**Introduction**

TurboSEC is an optional 32-bit software package that provides complete and flexible molecular weight distribution processing and reporting of TotalChrom data. TurboSEC methods may be run automatically, as part of a TotalChrom sequence, to generate Size Exclusion Chromatography (SEC) reports and plots at the completion of each data acquisition.

In size exclusion, or gel permeation chromatography, there is an intrinsic relationship between the molecular weight of a component and its retention volume. PerkinElmer’s TurboSEC software option for TotalChrom Chromatography Data Systems is a Microsoft® Windows® based SEC processing and reporting application. TurboSEC software is designed to take full advantage of the power inherent in today’s 32-bit operating environments.

TurboSEC methods permit calibration against narrow or broad molecular weight standards. TurboSEC methods are linked to TotalChrom data acquisition methods to facilitate automatic generation of the chromatographic run (Figure 1).

TurboSEC’s reporting options provide a wide variety of report formats and layouts, complete with a Print Preview option. All standard features of TotalChrom software can be utilized during the collection of data for SEC calculations.

**Familiar Data Acquisition**

SEC analyses are acquired via the standard TotalChrom methods. TotalChrom manages all instrument control parameters and data acquisition through methods that are passed to PerkinElmer’s standard interfaces (NCI or LINK) for instrument control and data acquisition. All interfaces incorporate buffered RAM memory to ensure data acquisition continuity in the event of network or PC interruptions. Since each interface’s memory is segmentable, multiple chromatographic runs may be stored in each interface, if necessary. The multitasking architecture of TotalChrom software permits data acquisition from conventional gas and/or liquid chromatographs during acquisition of SEC data.

![Figure 1. TurboSEC chromatogram plot with calibration curve overlay.](image-url)
Intuitive TurboSEC Methods

TurboSEC methods contain all the processing information needed to generate an SEC report from a TotalChrom result file. Methods are easily created via a Generate/Review feature in the SEC method editor. This approach guides the user through all ages and parameters of a method so that nothing is overlooked. Alternatively, the user may go directly to a specific page/parameter of an existing method that might need selective modification. Online context-sensitive help is always available to assist the user as methods are created or modified. After you complete a TurboSEC method the software automatically creates a calibration plot for your review. Different curve fit equations may be easily selected to generate the best fit to your data. Data points may also be annotated with labels for clarity. Nothing could be more intuitive.

Easy Calibration

TurboSEC method calibrations are based on different polymer standard types—narrow range standards with calibration curve fit choices of point to point or a polynomial regression fit from first to ninth order, and broad range standards based on the Integral Broad Standard or Hamielec technique. The Universal Narrow standard calibration procedure is also available. A flow marker component may be added to standards and unknown samples to provide correction for variations in column flow during an analysis.

A spreadsheet table is used to enter elution volumes and corresponding molecular weights. Retention/elution values may be entered manually or loaded automatically from an existing TotalChrom result file. Calibration curves and fit statistics may be displayed on screen or printed (Figure 2). Calibration data may be automatically updated as needed if the TurboSEC method is included as a user program in the TotalChrom data acquisition calibration run. Nothing could be easier.

Graphical TurboSEC Processing

Processing parameters that offer a wide range of options are incorporated into each TurboSEC method. The TurboSEC processing parameters work in tandem with the TotalChrom method to provide a total SEC data processing solution. For example, raw data may be smoothed prior to SEC processing by using the Savitsky-Golay smoothing algorithms native to the TotalChrom software. This may be accomplished in TotalChrom’s Graphical Method Editor (GME) which is already familiar to TotalChrom users.

Also from within TotalChrom, negative peaks, often encountered in refractive index detectors, can be processed or ignored. To ensure the most precise and reproducible molecular weight distribution results, TurboSEC methods permit the setting of processing limits and baseline placement in the SEC chromatogram graphically (Figure 3). For detailed examination of SEC data and baseline assignments, the user may zoom in on a portion of the chromatogram for a closer look at the data.

WYSIWYG Reports and Plots

A wide variety of user-selectable reports and plots are available from a TurboSEC method. All SEC reports and plots may be displayed on screen, prior to printing, based on the report/plot options selected in the TurboSEC method.

Report formats include a molecular weight average report, a peak molecular weight averages report, a weight slice report, and an above/below molecular weight limits report (Figure 4). The molecular average report may include $M_n$, $M_w$, $M_z$, $M_w/M_n$ (Polydispersity), $M_w(1+1)$ Average Mw and Intrinsic Viscosity values. Reports may be stored as an ASCII text file and printed at a later time.

TurboSEC plot formats include the ability to display the SEC chromatogram with molecular weight average values, peak molecular weight values or peak retention times. The SEC chromatogram may also be displayed in a time slice format. A number of slice report curves, including cumulative Area %, cumulative $M_n$, cumulative $M_w$% and cumulative $M_z$%, may be overlayed on the SEC chromatogram, if desired (Figure 5).
Additionally, the SEC calibration curve may be overlaid on the chromatogram. The TurboSEC plot may also be sized to fit any portion of a printed page. This feature facilitates printing the plot and report on the same page. All plots may be reviewed in Print Preview mode.

Figure 3. Graphical reassignment of SEC processing.

Figure 4. TurboSEC peak molecular weight report.

Figure 5. TurboSEC peak molecular weight plot.