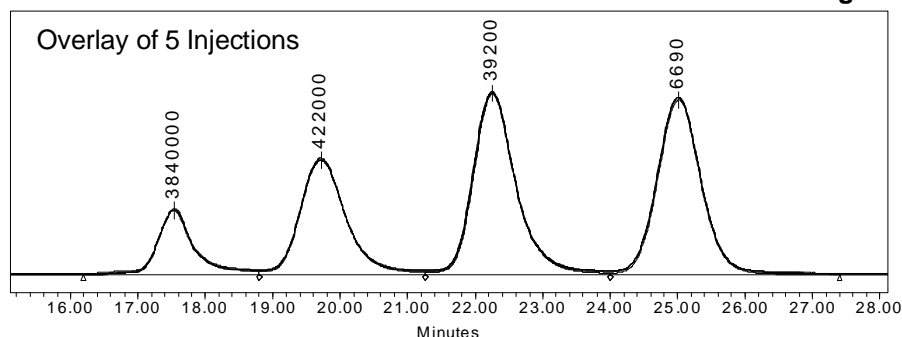


Waters® Breeze™ Systems GPC Performance

Gel Permeation Chromatography (GPC) requires an HPLC system that delivers precise flow. In GPC, the retention time is plotted against the log of the molecular weight, thus, flow rate variations become magnified exponentially in the calculated molecular weight distributions. A small change in flow rate (1%) can result in a large difference (10%) in calculated molecular weight values. The excellent flow rate precision of Breeze isocratic pumps is demonstrated in Figure and Table 1 (overlay of 5 injections of a mixed narrow polystyrene standard). Percent relative standard deviations of <0.1 were obtained on Waters Breeze System without the use of flow rate or internal reference peak corrections.

Excellent GPC Performance with Breeze HPLC

Fig. 1



Breeze HPLC Conditions Used for All Figures and Tables

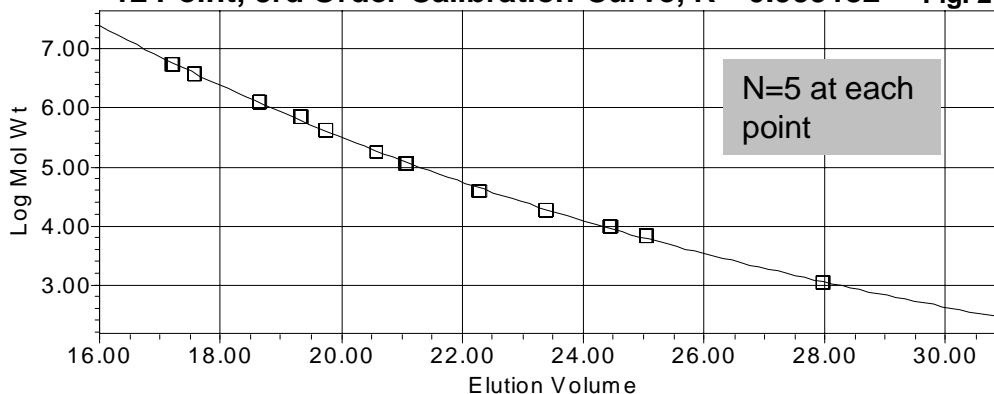
Pump: Breeze 1515 (Isocratic)
Injector: 717+ Autosampler
Detector: 2410 RI at 2 pts/sec (35° C)
Columns: (2) Styragel® HR5E, (1) HR2 columns
 7.8 X 300 mm (30° C)
Sample: Mixed Polystyrene Standards
Eluent: THF at 1 mL/min
Data: Breeze Software

Table 1

Peak#	Mol. Wt.	RT	%RSD
1	3840000	17.538	0.032
2	422000	19.711	0.020
3	39200	22.250	0.028
4	6690	25.010	0.023

12 Point, 3rd Order Calibration Curve, $R^2=0.999182$

Fig. 2



Breeze System software provides easy to use fundamental GPC calculations including narrow and broad standard as well as molecular weight distributions of broad unknowns (Figures 3+4, Table 2). Relative and modified universal calibration types employing point to point and 1st through 5th order fits are available. A partial list of reportable peak result fields include Mn, Mw, MP, Mv, Mz, Mz+1, and polydispersity (Table 3).

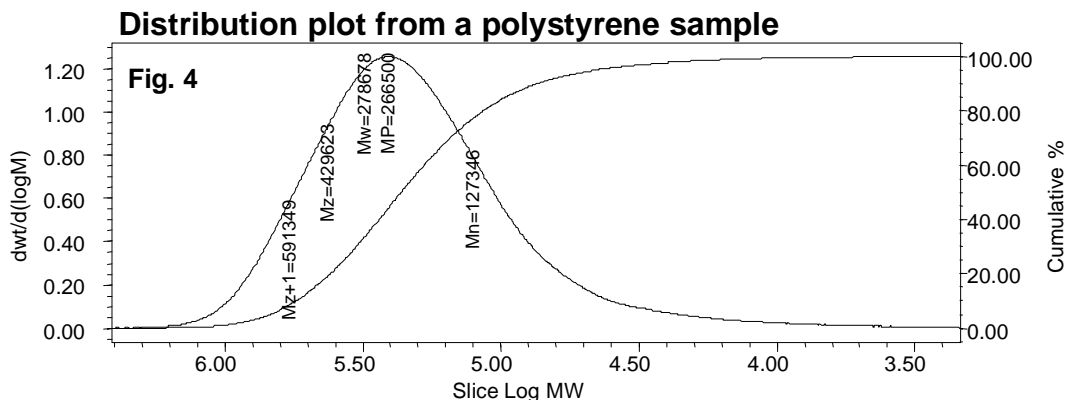
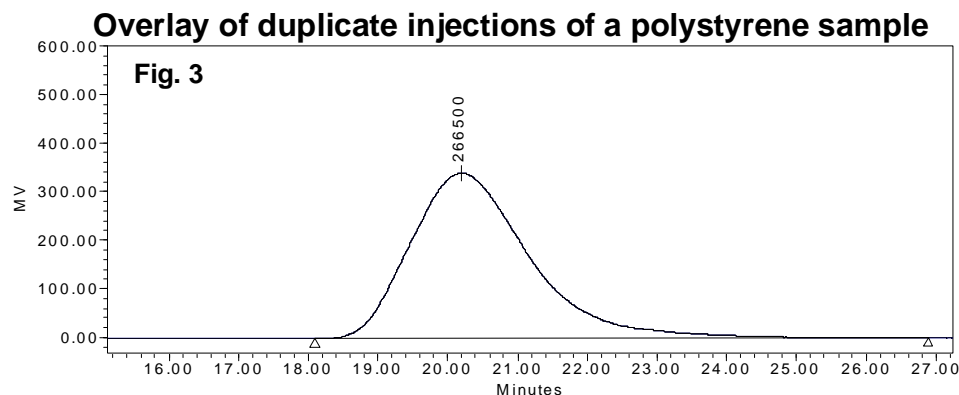


Table 2 - Slice table from a polystyrene sample

	Slice MW (Daltons)	Slice Log MW	Slice Volume (ml)	Slice Area	dwt/d(logM)	Cumulative %	Slice [n] (dl/g)	Outside Vo-Vt
1	2180632	6.338582	18.092	-0	-0.000000	0.000		<input type="checkbox"/>
2	2161096	6.334674	18.100	73	0.000230	0.000		<input type="checkbox"/>
3	2141745	6.330768	18.108	240	0.000757	0.000		<input type="checkbox"/>

Table 3 - Calculated peak fields from a polystyrene sample

Mn	Mw	MP	Mv	Mz	Mz+1	Polydispersity
127346	278678	266500		429623	591349	2.188348

Summary:

- Breeze isocratic pumps provide the excellent flow precision necessary for high quality Gel Permeation Chromatography.
- All basic GPC calculations can be performed using the easy-to-use interface included with Breeze software.