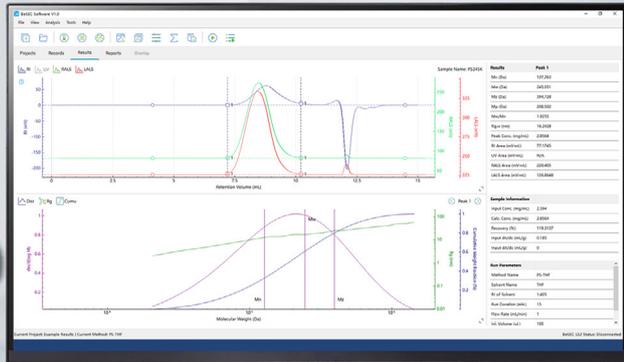


ABSOLUTE MOLECULAR WEIGHT

MOLECULAR WEIGHT DISTRIBUTION

MOLECULAR SIZE



BeSEC Series

Absolute Insight into Every Molecule

Bettsize

BETTER PARTICLE SIZE SOLUTIONS

Advanced Light Scattering Detector

for SEC/GPC systems

Step into the future of chromatography with the BeSEC Series. Designed as a next-generation light scattering detector, the BeSEC transforms conventional SEC/GPC workflows into powerful platforms for **absolute molecular weight analysis**.

Unlike traditional methods that rely on retention time, the BeSEC delivers first-principles data, ensuring unmatched accuracy for researchers in biopharmaceuticals, advanced polymer science, and food chemistry—accelerating the path from discovery to market.



Features

- Dual detection angles: **7° and 90°**
- Molecular weight range: **1 kDa to 2 GDa**
- Supports radius of gyration **R_g > 12 nm**
- Homopolymer and protein modes
- Acquires RI, UV, and start signals
- Intuitive software with real-time analysis
- 18 μ L flow cell minimizes band broadening

Benefits

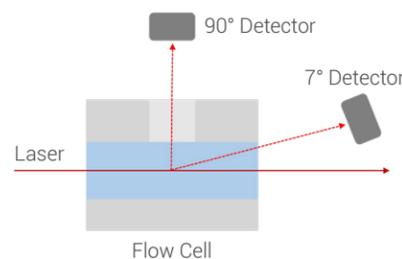
- **Proteins:** Determine molecular weight, oligomer state, and aggregates
- **Polymers & Polysaccharides:** Analyze molecular weight distribution and size
- No column calibration required since Mw is independent of elution volume
- Low-angle detection enables accurate molecular weight
- Compatible with any SEC or GPC system

Measurement Parameters

M_n Number-average molecular weight	M_w Weight-average molecular weight	M_z Z-average molecular weight	M_p Peak molecular weight
R_g Radius of gyration	Pd Polydispersity index	dn/dc Refractive index increment	Conc. Concentration

Why Dual-Angle Detection Matters

By capturing light scattering data at both 7° (Low-Angle) and 90° (Right-Angle), the system eliminates the inaccuracies of traditional column calibration, and allows for the analysis of absolute molecular weight and molecular size with exceptional sensitivity, even for complex or branched polymers.



- Direct measurement with **low-angle light scattering (LALS) at 7°**
- Direct measurement with **right-angle light scattering (RALS) at 90°**
- LALS delivers high accuracy for large macromolecules
- RALS provides high sensitivity for small macromolecules

Model Selection

	BeSEC LS1	BeSEC LS2
Detection Angle 90°	✓	✓
Detection Angle 7°	✗	✓
Mw Range	1 kDa to 20 MDa	1 kDa to 2 GDa
R _g	✗	✓

Universal Integration

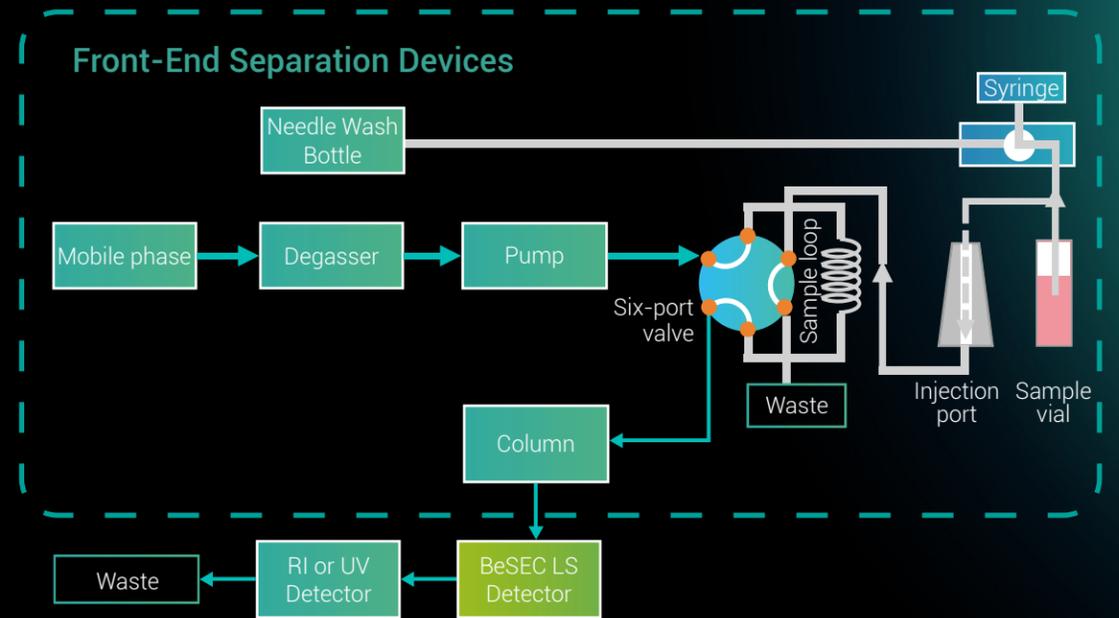
Coupling with Any SEC/GPC Platform Seamlessly

The BeSEC Series is engineered for universal compatibility, allowing seamless integration downstream of any third-party SEC/GPC system.

Chromatography workflows typically consist of two stages: the separation stage, which includes the solvent delivery pump, inline degasser, autosampler or manual injector, and SEC columns; and the detection stage, which employs a combination of detectors—most commonly Refractive Index (RI), UV-Visible, and Light Scattering—to characterize molecular properties in real time.



SEC/GPC Analytical Workflow



Determining Absolute Molecular Weight with Static Light Scattering Technology

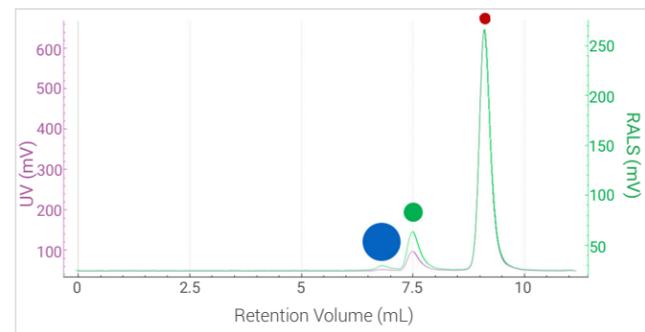
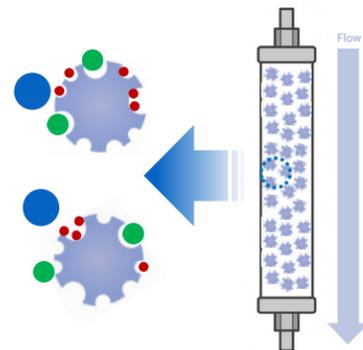
In size exclusion chromatography (SEC), separation depends only on the hydrodynamic size of the molecules. Larger molecules are unable to penetrate the pores of the stationary phase and elute earlier, while smaller molecules enter the pores and elute later. The separation mechanism is purely physical, and no chemical or adsorptive interactions occur between the solute and the stationary phase.

- Large molecules**

Cannot enter or only partially enter the pores, travel through the column voids, and elute first.

- Small molecules**

Enter more pores, take longer paths, and elute later.



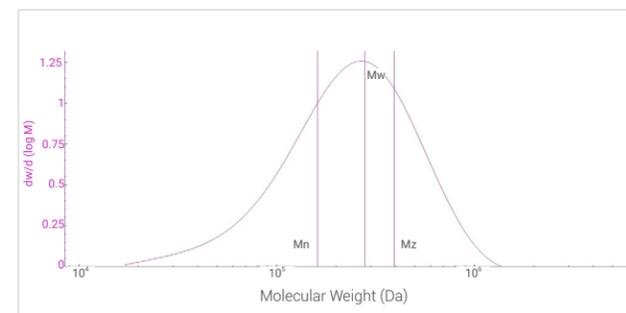
UV & RALS Responses versus Retention Volume

Mathematical Definitions of Average Molecular Weight

Number-average molecular weight (M_n)
$$\overline{M}_n = \frac{\sum c_i}{\sum c_i / M_i}$$

Weight-average molecular weight (M_w)
$$\overline{M}_w = \frac{\sum M_i c_i}{\sum c_i}$$

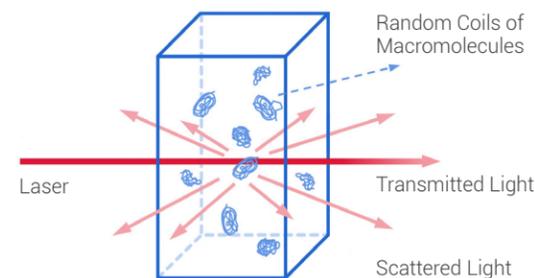
Z-average molecular weight (M_z)
$$\overline{M}_z = \frac{\sum M_i^2 c_i}{\sum M_i c_i}$$



Principle of Static Light Scattering (SLS)

$$\frac{Kc}{R_\theta} = \frac{1}{M_w P(\theta)} + 2A_2c$$

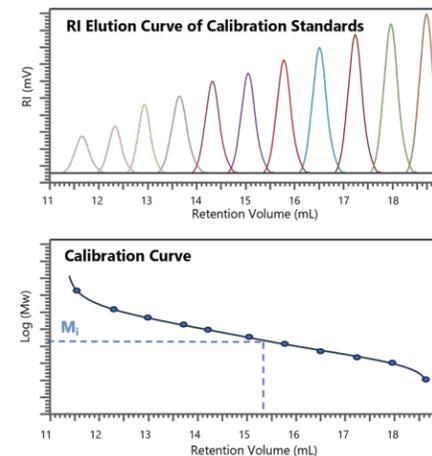
SLS measures the scattered intensity of macromolecules in solution. By applying the Rayleigh equation to the scattering data collected at specific angles, this technique provides a direct correlation between scattered intensity, absolute molecular weight, and the second virial coefficient (A_2), enabling precise characterization of molecular properties.



Breaking Free from Column Calibration How the BeSEC Improves SEC/GPC Workflows

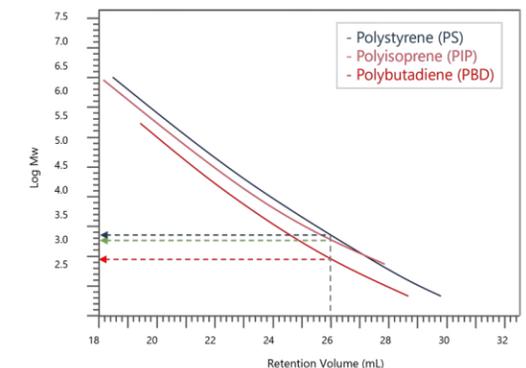
Traditional SEC/GPC systems without light scattering detection provide only relative molecular weight

These systems require calibration with a series of polymer standards to create a calibration curve of molecular weight versus retention volume.



Conventional methods that rely on retention volume introduce significant bias

Polymers with similar hydrodynamic size can elute at the same time yet differ greatly in molecular weight due to structural variations. Without light scattering detection, these differences remain hidden, making it impossible for traditional SEC or GPC to accurately distinguish between such samples.



Advantages of Light Scattering Detector BeSEC

VS

Limitations of Conventional SEC/GPC

- ✓ **No Calibration Curve Required**

BeSEC measures molecular weight directly from light scattering, eliminating reliance on polymer standards and avoiding errors caused by structural differences between standards and samples.

- ✓ **Independent of Retention Time**

When coupled with SEC/GPC, the BeSEC determines the absolute molecular weight for each eluting species, even in the presence of chromatographic anomalies such as adsorption, shear, or peak overlap.

- ✗ Calibration is time-consuming and must cover the full elution range

- ✗ Limited availability of suitable standards reduces accuracy

- ✗ Molecular weight remains relative to chosen standards

- ✗ Structural effects like branching or aggregation are often missed

- ✗ Results depend heavily on column performance, which degrades over time

BeSEC Workstation Software

Research-Grade Chromatography Software

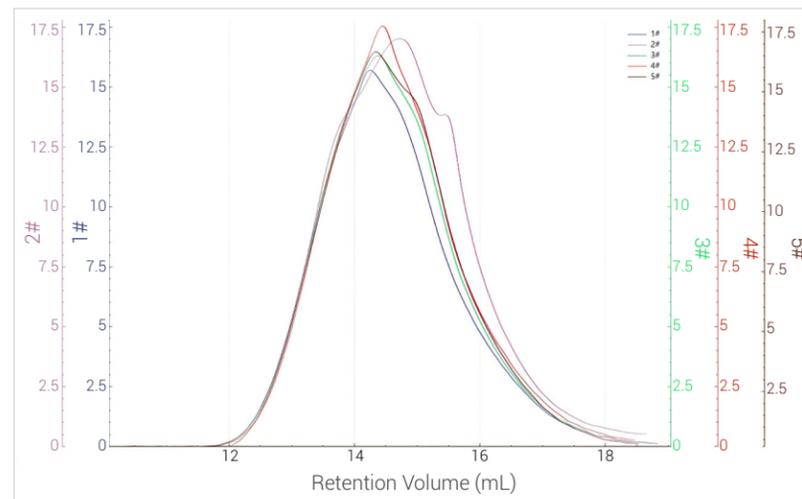
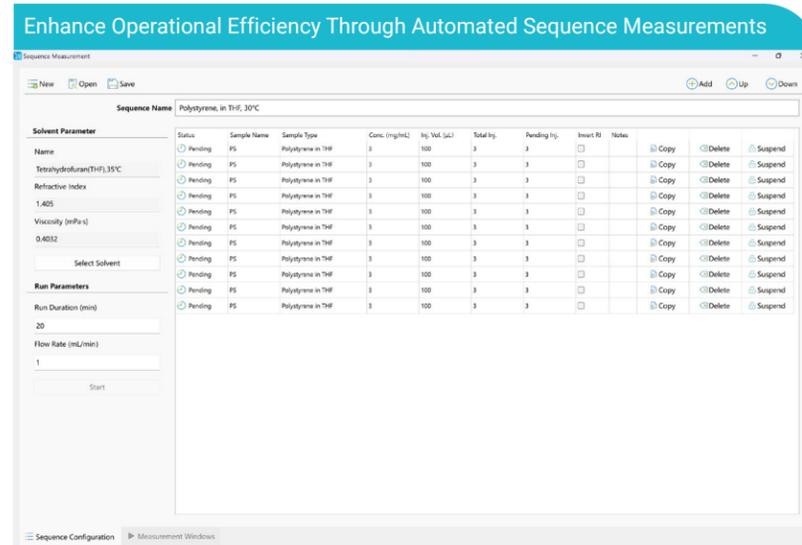
BeSEC software is a dedicated chromatography workstation for light scattering detectors.

It features a clear, user-friendly interface and straightforward operation, and delivers a wide range of application-specific reports and results.



Features & Benefits

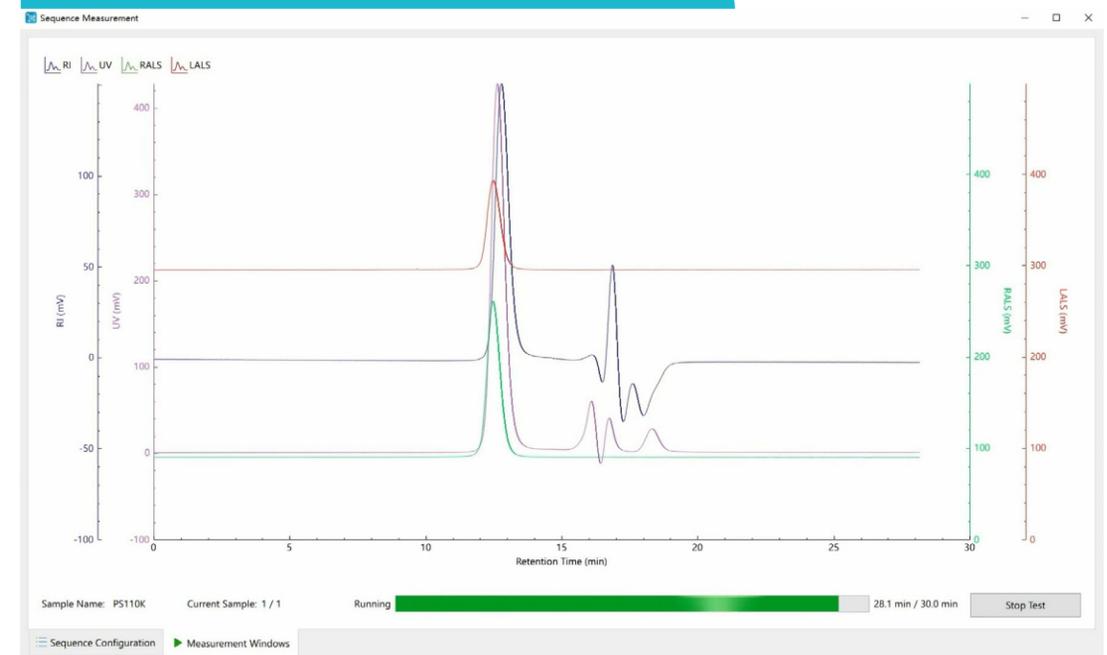
- Compatible with any third-party GPC or SEC system, acquiring **RI, UV, and start signals**
- Supports **automated sequence measurements**
- Enables reliable **multi-peak integration**
- Allows baseline and integration settings across all detector signals simultaneously
- Provides dn/dc determination and concentration calculation
- Offers statistical reports for clear comparison between measurements
- Delivers over 20 output parameters to support research, QC, and production



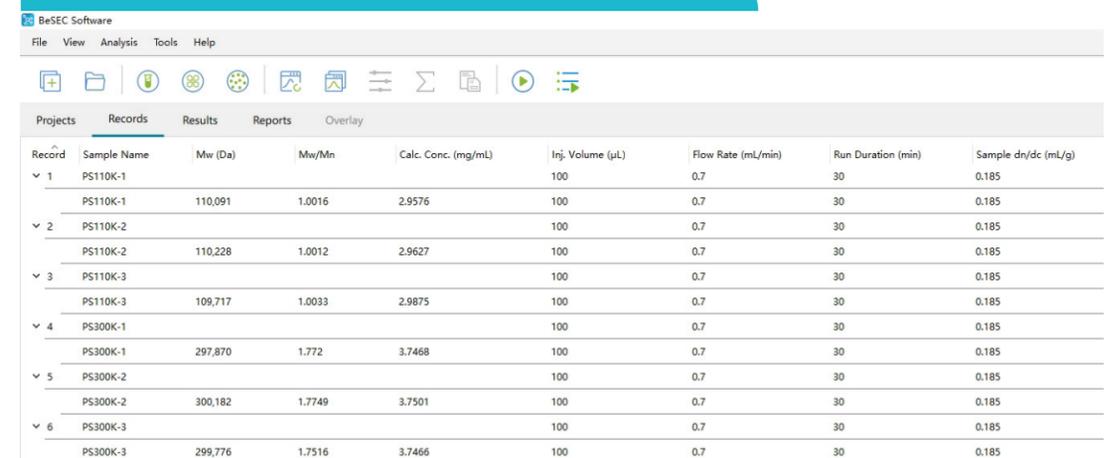
Chromatogram Comparison and Statistical Data Analysis

	1#	2#	3#	4#	5#
Mn	80,512	94,839	89,895	78,859	86,202
Mw	146,949	141,931	148,299	140,964	149,332
Mz	236,621	215,152	227,991	222,878	230,188
Pd	1.8252	1.4965	1.6497	1.7875	1.7324
Rg	23.6687	24.1895	25.0780	23.0802	25.7980

Dynamic Live Plotting Paired with Industry-Leading Signal Performance



Optimized User Experience Featuring an Intuitive and Streamlined Layout



Simplify your testing with the BeSEC workstation

Experience industry-leading signal performance and real-time data analysis through a streamlined, user-friendly interface that delivers clear results from start to finish.

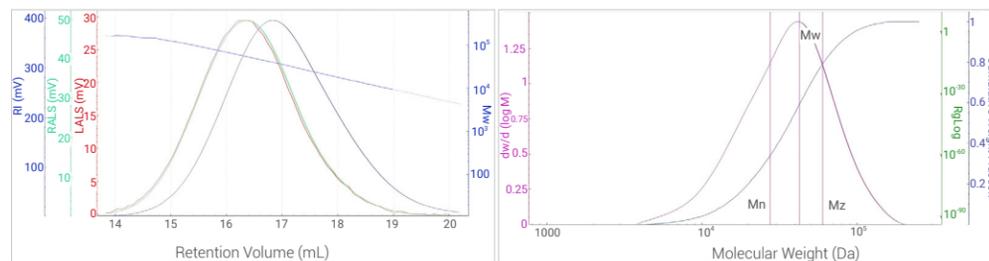
Application Examples

Polymers & Plastics



Molecular weight plays a critical role in determining both the mechanical strength and processing behavior of polymers such as PET. Traditional methods like intrinsic viscosity provide only an average value and fail to reveal the complete molecular weight distribution.

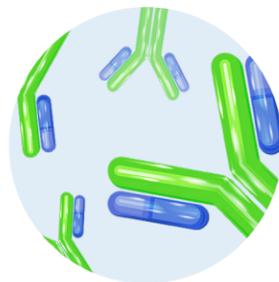
By integrating light scattering signals with an SEC system, researchers can directly measure absolute molecular weight and resolve the full distribution. This capability supports improved process control and product optimization, ensuring consistent quality and performance.



Elution profile of the molecular weight

Molecular weight distribution

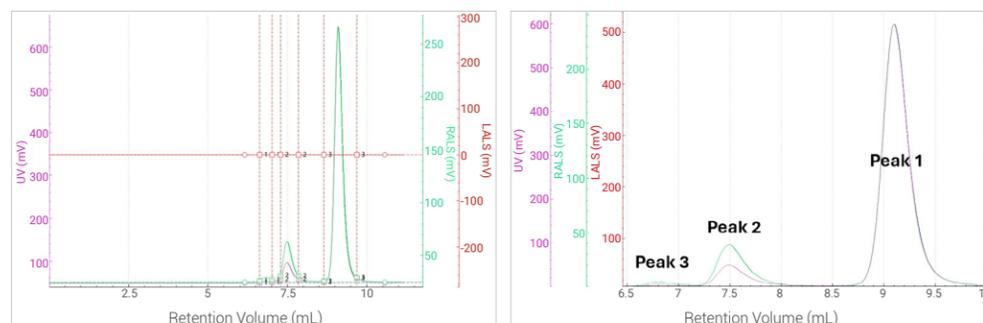
Proteins & Biologics



In biopharmaceuticals, aggregates impact therapeutic efficacy and patient safety, as large aggregates may trigger immune responses. Understanding the type and level of aggregates in protein formulations is therefore essential.

The BeSEC system can effectively distinguish monomers, dimers, and higher-order species, while accurately quantifying their content. This insight is critical for ensuring formulation stability and compliance with stringent regulatory standards.

Peak	Mw (Da)	Ratio of Peak n/Peak 1	Area (%)
Peak 1	149,776	1.00	75.8
Peak 2	295,157	1.97	17.4
Peak 3	450,351	3.01	3.8



Elution profile of the detector signals

Elution profile of the molecular weight

Specifications



	BeSEC LS1	BeSEC LS2
Measurement		
Molecular Weight Range	1 kDa to 20 MDa*	1 kDa to 2 GDa*
Rg	N/A	> 12 nm*
System		
Detection Angle	RALS (90°)	LALS (7°) and RALS (90°)
Laser Source Type	Diode laser	
Laser Power	10 mW	
Laser Wavelength	640 nm	
Sample Cell Volume	18 µL	
Acquisition Rate	5 Hz	
Dynamic Range	+/- 2500 mV	
Connection to PC	USB	
Measurement Modes	Homopolymer mode, protein mode	
Output Results	Mn, Mw, Mz, Mp, Pd, dn/dc, Concentration, Mw distribution	Mn, Mw, Mz, Mp, Pd, dn/dc, Concentration, Mw distribution, Rg
Analog Inputs	RI, UV and start signals	
Solvent Compatibility	Aqueous and organic solvents	
Wetted Parts	PTFE, PEEK, glass, stainless steel	
Power Supply	AC 100-240 V, 50-60 Hz, 4.0 A	
Dimensions (L x W x H)	450 x 325 x 157 mm (= 17.7" x 12.8" x 6.2")	
Weight	11 kg (= 24.2 lbs)	

* Depending on sample and options

Bettersize

BETTER PARTICLE SIZE SOLUTIONS

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