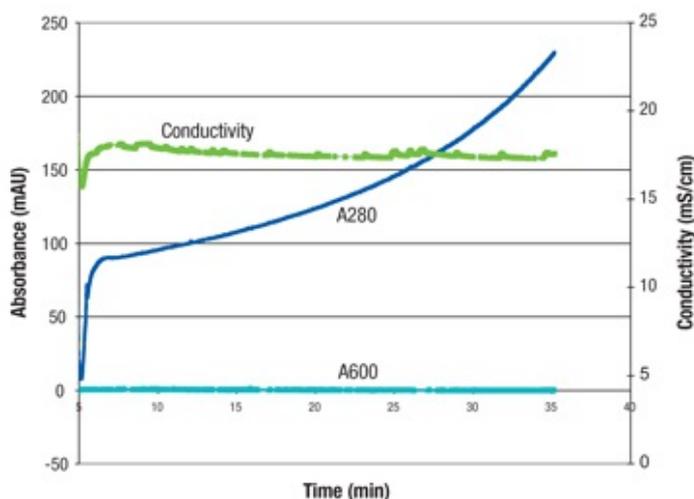
\*\* Typical filtrate flow rate is based on an average filtrate flow rate of 50 LMH and a process time of about four hours. Actual value may be higher or lower depending on the MWCO of membrane, sample composition and viscosity, operating conditions, i.e., transmembrane pressure, cross flow rate, temperature, etc.

\*\*\* Minimum concentrated volume depends on system hold-up volume, reservoir design and pump type and speed. Smaller volumes can be achieved by minimizing tubing lengths and use of properly sized components, tubing fittings, etc.

### Minimate™ TFF System Streamlines Lab-scale Concentration, Desalting, and Buffer Exchange Processes

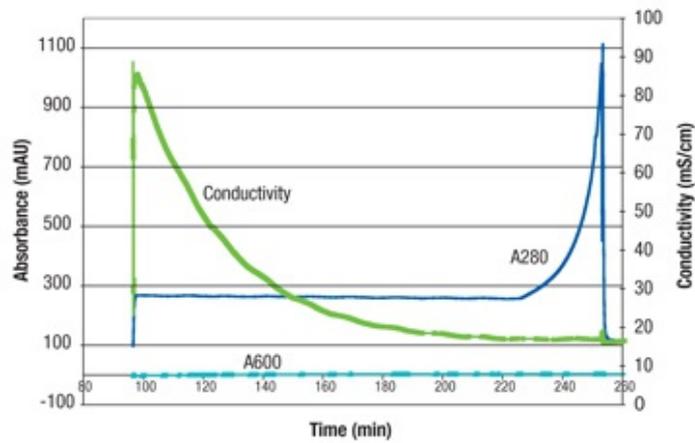
The Minimate TFF system efficiently concentrates samples from up to one liter to as little as 5 mL, enabling high concentration factors. Subsequent desalting or buffer exchange steps can be run on the same system with minimal user intervention. The system works with Pall's Minimate TFF capsule, a disposable device designed to accelerate and simplify scale-up applications.

### Gain Precise Control of Protein Concentration with the Minimate TFF System and a Liquid Chromatography System



The concentration of a 1 mg/mL BSA solution was accomplished by leaving the diafiltration feed line open to air. The run, using a Minimate 10K capsule, was processed at 25 mL/min recirculation rate. Salt, protein (A280) and turbidity (A600) were monitored using in-line sensors.

### Facilitate Sequential Buffer Exchange and Concentration with the Minimate Capsule and a Liquid Chromatography System



Sequential diafiltration followed by concentration was documented for a single run using a 1 mg/mL BSA solution in 1X PBS, 1M NaCl starting solution. The run using a Minimate 10K capsule was processed at 25 mL/min recirculation rate with the buffer exchange from high salt to low salt. The diafiltration buffer feed line was then opened to air, allowing the concentration of the sample. Salt, protein (A280) and turbidity (A600) were monitored using in-line sensors.

## Applications

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- ▶ Concentration and desalting proteins and peptides
- ▶ Protein fractionation
- ▶ Sample preparation prior to or post chromatography

**Page:** [1](#) | [2](#) | [3](#) | [4](#) | [5](#) | [6](#) | [7](#) | [8](#) | [9](#) | [10](#) | [Table of Contents](#) | [Download PDF](#) | [Proteomics Overview](#)