



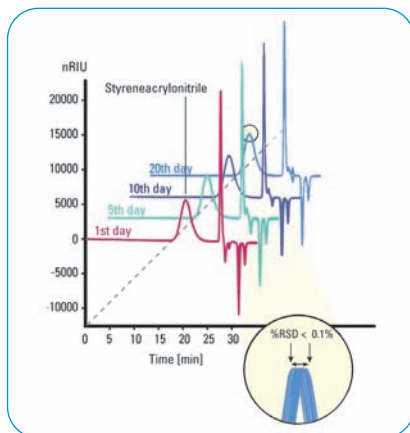
Agilent 1200 Series GPC-SEC System

Easy and reliable polymer characterization

A precise solution for polymer characterization

Gel Permeation Chromatography (GPC), also referred to as Size Exclusion Chromatography (SEC), is the technique of choice to characterize polymers. Average molecular weights and molecular weight distributions are calculated based on the elution behavior in a size exclusion column set. The Agilent 1200 Series instrumentation offers excellent retention time precision and molecular weight data for this application.

The Agilent 1200 Series GPC system is designed for cost-effective, routine polymer characterization by GPC-SEC with refractive index and UV detectors. It is based on the reliable Agilent 1200 Series HPLC modules. HPLC instrument control, data acquisition and GPC data analysis can be performed with the easy-to-use Agilent ChemStation with integrated GPC-SEC data analysis software.



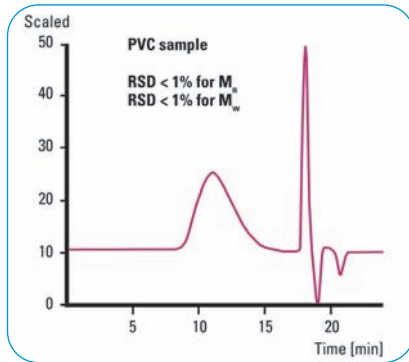
A new level of molecular weight data precision

The excellent flow precision of the Agilent 1200 Series solvent delivery system and the superior column thermostat stability from 10 degrees below ambient to 80 °C ensure retention time precision below 0.1% RSD. Moreover, intraday and interday repeatability is outstanding (see table). The Agilent 1200 Series refractive index detector (RID) is the perfect partner for GPC-SEC. It combines exceptional baseline stability with excellent automation capabilities. Additional UV detectors for absorbing polymers can be added as needed.

This overlay of 10 consecutive runs per day shows the remarkable intraday and interday retention time precision achieved with the Agilent 1200 Series GPC-SEC system.

Day number	% RSD Ret. time	% RSD for M_n	% RSD for M_w
1	0.071	1.16	1.12
2	0.076	1.43	0.78
3	0.020	0.92	0.72
4	0.032	0.82	0.83
5	0.030	1.18	0.97
6	0.038	0.95	0.78
7	0.037	1.13	1.08
8	0.030	0.58	0.81
9	0.043	0.91	0.66
10	0.025	0.73	0.32
11	0.022	1.43	0.43
12	0.021	0.81	0.35
13	0.016	0.89	0.59
14	0.029	0.88	1.19
15	0.065	1.08	1.27
16	0.002	0.68	0.70
17	0.045	0.99	0.85
18	0.038	0.94	0.78
19	0.041	0.95	0.80
20	0.009	0.70	0.71
Average % RSD	0.035	0.96	0.78

Intraday retention time precision and molecular weight averages for a styrene acrylonitrile over a series of 20 days.

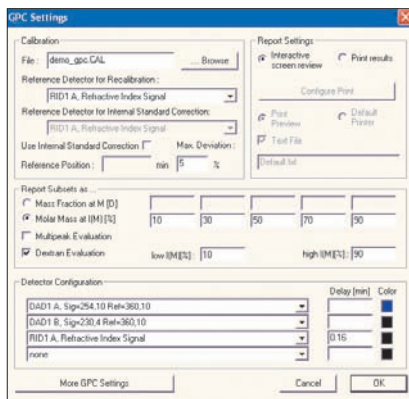


The Agilent 1200 Series GPC-SEC system enables outstanding precision for molecular weight information (overlay of 10 runs).

Outstanding features of ChemStation GPC-SEC data analysis software

The GPC-SEC data analysis software, fully integrated with the Agilent ChemStation, provides interactive and automated GPC-SEC analysis, including recalibration and reporting. It simplifies retrieval of your GPC data, including average molecular weights, M_n , M_w , M_z , M_p , M_v , polydispersity D , differential and integral molecular weight distribution. The software enables internal standard and detector delay corrections

and includes narrow, broad, universal and integral calibration. Multi-peak and dextran evaluations according to Pharmacopeia are newly implemented features. The software comes complete with validation and automated instrument verification procedures and is fully compliant with ISO/EN 13885 and DIN 55672 GPC standards.

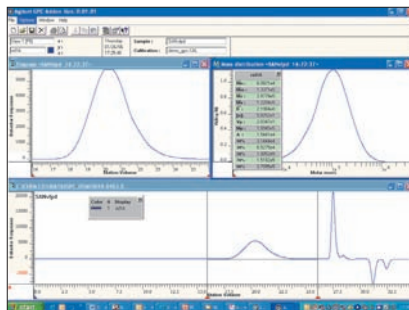


The dialog box for the ChemStation GPC settings enables entry of main parameters like calibration file and type of detector.

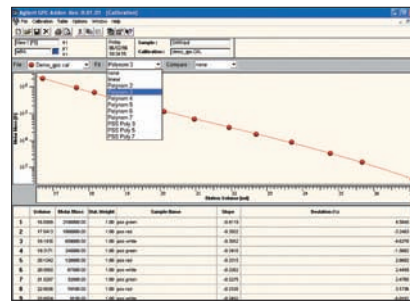
Unmatched productivity in GPC-SEC analysis

The 1200 Series GPC-SEC system offers a variety of features to improve laboratory productivity. These include:

- Fully automatic, unattended analyses and reporting, even recalibration can be completely automated
- Proven and reliable hardware from the industry-leading HPLC system with minimal maintenance costs
- Outstanding refractive index detector baseline stability ensures reliable results
- Warm-up time less than one hour, even for systems with refractive index detection
- RID built-in solvent recycling valve minimizes solvent usage, reducing cost of ownership
- RID programmable reference cell purge enhances the automation capabilities
- Polarity switch quantifies positive and negative peaks in a single run
- Fast and convenient front access to all maintenance parts increases system uptime
- Built-in diagnostics and automated OQ/PV procedures reduce downtime
- Easy-to-use Agilent ChemStation with cost-effective GPC data analysis software
- Validated software package in compliance with international GPC standards (ISO/EN 13885 and DIN 55672) saves time in preparing audits



Main window of the ChemStation GPC data analysis software.



GPC calibration window for optimum selection of best curve fit.



Seamless integration in ChemStation for fast start-up.

Complete solutions

Agilent offers complete configurations of the Agilent 1200 Series modules which are tailored to simplify startup of specific HPLC applications. These configurations include the gel permeation GPC-SEC system. This system comes with a startup kit containing an application-specific column, EasyCal vial calibration standards for rapid and convenient calibration and an instruction manual. The startup kit is available for applications with organic and aqueous eluents. Your Agilent representative can provide details on these solutions.



GPC-SEC startup kit

A complete GPC-SEC analysis system includes:

- Agilent 1200 Series degasser with large solvent cabinet
- Agilent 1200 Series isocratic pump for flow precision < 0.1% RSD
- Agilent 1200 Series autosampler with single valve design
- Agilent 1200 Series thermostatted column compartment for temperatures from 10 degrees below ambient up to 80 °C and temperature precision of ± 0.15 °C; for temperatures from 10 degrees below ambient up to 100 °C and best temperature precision of ± 0.05 °C use the thermostatted column compartment SL
- Agilent 1200 Series refractive index detector with an automatic recycle valve
- Agilent ChemStation with GPC-SEC data analysis software
- A startup kit for organic or aqueous eluents containing:
 - A high performance PL gel mixed C column or a high efficiency PL aquagel-OH mixed column
 - EasyCal vial calibration standards, based on polystyrene or polyethylene oxide GPC-SEC start-up kit
 - Broad polystyrene or dextran test sample
 - Certificates for column and calibration standards
 - Instruction manual with setup instructions, performance data, typical applications and a troubleshooting chapter

A variety of further GPC-SEC columns for organic and aqueous eluents are available. For details on these columns refer to:

- The Fast Track to GPC-SEC, Agilent publication number 5968-9259E

For typical application examples refer to:

- Polymer and Hydrocarbon Processing Solutions with HPLC, Agilent publication number 5968-7020E

Typical specifications of an Agilent 1200 Series GPC-SEC system

Agilent 1200 Series pumps

Flow precision:	< 0.1% RSD or 0.02 min SD, whichever is greater, (typically < 0.065% RSD or 0.015 min SD, six replicates, isocratic mode from 1 bottle, based on retention time)
Pressure pulsation:	< 2% amplitude, (typically < 1%) at 1 mL/min isopropanol, at all pressures > 1 MPa, (> 10 bar, 147 psi)
Compressibility compensation:	User-selectable, based on mobile phase compressibility
Recommended pH range:	1.0 – 12.5 pH range; solvents with pH < 2.3 should not contain acids which attack stainless steel

Agilent 1200 Series thermostatted column compartment

Temperature range:	10 degrees below ambient to 80 °C (SL version: 10 degrees below ambient to 100 °C)
Temperature stability:	± 0.15 °C (SL version: ± 0.05 °C)
Temperature accuracy:	± 0.8 °C, with calibration ± 0.5 °C
Column capacity:	Three 30-cm columns (if the application requires more columns, a second column compartment can be added)

Agilent 1200 Series autosampler

Sample capacity:	100 x 2-mL vials in 1 tray, 40 x 2-mL vials in 1/2 tray, 15 x 6-mL vials in 1/2 tray Microvials (100 or 300 µL) with sleeves
Injection volume:	0.1 – 100 µL injection range, up to 1500 µL with multipledraw Optional injection range upgrade kit: 0.1 – 900 µL injection range in 0.1 µL increments (recommended 1 µL increments) Up to 1800 µL with additional multiple-draw Up to 5000 µL with additional exchange of seat capillary
Precision:	Typically < 0.5% RSD from 5 – 100 µL, typically < 1% RSD from 1 – 5 µL Optional injection range upgrade kit: Typically < 0.5% RSD of peak areas from 10 – 900 µL

Agilent 1200 Series refractive index detector

Detection type:	Deflection method
Short-term noise:	± 2.5 x 10 ⁻⁹ RIU*
Drift:	200 x 10 ⁻⁹ RIU/h*
Valves:	Automatic purge and automatic solvent recycle *According to ASTM E-1303-95 "Practice for Refractive Index Detectors used in Liquid Chromatography." Reference conditions: response time 4 s, 35 °C, 1 mL/min H ₂ O (online degassing), restriction capillary

Specifications common to all modules

Communications:	Control area network (CAN), HP-IB, RS-232, APG remote, optional local area network (LAN). Remote: ready, start and shutdown signals
Safety and maintenance:	Extensive diagnostics, error detection and display, leak detection and safe leak handling, low voltages in major maintenance areas
GLP features:	Early maintenance feedback (EMF) for continuous tracking of instrument usage with user-settable limits and feedback messages. Electronic records of maintenance and errors, automated OQ/PV procedures. (For a complete listing refer to the specifications of the modules)

www.agilent.com/chem/1200

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