

Biotage Scale Up Solutions

Flash Purification, Metal Scavenging,
Reagents & Scavengers



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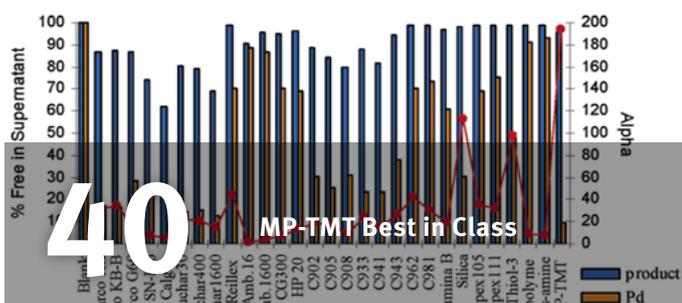
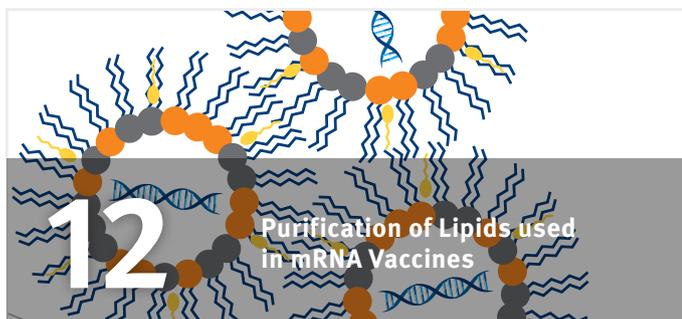
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Highlights



This is Biotage

Biotage is a Global Impact Tech Company committed to solving society's problems. We offer workflow solutions and products to customers in drug discovery and development, analytical testing and water and environmental testing.

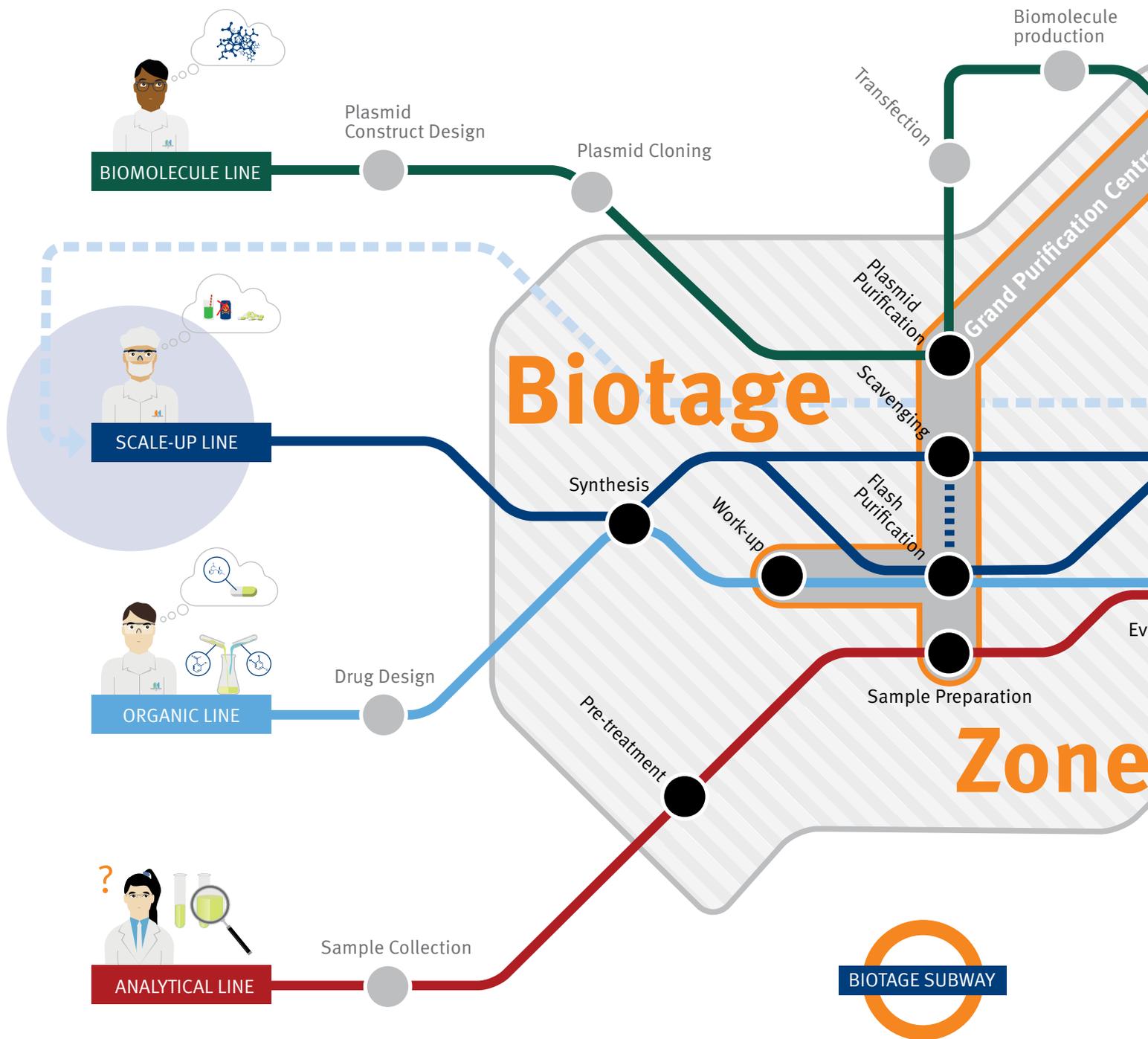
Biotage is contributing to sustainable science with the goal to make the world healthier, greener and cleaner – HumanKind Unlimited. Our customers span a broad range of market segments including pharmaceutical, biotech, contract research and contract manufacturers as well as clinical, forensic and academic laboratories in addition to organizations focused

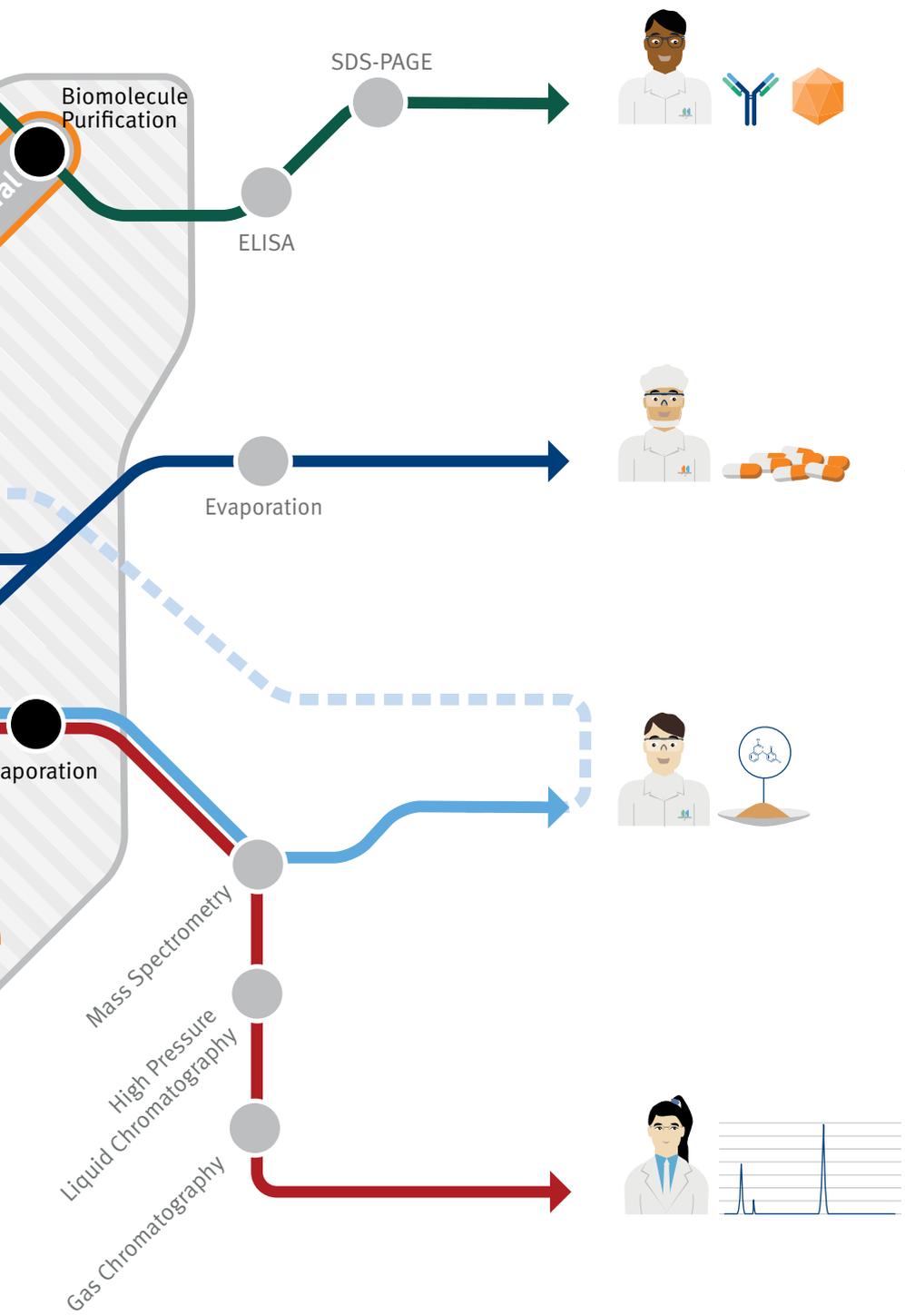
on food safety, clean water and environmental sustainability. Biotage is headquartered in Uppsala in Sweden and employs approximately 485 people worldwide. The Group had sales of 1,092 MSEK in 2020 and our products are sold in more than 70 countries. Biotage's share (BIOT) is listed in the Mid Cap segment on the NASDAQ Stockholm.



The World of Biotage

Biotage offers workflow solutions and products to customers in drug discovery and development, analytical testing and water and environmental testing.





Scaling Up

When a drug candidate is going to be tested, volumes must be scaled up. This requires larger capacity equipment for purification. From traditional small molecules to peptides, natural product extraction, targeted synthesis of targets in the latest high-tech HP-APIs, or novel lipids used in COVID-19 formulations, Biotage purification platforms and scavenging technologies are trusted and underpin efficient processes, from research to cGMP campaign or commercial production, the world over.

Regulatory and Quality

It is critical that equipment used in process is reliable, reproducible, robust and traceable. Biotage has worked with suppliers and a number of internationally recognized bodies to attain global standards of benchmarked quality and compliance in our scale-up products.

Sustainability



At Biotage Sustainability is in the forefront of our work. Our tagline “HumanKind Unlimited” underscores our ambition to strive towards improving global health. Whilst we focus on the development of our products, we also monitor our own waste materials and emissions and how they affect our environment. From a social perspective, we focus on our employee’s job satisfaction, their working environment and ensuring we offer rewarding terms and conditions. On an international perspective, we support the Universal Declaration of Human Rights and through our Code of Conduct ensure our interactions with stakeholders adhere to its principles. We fully support efforts against corruption and enhancing local societies through tax contributions, diversity, work opportunities, fair competition, consumer protection and product safety. Globally, we are a signatory of the United Nations Global Compact, which encourages businesses to embrace sustainability and social responsibility.



SDS support

Biotage supported reagents and scavengers are made in an ISO 9001:2008 compliant manufacturing facility. Each material is batch and lot controlled, with benefits of full traceability. The products are readily available in multi-kg quantities off-the-shelf and supported by a comprehensive regulatory qualification support package comprising certificate of analysis, extractables, chemical loading, lot information, batch identity and consistency, MSDS/SDS, and full instructions and suggestions for use. Biotage can provide extensive technical support relating to the efficient use of these products in various processes.



Environmental Accreditations

Natural Resource Wales, Environmental Permit Regulations 2010, registration #EPR/DP3832EF

Preserving our shared environment is fundamental to Biotage, as it is to our employees, customers, and other stakeholders. Biotage has attained an environmental permit from Natural Resources Wales, under The Environmental Permitting (England & Wales) Regulations 2010. Our registration number is EPR/DP3832EF.

Quality Assurance



ISO 9001:2008

Biotage is accredited to the world-renowned British Standards Institute ISO 9001:2008 standard (registration number FM31206), with the scope defined as “Design and manufacture of sorbent and resin materials for sample preparation and purification products. Manufacture of laboratory automation equipment.” Quality is built into our everyday principles and practices. 2015 was a milestone in our commitment to quality as we have now held this ISO accreditation for over 20 years. All Biotage products are manufactured in controlled conditions. Consumables are lot controlled and traceable, and instruments carry ASME, TÜV and CE registration as necessary.



ISO 14001:2004

Biotage is also accredited to the British Standards Institute ISO 14001:2004 standard (registration number EMS640981) with the scope defined as “Design and manufacture of sorbent and resin materials for sample preparation and purification products. Manufacture of laboratory automation equipment.” Ensuring we play our part responsibly is important to us and our registration to ISO 14001:2004 system was yet another milestone in our achievements and commitment to all our futures.

Impurity and Chemical Control



TSE/BSE Statements

All Biotage polystyrene backbone resin materials and silica-based products in the consumables range are produced from either petroleum based chemicals or inorganic salts. Raw materials are traceable and do not contain materials of animal or biological origin; nor do ancillary chemicals used in production processes.



cGMP qualified

Biotage scale up purification platforms come complete with a CE mark, an ASME "UM" stamp and are certified for usage in Japan, Europe and North America. To assist you in developing SOPs, Biotage Flash 75/150/400 systems are fully supported by user friendly and icon-based instructions manuals. Biotage Flash 75/150/400 are supported by a comprehensive engineering documentation package, a certificate of performance and a certificate of compliance for validation filing. Please enquire for more details.



ICH Q3D

The ICH (International Conference on Harmonisation) Q3D guidelines were accepted in December 2014. The guidelines relate to impurities in new drugs and formulations, and affect a large number of pharmaceutical industries. To support our clients commitment to ICH Q3D, Biotage has liaised with suppliers to provide data to support a statement which can be risk assessed in the context of the proposed industrial process, supporting compliance.



ATEX

ATEX is the framework of legislation and guidance for controlling explosive atmospheres and the standards of equipment and protective systems used in them within Europe. Biotage Flash 75/150/400 systems are compliant with the ATEX Product Directive, 2014/34/EU.



Extractables

We all try to avoid plastics, but where a process or industry application demands a single use plastic for the purpose of impurity control, or safety/risk mitigation, we can provide several assurances. Biotage Flash 75, Flash 150 and Flash 400 cartridges are constructed of medium or high density polyethylene or polypropylene, and meet the FDA extractable requirement specified in 21 CFR 177.1520. Resin and silica products are efficiently washed and tested during production phases to minimize any downstream contamination risk and reduce the burden of solvent utilization for our client base. Extractable data for all scavengers and stationary phases is available on request. Our metal scavengers have been demonstrated to be the cleanest available. In a study a few years ago, we simply extracted small quantities of metal scavenger from various suppliers, into a number of different commonly used solvents. We analysed the extracts by GC. Biotage Si-Thiol (a metal scavenger) significantly cleaner than other thiol based metal scavengers, resulting in much cleaner extracts and the assurance that impurities would not inadvertently be added to API or intermediates during metal scavenging processing steps.



Shelf-Life Statements

Due to the highly stable nature of components and raw materials, the shelf-life of Biotage consumables products is actually very long-indefinite, however for Quality Assurance or planning purposes; our clients typically use 1 year as guidance for expiration. See individual product notes for further details.



REACH

Our suppliers have confirmed that the raw materials used to manufacture our products do not contain any substances that require registration. We will continue to monitor our suppliers to ensure that any changes in raw materials will be recorded and if required they will be registered as stated in the REACH Directive. Products manufactured and sold by Biotage do not contain any of the listed Substances of Very High Concern in amounts greater than 0.1% as defined in REACH article 57, Annex XIV.




Biotage®

Flash Purification



Flash Purification

In 1994 Biotage was the first company to develop pre-packed cartridges for flash purification and has been the leader in quality, performance, and innovation ever since. Biotage has a long history with purification instruments, pioneering innovation since the late 1970s. Our research scale purification instruments are the most technologically advanced and effective purification systems available.

Our method development and purification algorithms help scientists convert traditional regular flash purification to faster, greener, and more economical processes for reliably isolating pure compounds at scale. Our development systems enable you to leverage these value added features in silica choice and flow rate in method development, and apply key benefits to larger scale purification, radically enhancing the efficiency of a production processes. Many of the high performance spherical stationary phases (which can accept twice a normal sample load, or give higher plates when packed into columns) are available as standard in our large scale development or process cartridge range.

Purification Platforms and accessories

Biotage lab scale systems come with software that can automatically create linear gradients from TLC Rf spots; and then automatically convert those linear gradients into step gradients for application on a larger scale. Each large scale system may be configured with either 'M' or 'L' cartridge capability to further

increase its flexibility and range.

Moving from a traditional lab based synthetic process to more commercially orientated and efficient processes with a limited timeline used to be quite problematic, however advances in scale up purification techniques along with improvements in stationary phase science has meant that many of the conveniences previously enjoyed by the lab scale medicinal chemist are now available for scale up, along with the additional benefits conferred by process efficiencies. Biotage® Flash 75, 150 and 400 systems are extremely tough, economically viable industrial purification systems that have been developed for this purpose. Scaling up flash purification methods is easy and straightforward. Any method developed using a Biotage lab scale cartridge can be transferred to a larger cartridge using the scale-up factors in the table below. Once the development cartridge is determined, the lab scale method can be replayed, providing peak elution profiles for the scale up system consistent with the development process and suitable for final optimization.



Flash Purification Systems and Platforms

see page 16



Stationary Phases

see page 28



Scale up resources and calculations

see page 57

Flash chromatography is a preferred purification technique of organic, medicinal, natural product chemists, and more recently peptide chemists because it has the power to separate a broad variety of compounds more efficiently than other crude purification techniques such as crashing out of solution or liquid-liquid extraction.

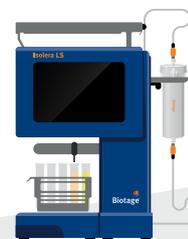


Scope and Application Guide

Product	Examples	Normal Phase	Reversed Phase	Amino Phase
Alkaloids	Cocaine, morphine, nicotine, quinine	✓	✓	✓
Amino acids			✓	
Analgesics	Aspirin, acetaminophen, ibuprofen	✓	✓	
Aromatics		✓	✓	✓
Basic drugs			✓	✓
Carbohydrates	Sugars		✓	✓
Flavonoids			✓	
Glycosides			✓	✓
Lipids	Phospholipids	✓	✓	
Natural products	Terpenes, saponins, polyphenols	✓	✓	
(Oligo) nucleotides			✓	
Peptides		✓	✓	
Steroids		✓	✓	
Tannins			✓	
Vitamins	Tocopherols (vitamin E), retinol (vitamin A), vitamin D, vitamin K	✓	✓	✓

Biotage Flash Purification Platforms

Meet the Family

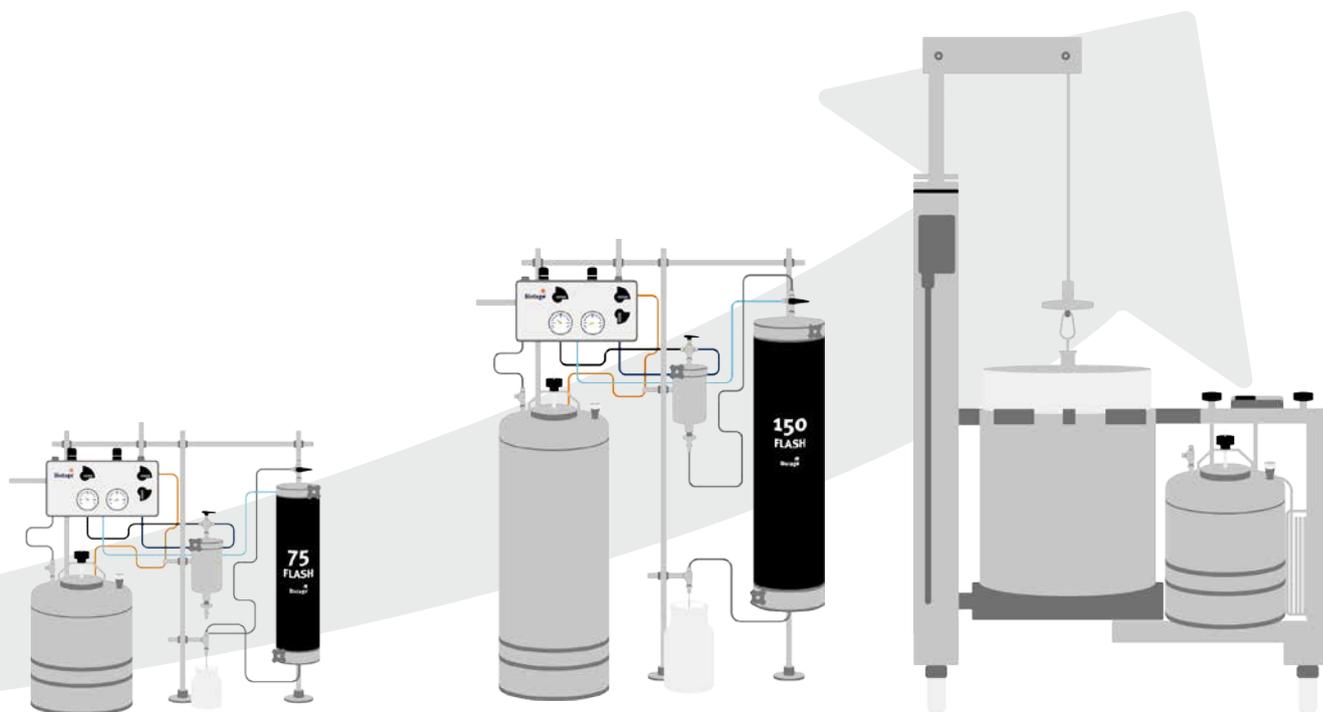


Flash System	Isolera™	Biotage® Selekt	Isolera™ LS
Format			
Scale	Development	Development	Development & production
Input Sample Size Normal Phase (g)	80	150*	150*
Flow Rate (mL/min.)	200	300	500
Solvent Reservoir Volume (L)	Multiple bottles/ drum sizes possible	Multiple bottles/ drum sizes possible	Multiple bottles/ drum sizes possible
Cartridge Size d x h (mm)	Various	Various	Various
Compatible cartridge mass***	5–900 g	5–1800 g	50–1800 g
System Part Number	Several models available	Several models available	Several models available
Additional Compression Modules**			

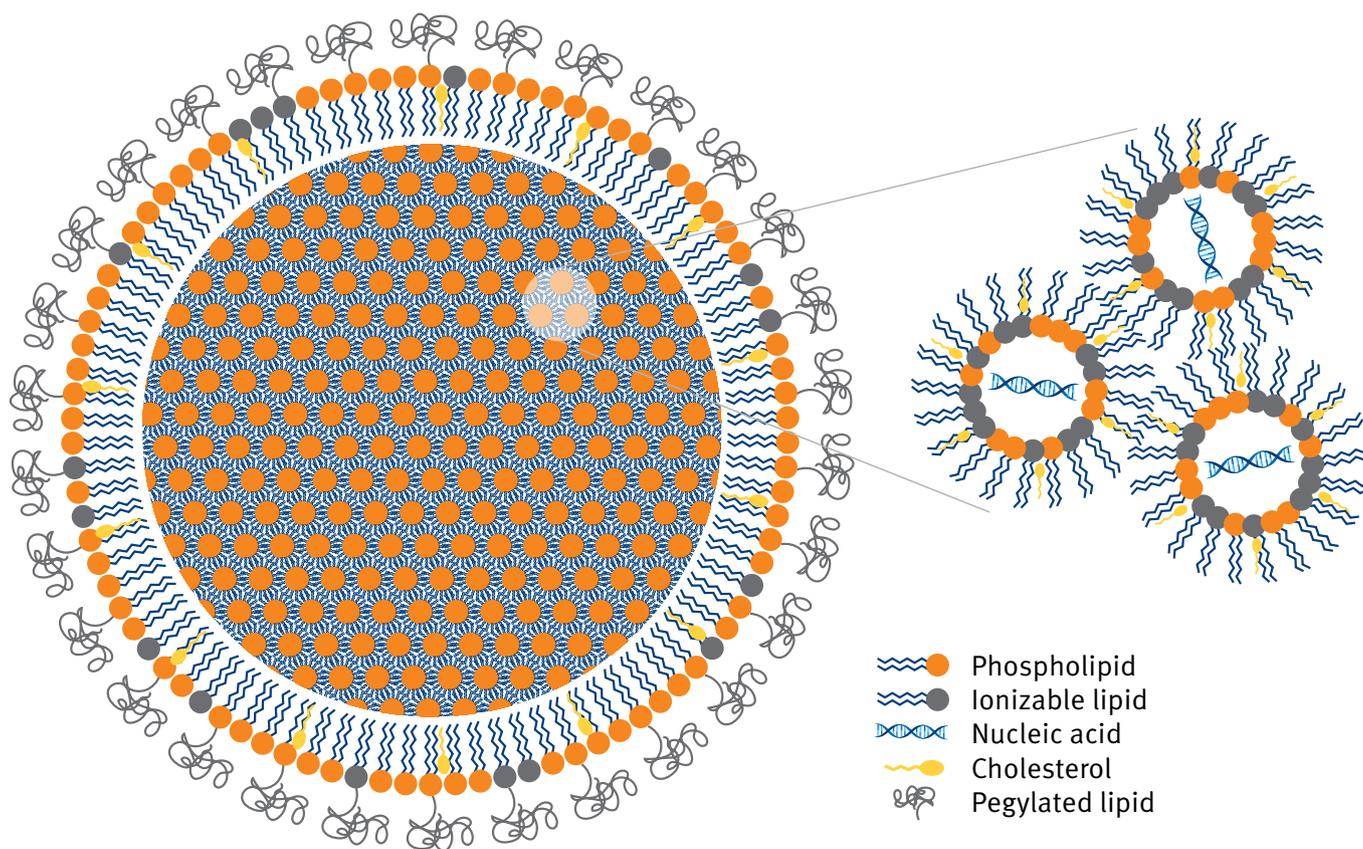
* With pressure releasing safety valve kit P/N 417115SP for cartridges with CV > 0.8 L (i.e. >340 g).

** Additionally available and interchangeable within the M/L format to extend the range of the systems. See ordering information section for more detail.

*** See detailed column silica masses in the resources and scale up guidance in this brochure.



Biotage® Flash 75		Biotage® Flash 150		Biotage® Flash 400	
M	L	M	L	M	L
Development & production		Production		Production	
50	100	250	500	4000	8000
250	250	1000	1000	6000	6000
12	12	37	60	N/A	N/A
75 x 150	75 x 300	150 x 300	150 x 600	400 x 300	400 x 600
400 g	800 g	2.5 kg	5 kg	20 kg	40 kg
SF-022-19041	SF-022-19071	SF-022-25071	SF-022-25151	SF-521-50070	SF-521-50150
available	available	available	available	available	available



Scaling Up with Flash 400 for the Purification of Lipids used in mRNA Vaccines

Case Study

In 2020, Biotage collaborated with the specialty chemical company Croda on a project focused on the production of a potential key novel small-molecules used to stabilize mRNA in COVID-19 vaccine formulations, for global distribution.

The Biotage team contributed their expertise in large scale and commercial purification and with the help of Biotage Flash 400, Croda managed to scale up their processes from development to production in just four months. This not only resulted in a stable, commercial-grade manufacturing process, it also saved Croda valuable time and reduced their solvent consumption compared to existing, traditional methods.

“This is a success story that we are proud to share. Usually it takes 2–3 years to complete major projects such as this but in 6 months we got the technical solution in place. Using the Biotage Scale-Up platform saved enormous amounts of solvents. Croda designed and built a new factory in six months for this purpose. We are proud of the hard work our respective organizations

have achieved and we feel proud of being part of solving a serious societal problem using Smart science to improve lives”

– Steve Mellor, Research & Technology Director, Croda

Read more

PPS654: Collaborating with Croda to help supply lipids for the global response to COVID-19 and mRNA vaccine development.



Smart Science to Improve Lives™

Croda is the name behind the high performance ingredients and technologies in some of the biggest, most successful brands in the world: creating, making and selling speciality chemicals that are relied on by industries and consumers everywhere.

<https://www.croda.com/en-gb>

CRODA
Health Care



Biotage® Flash 400 system in use at CordenPharma.

Adopting Biotage® Flash 400 Into an Existing API Manufacturing Workflow

Case Study

Biotage Flash 400 large-scale chromatography system and pre-packed cartridges were evaluated alongside a custom-made alternative as part of a plan to increase the efficiency of the workflow. The purification was of a large multi-kg batch of crude API (the nature of the API was proprietary).

The original purification process custom-built for API manufacture involved using a filter as a housing for silica, and an external pump to move the solvent. New process using Biotage Flash 400 reduced the overall process time from 18 days (for 2 operators) to 6 days, retaining the same excellent purity of 89.8% by HPLC-UV, but with an increased mass recovery of 34.4 kg (89.8%). The overall operating costs of the process were reduced by 50%. There were other noted process advantages. Due to the higher column loading, the concentration of eluted product was much higher using Biotage Flash 400 silica, saving 5,400 L of solvent and therefore much less evaporation was required.

In total, 550 kg of loose silica was replaced by one Flash 400 column (40 kg) and 5.5 m³ less waste was produced by the more streamlined process, which was easier to integrate into the production environment, resulting in more efficient planning for resource needs in future projects.

Read more

PPS647: Evaluating the adoption of the Biotage® Flash 400 system into an existing API manufacturing workflow at CordenPharma in Switzerland



CordenPharma

CordenPharma is a full-service CDMO for a global market, specializing in APIs, drug products, and associated packaging services operating through a growing network of cGMP facilities across Europe and the US organized under five technology platforms: Peptides, Lipids & Carbohydrates; Highly Potent & Oncology; Injectables; Small Molecules; Antibiotics.



Purifying 147 kg of Natural Product

Satori Pharmaceuticals

Biotage® Flash 400 cartridges were used to purify large crude batches for an Alzheimer's drug candidate.

Gamma-secretase modulators (GSMs) are promising compounds for Alzheimer's disease therapy. As part of the synthetic pathway to obtain the GSM SPI-1865, an international research group synthesized large quantities of two cycloartenol triterpenoid glycosides from roots of *Actaea racemosa*, known as black cohosh. In doing so, no less than 147 kg of extract solution was purified on a Biotage® Flash 400L KP-Sil cartridge, installed on a Biotage® Flash 400 system. The fractions contained 11.44 kg of extracted product.

Ruichao Shen, a leading scientist at Satori Pharmaceuticals Inc. explains: "The problem we faced was to find an efficient method to purify the crude mixture as fast as possible and maintain a good recovery at the same time. At that time Biotage had the largest pre-packed SiO₂ cartridge available in the industry. We chose the product and it helped us solve the problem well."

Read More

Ruichao Shen et al., 2014. Multikilogram-Scale Production of Cycloartenol Triterpenoid Glycosides as Synthetic Intermediates for a γ -Secretase Modulator. *Organic Process Research & Development* 2014 18 (6), 676-682 DOI: 10.1021/op5000732



Root nodules of *Actaea racemosa*, a well known medicinal herb containing a candidate precursor for a novel Alzheimer remedy.

17 kg Sample over 2 Days

A major UK Major Pharmaceutical Company used Biotage Flash 400 for bulk drug purification.

A sample (17 kg made up in DCM), containing 4 kg of product was split and 3 x 5.7 kg injections performed. Using normal phase conditions (hexane/ethyl acetate) with a flow rate of 5 L/min, 3 kg of purified product was isolated in 95% purity, representing 75% recovery. Each injection was 50 minutes and the total time for batch purification was only 2 days.



Type 2 Diabetes Candidate

US Major Pharmaceutical Company

A US Major Pharmaceutical Company developing a Type 2 Diabetes candidate (a G Protein-coupled receptor 119 (GPR119) agonist) had ~13 kg of racemic acetate, which was hydrolyzed in 2 batches to target one chiral form.

2 Flash 400 runs, with 6.5 kg injections was performed, using normal phase (KP-Sil 40–63, average 50 micron particle size) conditions and a 50/50 ethyl acetate/heptane isocratic solvent mix. Final mass yield was 4.1 kg (36.5%, theoretical 5.627 kg), and due to the chemical control in hydrolysis, an ee of 99.4%

- » Overall mass yield 4.1 kg (36.5%, theoretical 5.627 kg)
- » ee 99.4% (see next slide)

Read more

Organic Process Research and Development 2015, 19, 819–830



Process Improvement with Biotage® Flash 400

US Major Pharmaceutical Company

Biotage Flash 400M system was used to improve a pre-existing but inefficient process which used a stainless-steel self-packed column, and 26 x 1.5 kg injections in order to process a 40 kg batch.

The original SS column needed to be packed and unpacked between each run, and the overall cycle time of 3 days, with no silica re-use resulted in a final process that took 6 weeks to complete, using a 3-per-day shift pattern supporting 20 hour runs. Application of Biotage Flash 400M enabled 6 runs to be completed per day, during a single 8 hour working shift, and the surrounding optimization requiring only 1 week to complete the project. Only one cartridge was used, resulting in silica and labour costs being reduced by 75%.





Biotage® Selekt

Development Scale Flash System



Biotage® Selekt Systems are the latest in state of the art automated purification systems designed to autonomously separate upto 150 g of sample per run, at 300 mL/min, whether natural product extracts or other organic compound mixtures from chemistry.

Biotage’s approach to laboratory scale applications using Selekt is built around speed, productivity and reduced environmental impact. This is achieved by the combination of Selekt with Sfär high-performance flash columns. And of course, the more efficient a small scale or developmental run is, the greater the likelihood of a robust and successful tech transfer and scale up process.

The Smallest Columns

Selekt makes use of the Sfär flash columns. These columns have very high loading capacity when compared to ‘traditional’ flash columns, achieved through the use of high-quality spherical silica. The result is that you can load the same amount

of sample as you can on a traditional column onto a Sfär column half the size. A smaller column means reduced solvent consumption and more concentrated fractions with no loss in resolution, in a fraction of the time. Faster and greener!

Greatest Productivity

The Selekt system operates at the highest flow rates and pressures of any flash instrument. As a result Sfär columns can be run at very high flows without compromising separations – faster flows mean faster results. Also Sfär columns are equilibrated using a patented high pressure method, resulting in ultra fast equilibration and full wetting of the column for rapid, reproducible chromatography.

Specifications



WEIGHT

23–25 kg (50–54 lbs.)
depending on the system
configuration



DIMENSIONS

Footprint: (W x D) 335/550 mm
x 393 mm (13.2/21.7" x 15.5").
The width depends on using
one or two collection trays.
Height: 545 mm (21.5")
excluding secondary solvent
containment.



COLUMN CHANNELS

Two



MAX NUMBER OF FRACTIONS

144 fractions with no rack
change (288 with two collec-
tion trays) using 13 x 100 mm
racks.



AMBIENT TEMPERATURE

Operating: 15–32 °C (59–90
°F). Storage and transporta-
tion: -25–60 °C (-13–140 °F).



FLOW RATE RANGE

1–300 mL/min, in 1 mL/min
increments.



SOLVENT SUPPLY

A maximum of 4 x 5 liter
reservoirs on the optional
secondary solvent
containment.



INTERNAL DETECTOR WAVELENGTH

200–400 nm (UV) or 198–810
nm (UV-VIS).



RACK TYPES

13 x 100 mm, 16 x 100 mm, 16
x 150 mm, 18 x 150 mm, 25 x
150 mm, 120 mL, 240 mL, and
480 mL.



PRESSURE RANGE

0–30 bar (0–3000 kPa; 0–435
psi).



ELECTRICAL SUPPLY

100–127, 220–240 VAC,
50/60 Hz. Connect only to a
grounded outlet.



Large scale applications

Biotage Selekt is also capable of performing large scale purification running 750 g and 1.5 kg columns. Scale up to large sample sizes couldn't be easier than with Selekt. A simple scale-up route from laboratory columns means that methods can be created using small-scales, and then quickly and easily adapted for larger sample sizes, all in the Selekt software. A seamless and simple approach to large sample sizes.

Safety first

When running large scale columns, Selekt can be fitted with a safety valve that prevents over-pressuring of the columns. At Biotage safety is paramount, giving you peace of mind across all of your applications is important to us.

What's in the Box?

Everything you need to get started, a base system (including pump, specified uv detector, fraction collection tray), accessory kit including manual, documentation package, starter columns, 5–350 g column holders, 3 racks (16 x 150 mm) for fraction collection, tubing, connections.



Isolera™ LS

Flash System for Scaling Up



Isolera™ Spektra LS flash systems are automated purification systems designed up to 150 g of sample per run, whether natural product extracts or other organic compound mixtures from chemistry.

Isolera LS is the definitive flash chromatography system for reliable scaling up from grams to multi, even hundred gram scale purification, using the industry standard original Isolera interface. Enjoy all of the sophisticated software features of laboratory scale systems in a robust instrument built for scale-up labs. Isolera Spektra LS adds an integrated pump assisted loading mechanism for larger samples, and a funnel rack collection option which allows samples to be collected in larger fraction collection vessels.

Up to 30% solvent savings with Gradient Optimization “GO”

Step-gradients can be short and powerful providing separations for one or more compounds but can be challenging to develop and optimize. Isolera Spektra provides gradient optimization through TLC-to-Step Gradient technology. Using solvent and

TLC Rf data, Isolera Spektra builds a gradient to separate all the compounds (up to 6) in the sample. This new technology will also provide cartridge selection guidance based on the cartridge loading capacity and purification speed. The step gradient can also be used to isolate a targeted compound reducing run time and solvent use further.

Improve fraction and compound purity with λ -All detection and PDA spectral analysis

PDA scanning and λ -All technology detects any UV absorbing compound eluting from a flash cartridge while measuring and displaying each eluting compound's individual UV spectrum. Combined with novel baseline rise correction, yield losses to improper wavelength selection and large fraction volumes are no longer a concern. The PDA spectra can be reviewed and used to determine fraction purity eliminating the need for post-flash purity analysis.

Baseline Correction

Many chromatographic solvents absorb UV light. We don't want to be limited in our choice of solvents, Isolera Spektra uses advanced real gradient blanking for true baseline correction to eliminate background shifts.

Digging Deeper With PDA Spectral Analysis

Isolera Spektra brings Photodiode Array (PDA) detection to flash chromatography for the first time. The full spectrum for each compound can be seen as it elutes from the cartridge – in real-time. This information can be used to confirm purity and compound identity. All spectra are stored and can be reviewed in 2D to verify fraction purity. Post fraction thin layer chromatography (TLC) for determining which fractions contain pure compound can be eliminated, and also to determine key elution conditions for subsequent development steps.

Elute complex samples with the Quatro-binary gradient

Use up to four solvents in a single gradient to easily purify samples with diverse polarity. With Quatro-binary gradient capability traditional binary gradients with a limited polarity range can be adjusted to elute very lipophilic and highly polar compounds within a single purification or compound solubility during the separation by adding a constant amount of a co-solvent, acid, or base with the Isolera advanced pump.

Enhance productivity with on-the-fly editing

Isolera methods can easily be edited either in front of the Isolera or from the comfort of your office. Edit the gradient (click & drag points AND segments), flow rate, collection volume, fraction wavelengths and modes, and add more collection racks if you need to – all while the run is in progress. Gradient changes can now be made with a simplified graphical interface or through a table layout.

3D Graphics for the Complete Picture

Identify impurities by taking advantage of the PDA 3D chromatogram display. Chemists can view the chromatogram in terms of both elution volume and UV absorbance which provides even more purity confirmation.

What's in the Box?

Everything you need to get started: a base system including pump, specified uv detector, and extended bed fraction collection tray. Start up and accessory kit including manual, documentation package, 50 g starter columns, 50–350 g column holders, tubing, connections.

A wide variety of racks to hold various sizes of fraction collection tubes and bottles are available for purchase.

Specifications



WEIGHT

40 kg (88 lbs) typical, depending on configuration



DIMENSIONS

565 mm (22") x 596 mm (23.5") x 497 mm (19.6") (expanded bed)



FLOW RATE RANGE

50 – 500 mL/min



FRACTION COLLECTION MODES

Volume, threshold, threshold with volume, low slope, medium slope



SOLVENT DELIVERY

Two constant volume (11-mL) electric HPFC pumps



POWER REQUIREMENTS

100 – 240 VAC, 50/60 Hz, 4.0 A



COLLECTION VESSELS

Test tubes (13, 16, 18, and 25 mm) and bottles (120 mL, 240 mL)

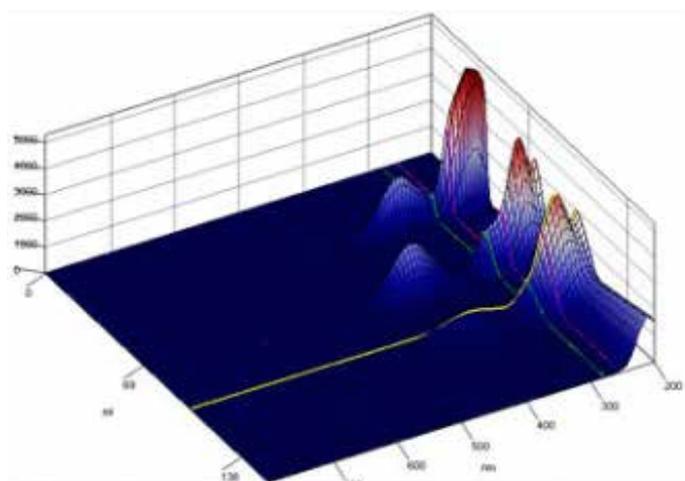
UV DETECTION

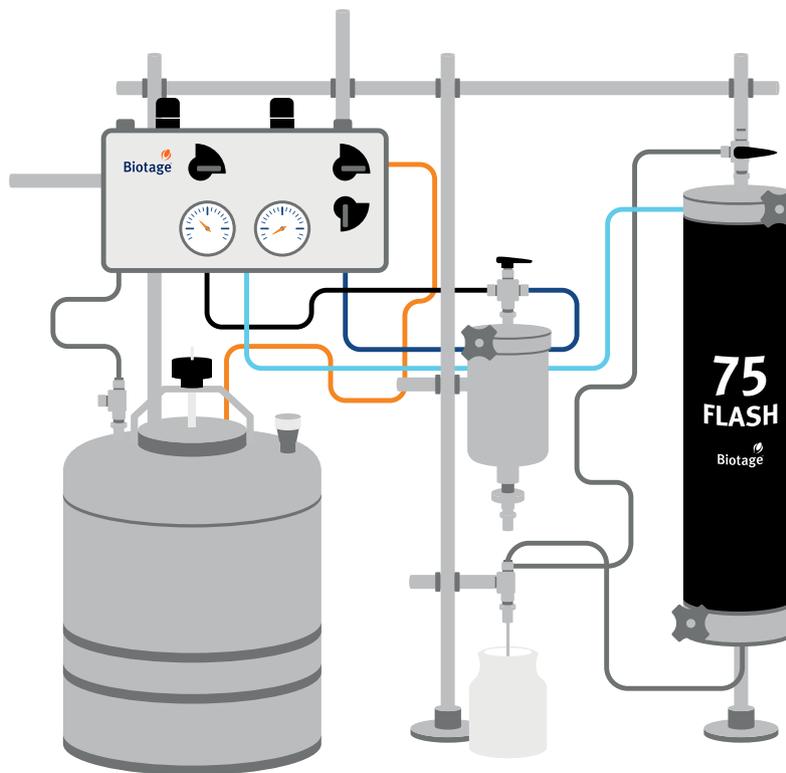
Choice of variable wavelength (200–400 nm) or UV-VIS (200–800 nm)



UV COLLECTION MODES

Single/dual/ λ -All wavelengths (variable UV and UV-VIS)





Biotage® Flash 75

Flash Purification up to 250 mL/min.



Biotage® Flash 75 systems support flash purification up to 80% faster than traditional glass columns. Purify 100 g samples at 250 mL/min. Operates safely at 100 psi enabling fast flow rates and the use of high viscosity solvents.

Our proven radial compression technology ensures near zero “wall effects” and channelling inside each column. This maintains the bed’s stability, rendering cleaner, purer fractions in less time and higher overall product yield. Flash 150 cartridges are so-called as they are 150 mm in diameter and routinely operate at flow rates up to 1000 mL/min. These purification systems allow you to quickly scale-up and complete runs, saving hours or even days of purification time.

There are simple, robust and reliable systems, containing everything needed to scale up purifications from the lab. Our

broad selection of columns enables professionals to choose the solution which best suits their purification needs.

In an early comparison study between a Biotage Flash 75L cartridge (75 mm x 300 mm) and a 110 mm x 200 mm traditional glass column, fractions were collected in 2.5 hours using the glass column, while the Flash 75L cartridge, using the radial compression, required just 40 minutes. Additionally, there were fewer mixed fractions, resulting in greater product purity.



Specifications



WEIGHT

16–84 kg depending on configuration (35–185 lbs.)



DIMENSIONS

modular system, footprint n/a, see specific drawings for more information



FLOW RATE RANGE

(pressure controlled, 0–250 mL/min)
100–250 mL/min recommended



SOLVENT DELIVERY

via inert gas pressurized solvent tank



POWER REQUIREMENTS

N/A – inert gas driven (fully grounded) system



CERTIFICATIONS

CE, ATEX, ASME



INLET PRESSURE RANGE

100–125 psi (6.9–8.6)

What's in the Box?

The system includes an easy-to-install radial compression module, a fully integrated air manifold, solvent reservoir, a start-up kit with all necessary tubing, grounding kit, and a user's manual. Flash 75 systems come with a sample injection module (SIM) as standard, which helps to bridge the gap from lab to large scale method development. The SIMs (available in 500 mL, 1000 mL and 2000 mL) facilitates the handling of routine samples as well as viscous oils and samples with poor solubility.



Visit the
Webpage



Biotage® Flash 150

Flash Purification up to 1000 mL/min.



Batch purification 80% faster than glass columns, 500 g samples at 1 L/min. The Biotage® Flash 150 system supports batch purification up to 80% faster than traditional glass columns.

Biotage® Flash 75 systems safely operate at 100 psi enabling fast flow rates and the use of high viscosity solvents. Our proven radial compression technology ensures near zero “wall effects” and channelling inside each column. This maintains the bed’s stability, rendering cleaner, purer fractions in less time and higher overall product yield. Routinely operating at a flow rate of up to 250 mL/min, these purification systems allow you to quickly scale-up and complete runs, saving hours or even days of purification time.

In a comparison between a Flash 150M cartridge (150 mm x 300 mm) and a 120 mm x 660 mm traditional glass column, fractions were collected in 7.2 hours using the glass column,

while the Flash 150M cartridge required just 90 minutes. Additionally, the recovery ratio of product from the Flash 150M system was 4 times that of the glass column. This resulted in a plant saving nearly 4 weeks of development time.

Flash 150 is a simple, robust and reliable system, containing everything needed for large or industrial scale separations. Flash 150 platforms are the industry standard for mid-scale reliable large scale flash purifications. Our broad selection of columns available in 2.5 kg and 5 kg sizes enable professionals to choose the solution which best suits their purification needs. Sample sizes up to 500 g are easily possible using this purification platform.

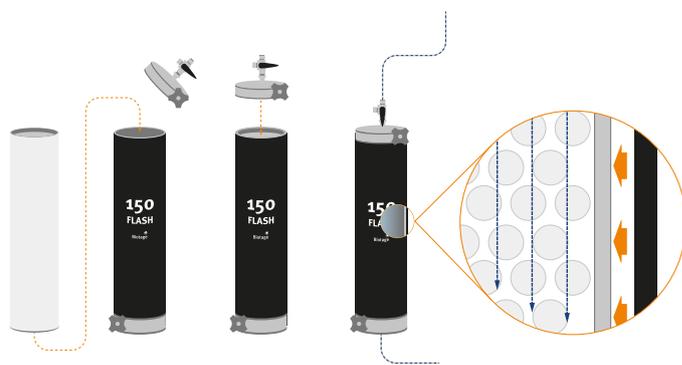
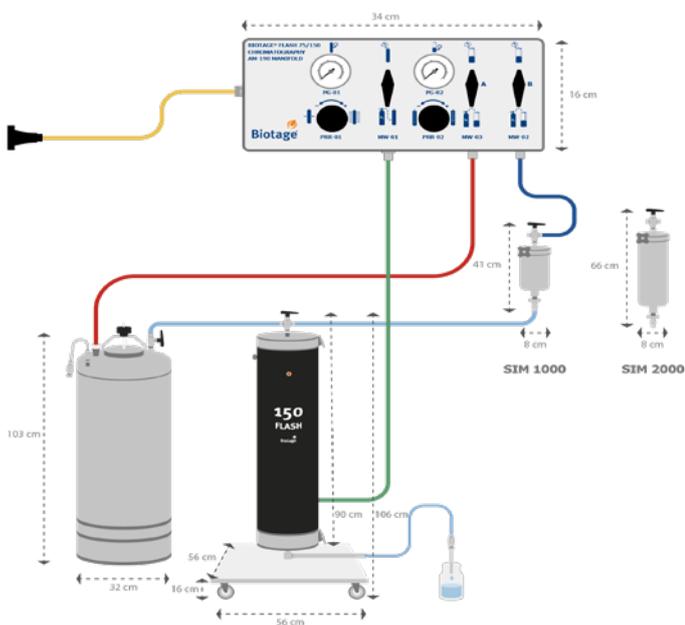


Specifications

 WEIGHT 16–84 kg depending on configuration (35–185 bs.)	 INLET PRESSURE RANGE 100–125 psi (6.9–8.6)
 DIMENSIONS modular system, footprint n/a, see specific drawings for more information	 SOLVENT DELIVERY via inert gas pressurized solvent tank
 FLOW RATE RANGE (pressure controlled, 0–100 mL/min) 100–700 mL/min recommended	 POWER REQUIREMENTS N/A – inert gas driven (fully grounded) system
	 CERTIFICATIONS CE, ATEX, ASME

What's in the Box?

The Biotage® Flash 150 system includes an easy-to-install radial compression module, a fully integrated gas manifold, solvent reservoir, sample injection module (SIM), a start-up kit with all necessary tubing, grounding kit, and a user's manual. Prepacked cartridges are ordered separately. Flash 150 compression modules are mounted onto robust portable bases (included in the system package), which are fitted with casters for easy mobility.



Visit the
Webpage



Biotage® Flash 400

The Ultimate Self-contained Purification System



Isolate up to 8 kg of product per run at 6 L/min.

Biotage® Flash 400 is a complete skid-mounted system designed for kilogram scale separations. Built to last and engineered with high quality materials that comply with various cGMP standards. Available in two configurations, supporting 20 kg and 40 kg cartridges, Flash 400 is the first choice of pharmaceutical and contract manufacturing companies around the world for critical purification applications.

Reliable Scale-Up, Faster

Biotage® Flash 400 systems safely operate at 100 psi enabling fast flow rates and the use of higher viscosity solvents. Our proven radial compression technology ensures near zero “wall effects” and channelling inside each column. This maintains the bed’s stability, rendering cleaner, purer fractions in less time and higher overall product yield.

Biotage® Flash 400 needs minimal maintenance and its design has proven to be extremely reliable. With operating pressures up to 100 psi, this system supports flow rates up to 6 liters per minute, allowing operators to save days or even weeks of

project time, resulting in substantial project cost savings.

Built and Documented for cGMP Production

All systems come complete with an ASME “UM” stamp, CE certification, and are certified for usage in Japan, Europe and North America. An extensive engineering documentation package, certificate of performance and certificate of compliance for validation filing accompany each system. Professional Biotage service personnel train users on proper operation, and are available for project based or yearly training sessions.

Safety is Paramount

Robustness and safety are key factors for any scale up system, and safety is a key design criteria on all Biotage flash systems. Designed for use around large quantities of solvents, Flash 400 systems can operate in an explosion proof, no sparking rated area. Air driven pump and hoists, proper grounding and pressure relief devices are some of the vital components included with every system. All systems comply with NEC Class 1, Division 1 and 2, Group C and D standards.



Specifications

	WEIGHT 16–84 kg depending on configuration (35–185 lbs.)		INLET PRESSURE RANGE 100 psi (6.9 bar)
	DIMENSIONS modular system, footprint n/a, see specific drawings for more information		SOLVENT DELIVERY via pneumatic solvent pump 100 psig (6.9 bar maximum)
	FLOW RATE RANGE (pressure controlled, up to 6 L/min) 2–5 L/min recommended		POWER REQUIREMENTS N/A – inert gas driven (fully grounded) system
	RADIAL COMPRESSION PRESSURE 80–100 psig (552–689 KPa)		CERTIFICATIONS CE, ATEX, ASME
			INSTALLATION FLOOR LOAD REQUIREMENT 1,220 kg/sq. meter, (250 lbs/sq. ft.)

What's in the Box?

Biotage® Flash 400 systems come complete with all the necessary hardware for large scale purification. Just add normal building services (air, nitrogen, grounding point), choose from a selection of different stationary phases, add solvent, and your process can be ready to go within minutes. A complete engineering documentation package with site preparation is available on request.

Cartridges for Any Application

From routine normal phase flash chromatography to more difficult separations with reversed phase silica, activated carbon, low metal/acid washed silica, Mitsubishi Diaion® HP20SS resins, ion exchange or other custom packed, client supplied media, Flash 400 systems are capable of addressing almost every purification need.

The Flash 400 system uses pre-packed cartridges and radial compression, and supports two interchangeable barrels for use with either 400 x 300 mm (Flash 400M) or 400 x 600 mm (Flash 400L) cartridges. One of the compression module sizes is included in the system (the module of the other size can be ordered and is interchangeable as an option).

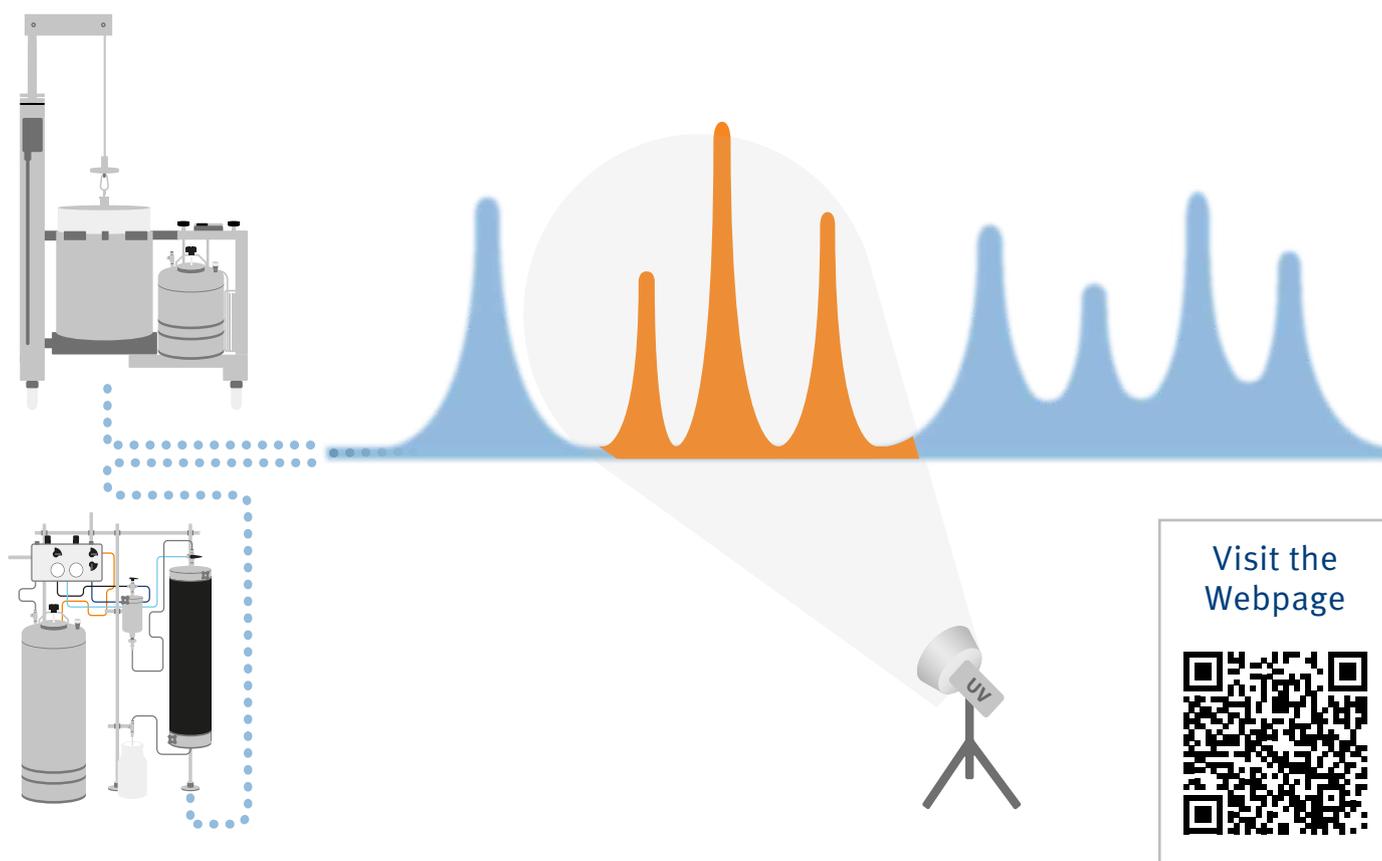
The stationary phase in each cartridge is self-contained, improving handling and eliminating exposure to contamination and impurities or potentially high toxicity APIs.

Scalable Results

Technologies such as crystallization and adsorption can be difficult and time consuming to scale up. Using the extensive cartridge range from Biotage, reliable results are verifiable and easy to achieve with any separation. For example a Biotage® SNAP or Sfär 10 g column (to purify 100 mg quantities) can be used as a basis to purify multi gram and ultimately kg quantities of product using a 40 kg Flash 400 cartridge. Moving up the cartridge range, purifications can be scaled up 4000 times. We recommend increments of 10-fold to provide maximum control and opportunity to optimize further any scale up parameters.

See it in Action





UV Monitor

For Biotage® Flash 150/400 Systems

The Biotage® UV Monitor kit features the latest in fiber optic technology and a powerful SW package for the most effective and flexible UV monitoring system for Biotage® Flash 150 and Biotage® Flash 400 purification systems.

Designed for Biotage Scale-Up Flash Purification, containing innovative technology, including one of the smallest UV monitors in the industry, this kit is available for Biotage® Flash 150, or Biotage Flash 400 systems or as an upgrade kit to Biotage Flash 400, if already installed on Biotage® Flash 150 systems. With some tubing adaptors, the system will work seamlessly on Biotage Flash® 75 systems, however, unless your project specifically requires a cGMP production environment platform, we would also suggest an automated lab system such as Isolera or Selekt for the ultimate in fully automated small scale batch purification flexibility.

Reliable Scale-Up, Faster

- » Increase confidence in fraction collection.
- » Improve fraction purity, reduce solvent usage, and fraction volume evaporation.
- » Increased safety; minimize handling of fractions containing HP-API's.
- » Simple in-line system.
- » Easily retrofit to existing Biotage Flash 150 or Flash 400 systems.
- » Comprehensive documentation package and audit trail support.

UV Monitor

- » Auto error check and calibration on start up.
- » Easily upgradeable and future proof.
- » Can be positioned away from the flash system via fiber optic cables and will wirelessly beam run data.
- » LED read out (for simplified non-wireless configuration).

Specifications

WEIGHT
1.5 kg

DIMENSIONS
Base unit:
121 × 129 × 187 mm
(W × H × D)

POWER REQUIREMENTS
External: Input 100–240 V, output 24 V DC, 60 W

LIGHT SOURCE
Deuterium (D₂) lamp with integrated GLP chip

WAVELENGTH RANGE
190–500 nm +/- 3 nm, precision 0.7 nm (ASTM E1657-98)

OPERATING CONDITIONS
4–40 °C, 39.2–104 °F, humidity <90%, non-condensing

CONTROL
Analog output 1 x ± 2.5 V scalable, 20 bit, max data rate 50 Hz (LAN), 20 Hz (Analog), 10 Hz (RS-232), input Autozero, Start (IN), Error (either IN or OUT), 0–10 V Analog IN

DRIFT AND LINEARITY
4.0 x 10⁻⁴ AU/h at 254 nm (fiber optics version) (ASTM E1657-98), linearity > 2.0 AU at 270 nm (ASTM E1657-98)

FLASH 150 FLOW CELL
path length 0.5/1.25/2 mm, volume 1.7/4.3/6.8 µl, material SS, max flow rate 10 L/min, max pressure 200 bar

FLASH 400 FLOW CELL
path length 0.5/1.25/2 mm, material SS, max flow rate 10 L/min, max pressure 80 bar



Flow Cell

- » Specialized for preparative flash purification applications, up to 10 L/min.
- » Built in an automatic flow splitting function.
- » Available in two sizes (for 0.25 inch and 0.5 inch Biotage Flash System tubing), each flow cell has an adjustable path length (0.5, 1.25, 2 mm).
- » Comes with materials certificates.

Tablet/Control Software

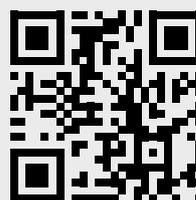
- » Automatic detection of connected UV monitor.
- » Storage of device-specific information (important for Good Laboratory Practice and Instrument Qualification).
- » Supports remote monitoring and changing of wavelength.
- » Additional acquisition data controls.
- » Automatic and current diagnosis of the device.
- » Audit trail and save data files securely.
- » ATEX Class II/22.

What's in the Box?

Everything you need for integration with Biotage Flash 150 or Biotage Flash 400 systems.

- » fiber optic base UV unit
- » 3 m of fibre optic cable
- » flow cell
- » tablet with full Mobile Control Chrom SW installed and activated (inc license)
- » documentation package
- » power cables.

Our upgrade kit (from Flash 150 to Flash 400) assumes you have the FL150 version and contains the Flash 400 flow cell, triclamp connections and a comprehensive compliance support documentation package)



Purification Columns

Choosing the correct purification cartridge is crucial for maximizing efficiency. The following tables highlight application areas, silica types and part number options available for a wide variety of scale-up projects.

Normal phase flash chromatography has been widely adopted as the method of choice for separation of product mixtures and reaction by-products. Whether standard silica or specially acid washed for low metals content, normal phase flash purification has proven itself to be incredibly powerful.

One of the most significant developments in purification is the separation of polar molecules by reversed phase purification. Reversed phase methods provide a great leap forward, but this has been a relatively under-used technique due to lack of information and supporting data. Polar, water soluble molecules are the focus of many pharmaceutical drug development programs and natural product research. These molecules make up the majority of the compounds involved in the fundamental chemistry of living organisms. Isolation

of large quantities of such polar compounds has traditionally been carried out using expensive preparative HPLC (High Performance Liquid Chromatography) systems. These systems are typically dedicated to final product purification, and are not economically viable options for many chemists in day to day or smaller/flexible projects.

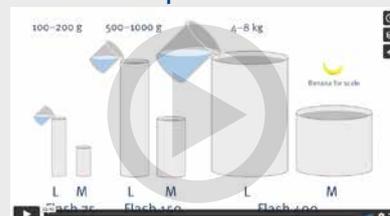
Faster Purification and More Yield with Higher Capacity Cartridges

Traditional process purification can benefit from advances in lab scale purification and materials science. Classic selection and predictor tables are based on a standard performance silica media for determining cartridge loading and sample size. Biotage® HP-Sphere®, Sfär 60 (KP-Sphere) and Sfär HC for example represent an innovative breakthrough in purification technology, leading to very high capacity and high resolution purification columns. With spherical beads, smaller particle size and a much higher surface area, these silica are more efficiently packed into columns, increasing the effective plate count whilst conferring approximately double the sample load capability. These revolutionary improvements result in a column that doubles the purification performance per run or allows a smaller column to be chosen for the same sample quantity, cutting the solvent use and run times in half.

Biotage has made spherical silica a standard with lab scale Sfär columns. This means all columns offer the efficiency and reproducibility of spherical stationary phases and are available in sizes upto 50 kg (depending upon the type). For our legacy or other current process scale stationary phases, these are also available in smaller lab scale sizes for method development, impurity analysis or other evaluation purposes, as standard. We offer a high level of choice of stationary phase, selectivity, loading capacity and performance, to provide maximum flexibility and robustness in the development of methods and for seamless scale-up of purification methods.

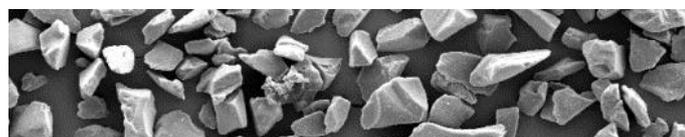
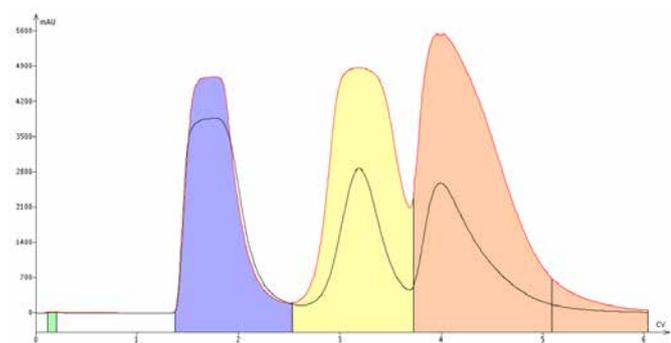
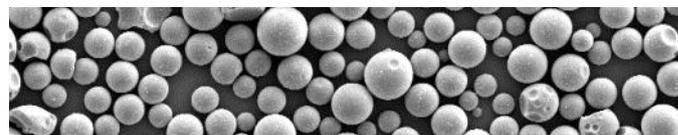
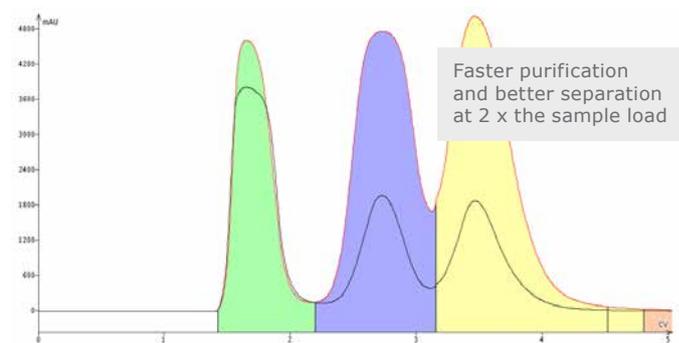


Get to Know Our Scale-up Columns

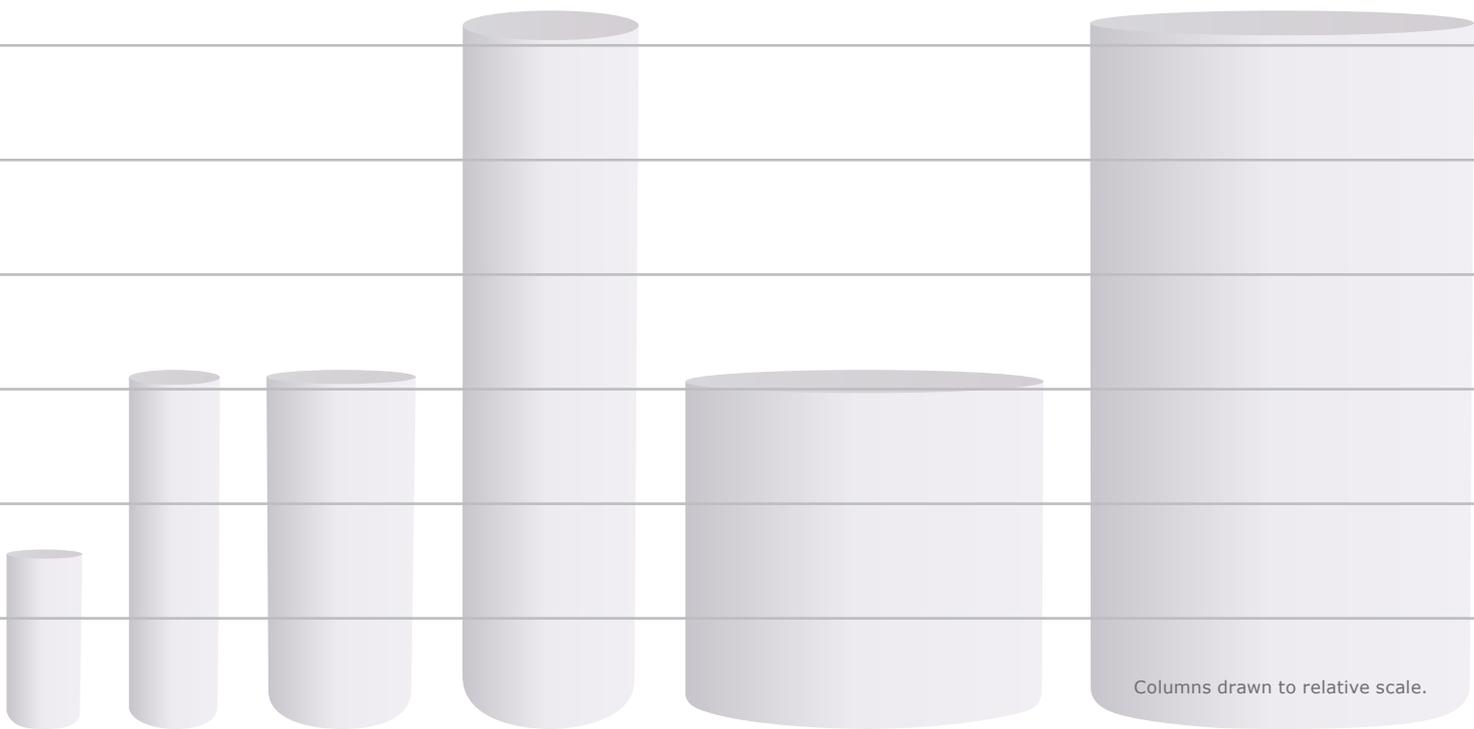


Stationary Phase Guide

Phase	Media	Media ID	Silica Type	Particle Size Average (μm)	Particle Size Range (μm)	Pore Volume mL/g	Surface Area m^2/g	Pore Diameter (\AA)
Normal	KP-Sil	1107		50	40–63	0.8	500	55
	KP-Sphere ⁺ /Sfär 60	0445		60	50–70	1	725	50 (30–70)
	HP-Sphere ⁺	0442		25	25–33	1	725	50 (30–70)
	Sfär HC	0443		20	17–26	1	725	50 (30–70)
Reversed	KP-C18-HS	1118		50	40–63	0.9	400	100
	HP-Sphere C18/Sfär C18	0401		30	25–35	1.0	340–460	90 (85–120)
Speciality	KP-Amino	0909		60	40–65	0.6	200	-
	Isolute-Amino	0454		50	40–63	0.8	500	55
	Carbon	4021		60	60–100	-	1400–1800	-
	HP20	2030		500	250–850	1.3	500	260
	HP20ss	2530		120	75–150	1.3	500	260

Irregular silica 50 μm , 25 g column, 25 mL/min, sample loading 2% wt/silica.Spherical silica 25 μm , 25 g column, 25 mL/min, sample loading 4% wt/silica.

Method development analysis: Comparison of a standard irregular 40–63 micron KP-Sil silica (left) with high capacity 25 micron HP-Sphere⁺ spherical silica (right).



Biotage® Flash

FL75M	FL75L	FL150M	FL150L	FL400M	FL400L
75	75	150	150	400	400
150	300	300	600	300	600
100–250	100–250	500–1000	500–1000	7000	7000
400 g	800 g	2.5 kg	5 kg	20 kg	40 kg
500 g	1 kg	3 kg	6 kg	24 kg	48 kg

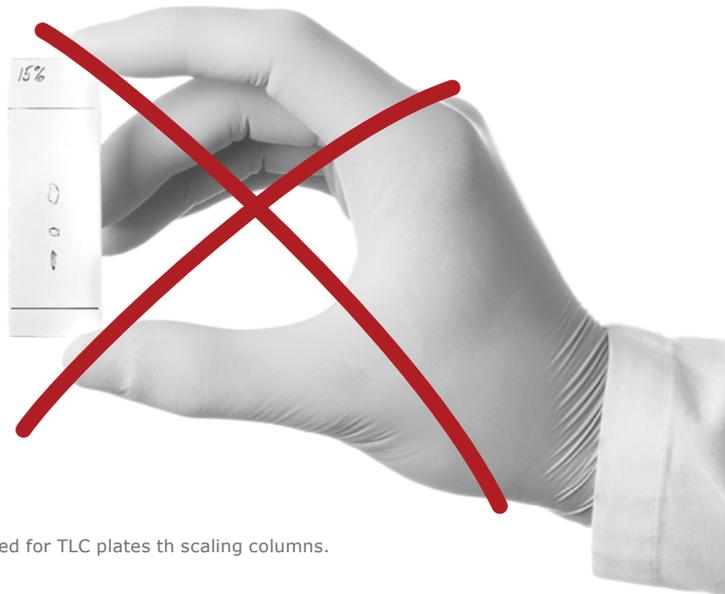




Scaling Columns

Scaling Columns are HPLC columns packed with the same media used in Biotage flash columns, designed for use on an HPLC for method development. Methods optimized using scaling columns are directly transferrable to flash chromatography using the same media and gradient and eliminate selectivity differences.

Flash Chromatography method development has historically been carried out using TLC plates. While this technique works in normal phase (silica, amine functionalized silica), differences in media properties between the TLC and flash column in reversed phase can give different selectivity and provide inaccurate method information. For reversed phase chromatography, TLC is quite limited and not very useful due to poor water wettability. Scaling columns are a better option in this case.



No need for TLC plates th scaling columns.

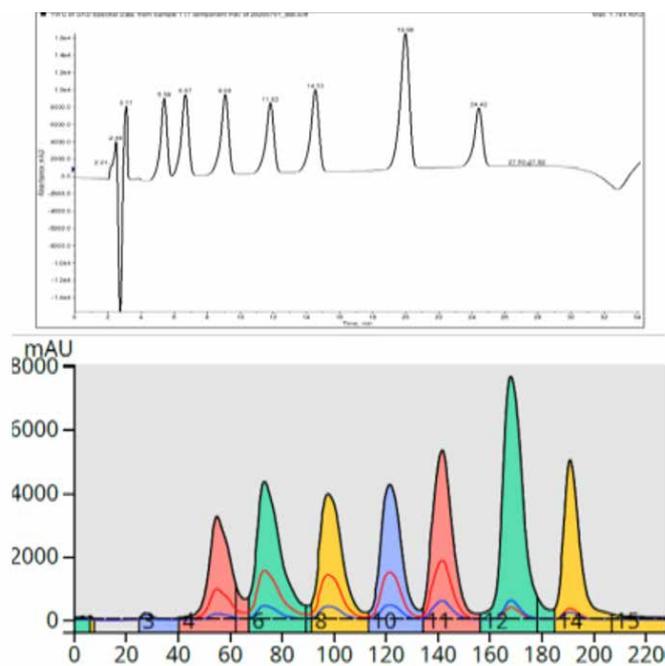


Figure 1. A method developed on an HPLC using a C18 scaling column (top) and the flash chromatography results using the same method on a 12-gram Sfär C18 column (bottom). The separations are nearly identical.

Using Scaling Columns for method Development

Create a 3-segment scaling column linear gradient using the method suggested below based on column volumes. The scaling column's column volume (CV) is the void time (t_0) multiplied by the flow rate and is typically 2.35–2.6 mL, depending on the silica.

Equilibration

- » 10% B for 3 CV at 1 mL/min (~7 min.)
- » Segment 1 10% B for 1 CV at 1 mL/min (~2.35 min.)
- » Segment 2 10% B to 100% B in 10 CV at 1 mL/min (~23.5 min.)
- » Segment 3 100% B for 2 CV at 1 mL/min (~4.7 min.)

If your compounds elute too early, reduce the end % B to 50% and run the new gradient (do not change the run time or flow rates). If your compounds elute late in the gradient, increase the start % B to 50% and run the new gradient (do not change the

Column size (g)	Scale factor	Biotage [®] Sfär KP-NH flow rate (mL/min)	Biotage [®] Sfär C18 flow rate (mL/min)
6	1	10	15
12	2	13	23
30	5	22	42
60	10	41	74
120	20	41	70
240	40	89	156
400	67	102	159

Table 1. Scale factors and flow rates with equivalent linear velocities for flash columns.

run time or flow rates). Continue this process until you have an acceptable separation then transfer the method to your flash system using either a 6 or 12-gram C18 column.

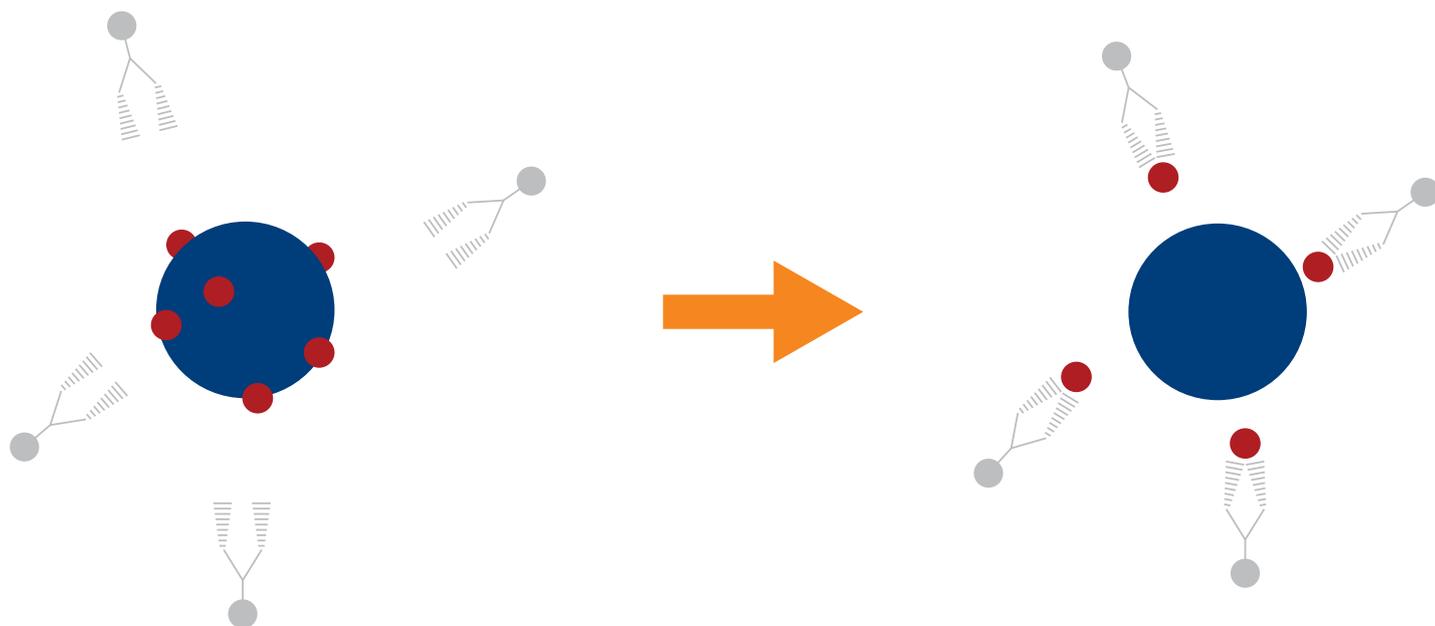
Determining Loading Capacity

1. Challenge the flash column's loading capacity until your target compound has achieved baseline resolution from its nearest neighbors, this will be your loading limit which can be scaled up to any size flash cartridge.
2. To scale-up the purification, choose the proper column size for the amount of material you need to purify, check Table 1.
3. Set your larger-scale flash column flow rate to match the small-scale column linear velocity using Table 1.

For further information about how to scale up flash purification, see page 57.



Metal Scavenging



Metal Scavenging

Biotage is an established leader in this area with numerous metal scavenging solutions implemented in processes around the world. Biotage metal scavengers are available in loose powder form, which can be added and stirred into batch reactions, or alternatively they may be used in packed columns in flow through applications.

Transition metal catalysts are powerful reagents that support principles of green chemistry. They are used sparingly, confer atom and economic efficiency, but may themselves be difficult to remove after the reactions.

Metal scavengers are a class of materials that have been designed to specifically remove these metals, leaving the rest of the system untouched.



Biotage metal scavengers are based on functionalized polystyrene or silica polymers. They are inert, specifically-reactive and clean additives deployed to achieve a specific purpose.

In order to help determine optimal scavenging conditions, convenient metal screening kits are available, featuring the market leading bound TMTs and the workhorse Si-Thiol metal scavengers, as well as some specific to basic and acidic products. Our scavengers or kits comes with full instructions and protocols for screening, development and scale-up, and all scavengers are supplied ready to use, straight out of the box.

Depending on the application, a resin particle or silica particle may be chosen. The decision of which one to use can depend

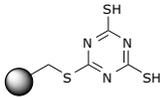
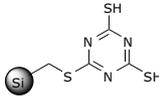
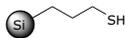
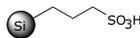
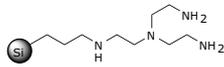
on the chemistry, but more often than not, since the chemistry is the same, the format and workflow. Generally resins are used in batch stir processes, and silica based scavengers are used in flow or fixed bed applications. In either case, polymer supported chemistry or clean up carries with it a number of advantages that are not present in traditional small molecule chemistry workflows.

Biotage metal scavengers can support processes from the removal of grams to multi kg of metals in multiple campaigns across a wide range of applications and industries.

Metal scavengers directly support our clients requirements for compliance with respect to impurity guidance and directives such as ICH Q3D.

Metal	Class	Notes Detail	Concentration (ppm)		
			Oral	Parenteral	Inhalation
Class 1 As, Cd, Hg, Pb	Human toxicants, limited/no use in manufacture	Evaluate across all potential sources and routes of administration	0.5–3	0.2–1.5	0.1–0.5
Class 2A Co, Ni, Va	Route dependent human toxicants	High probability of occurrence, risk assess across all sources and routes of administration	5–20	0.5–2	0.1–0.5
Class 2B Ag, Au, Ir, Os, Pd, Pt, Rh, Ru, Se, Ti	Route dependent human toxicants	Lower probability of occurrence, can be excluded UNLESS intentionally added during manufacture	0.8–15 Pd=10	0.8–1 Se=8 Au=10	0.1 TI=0.8 Se=13 Ag=0.7
Class 3 Ba, Cr, Cu, Li, Mo, Sb, Sn	Low oral toxicity, high PDEs (>500 ug/day), may need assessment for other routes	can be excluded UNLESS intentionally added during manufacture	55–1100	9–150	0.3–30
Others Al, B, Ca, Fe, K, Mg, Mn, Na, W, Zn	No PDE established	May be covered by other guidelines, e.g. Al (renal failure), Mn/Zn (hepatic)	n/a	n/a	n/a

Daily dose <10 g/day and option 1 method of risk assessment is used. International Conference on Harmonization of Technical Requirements for Registration of Pharmaceuticals for Human Use (ICH) guideline Q3D on elemental impurities – Step 5 – Revision 1 EMA/CHMP/ICH/353369/2013–29 March 2019, https://www.ema.europa.eu/en/documents/scientific-guideline/international-conference-harmonisation-technical-requirements-registration-pharmaceuticals-human-use_en-32.pdf accessed 15 Feb 2021.

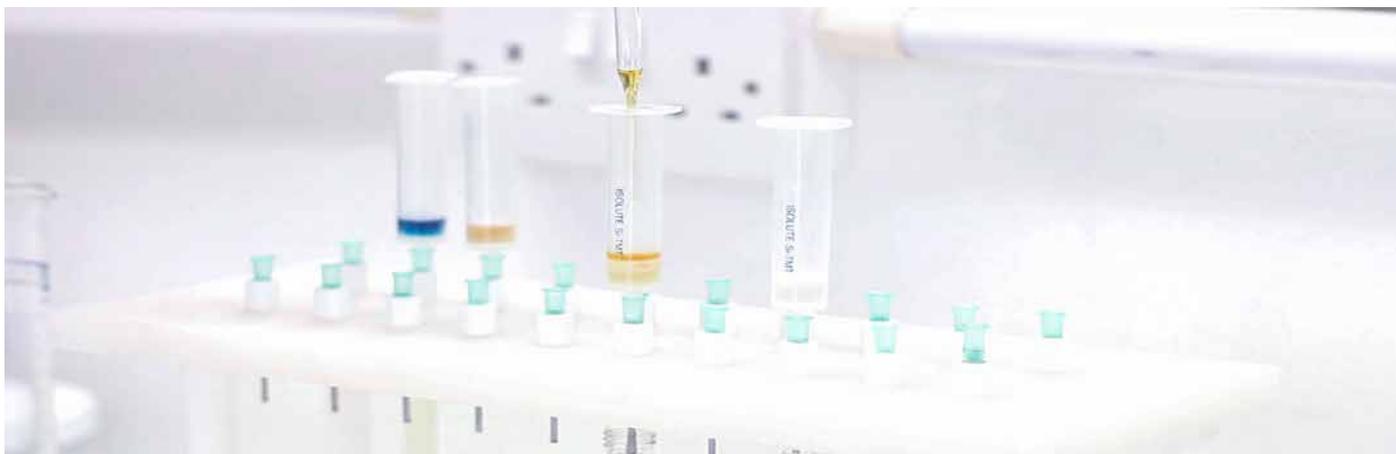
Scavenger	Biotage [®] MP-TMT	ISOLUTE [®] Si-TMT	ISOLUTE [®] Si-Thiol	ISOLUTE [®] SCX-2	ISOLUTE [®] Si-Trisamine
Structure					
Type	Macroporous polystyrene	Silica	Silica	Silica	Silica
Name	Macroporous polystyrene-2,4,6-trimer captotriazine	2,4,6-trimer captotriazine silica	Silica 1-propanethiol; 3-Mercaptopropyl silica	Silica Propylsulfonic Acid	Propyl tris-(2-aminoethyl) amine silica
Particle size Range (µM)	150–355	40–63	40–63	40–63	40–63

Part Numbers

	3 g	801506	n/a	n/a	n/a	n/a
	10 g	801469	9538-0010	9180-0010	9536-0010	9495-0010
	25 g	801470	9538-0025	9180-0025	9536-0025	9495-0025
	100 g	801471	9538-0100	9180-0100	9536-0100	9495-0100
	1000 g	801472	9538-1000	9180-1000	9536-1000	9495-1000
	5 kg	801473	9538-5000	9180-5000	9536-5000	9495-5000
	10 kg	801474	9538-10000	9180-10000	9536-10000	9495-10000
	25 kg	801475	9538-25000	9180-25000	9536-25000	9495-25000

Metals Scavenged	Transition metals and group 1 or 2 alkali metals including Ag, Cd, Cr, Co, Cu, Fe, Hg, K, Li, Na, Ni, Ni, Pb, Pd, Pt, Rh, Ru, Sn, V, Zr, Z
Typical Scavenging Conditions	Add 3–5 equiv. relative to Palladium to reaction and stir, RT, 5 minutes – 24 hours. Pass solution of metal through fixed bed/cartridge with scavenger, one pass or recirculate.
Compatible Solvents	Wide choice and no major compatibilities with common organic or aqueous solvents. As usual we would recommend carrying out routine development work to determine the optimum solvent /solvent combination for a particular application. Typical examples include (but not limited to): Tetrahydrofuran (THF), Dichloromethane (DCM), Acetonitrile (MeCN), Toluene, Water, Methanol (MeOH), Ethyl Acetate (EtOAc), Dioxane, Dimethylsulfoxide (DMSO), N,N-Dimethylformamide (DMF)
Storage	RT, (Long term, cool (4 °C)), dry location
Shelf-life	Nominally 1–3 years but indefinitely stable when stored in original packaging under closed atmosphere conditions in a cool dark place.

Metal Scavenging in Practice



1. Crude Pd/mother liquors (1000 ppm Pd) is applied to Si-TMT.



2. Product passes through and palladium is efficiently retained.



3. The clear product extract to the left and the original palladium catalyst to the right.

Metal Scavenging at Nippon Shinyaku

Mr. Toshio Fujiwara is working as head of Process Chemistry at CMC Research & Development Department, Discovery Research Laboratories. Nippon Shinyaku Co., Ltd has used Biotage metal scavengers for metals reduction within GLP/cGMP.

“Primarily, my role is to develop a synthetic process for pipeline compounds from exploratory studies. We are aiming to establish an efficient, inexpensive and safe synthetic approach in accordance with the production scale.

I heard about the metal scavenger kit of Biotage AB. Various evaluations were performed for each of the five types of scavengers included in the kit under a wide variety of solvents and temperature conditions. (Too many scavengers would make finding optimal conditions difficult because we must consider solvent conditions among other factors). Of course, we tested other makers’ products, but Si-Thiol of Biotage AB gave the best results in terms of removal rate.

After choosing Si-Thiol, we have proceeded with GLP/GMP productions and the API process is going well. A production scale of tens of kg gave the same results as the smaller production scale. There is no problem. Furthermore, we can place a large order in bulk to respond to demands for a larger scale production. That was the deciding factor. Recently, the speed in developing new drugs has been emphasized. Therefore, a response to a scale-up in production is important.

I also supply drug samples for GLP studies and clinical studies (its production should be done according to the GMP Guide for APIs and a quality level as prescribed by the Guide), which are required for drug development. Medicinal products that are



produced by a coupling reaction (i.e. Suzuki-Miyaura coupling) use such metals as palladium. Therefore, residual metals should be strictly controlled in the final drug substance. We usually use removal methods involving extraction or crystallization. However, characteristics of the target chemical may prevent removal. In such cases, we need to use a reagent such as metal scavenger. After elucidation of the chemical structure of the candidate compound, I participate in a project that involves GLP studies, clinical studies and finally registration application over a long period of time. I am sure the metal scavenger of Biotage will be our first choice when working on a future project in which palladium removal can be problematic.”

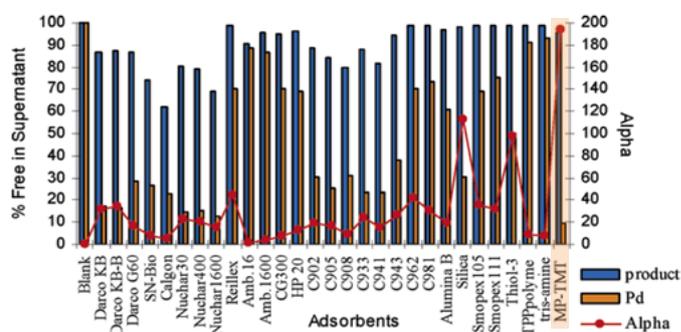
Literature Case: MP-TMT Best in Class

In an early example, the Welch group screened a variety of metal scavengers and developed a new metric to consolidate the effect of metal removal and also product yield (loss).

The alpha factor metric that they created was the ratio of metal removed and product lost. High alpha is strongly preferred solution, with low levels of metal and high yield of product, and Biotage® MP-TMT demonstrated the highest alpha factor of all materials tested.

Read more

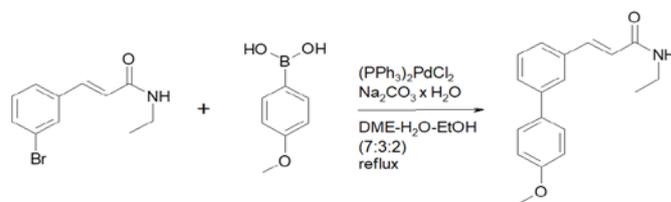
Welch, C.J.; Albaneze-Walker, J.; Leonard, W.R.; Biba, M.; DaSilva, J.; Henderson, D.; Laing, B.; Mathre, D.J.; Spencer, S.; Bu, X.; Wang, T.; Org. Proc.Res.Dev. 2005, 9, 198-205



Metal Scavenging vs. Recrystallization

The use of a metal scavenger was compared with a traditional recrystallization technique. Recrystallization is a powerful way to isolate product, but depending on the structure, metals may also be concentrated within the crystal structure and contaminate the product. Metal scavengers were seen to eliminate this concern.

In this example, the crude reaction product from a Suzuki reaction was analysed and recrystallized and the resulting metals content found to have reduced from 1,300 ppm Pd to 200 ppm. However, applying a sample of the crude (1,300 ppm) product directly to a column plug of the metal scavenger Si-TMT, resulted in a reduction of Pd, with the final concentration measured being 5 ppm.



Suzuki reaction and crystallized product.

Read More. The Use of Polymer and Silica Supported Metal Scavengers in Scale Up/Process Chemistry, New Approaches to Today's Challenges: A Detailed Study. Poster P29, Biotage.

Metal Scavenging vs. Carbon

Carbon is a classic way to remove metals, palladium in particular. However, using carbon as a purification technique or decolorizing agent carries some risks. Depending on the product, carbon may permanently absorb the product of interest, not just the metal contaminant, resulting in unacceptable losses in mass yield and recoveries, and devastating effects on process economics.

The efficiency, metal removal and overall mass recovery of identical quantities of metal scavenger and carbon were compared. A solution containing 500 ppm Pd catalyst and 1 g of a benzoxazole was made up, and varying quantities (0.2 g, 1 g, 2 g) of metal scavenger or carbon was added. The solution was stirred and then concentrated to support metals and mass yield analysis. The metal scavengers Si-Thiol and MP-TMT removed over 98.2% of the initial Pd content, however, carbon was less

effective, removing up to 88% at the maximum treatment level. Due to the density of carbon, implications for optimization the reaction to completion would have meant huge consumption of batch reactor space, and concordant difficulty in mass transport and stirring (and reactor washing). We also noted significant and unacceptable loss of organic product when used in conjunction with carbon, compared to quantitative recoveries when treated with the Biotage metal scavengers.





Metal Scavenging Tool Kits

It is always advisable to screen a variety of different scavengers in any early development program. Biotage metal scavengers and kits are industry proven and supported by a comprehensive regulatory qualification support package.

Their application is very simple:

1. Add resin/silica to reaction
2. Stir for desired time
3. Filter as usual to purify
4. ... or pack them into columns and flow through for fixed-bed applications.

For further details, case studies and example protocols, please see the Metal Scavenger User Guide (U1317). The mode of operation is very simple with wide solvent compatibility and specific reactivity, and metal scavengers impose very little constraint or stress on typical workflows. Biotage metal scavengers

are designed to be added, stirred and filtered, leaving pure products in the solution. This step-wise approach significantly reduces the traditional metal removal processing burden.

What's in the Box?

- » Certificate of Analysis
- » Extractable
- » Chemical loading
- » Lot information
- » Batch identity
- » MSDS
- » BSE/TSE statement
- » Full Instructions and Suggestions for Use

Which Kit Is Right for me?

K-MS-2 – Loose Powder Kit

Supports multi-variable development work, useful if there is small quantity of test product available, best when final process is batch stir, and ‘add-stir-filter’ is the workflow. Flexible and reliable, this approach can be used to design processes that will process hundreds of kg of API product.

- » 1 x 10 g ISOLUTE® Si Thiol
- » 1 x 3 g ISOLUTE® Si-TMT
- » 1 x 3 g Biotage® MP-TMT
- » 1 x 10 g ISOLUTE® SCX-2
- » 1 x 10 g ISOLUTE® Si-Trisamine
- » 5 x 500 mg/6 mL ISOLUTE® Si-TMT (1 sampler pack)

K-MS-3 – Pre-packed SPE Cartridges Kit

Useful for when the final scale-up situation demands a cartridge format or convenience of pre-packed screening cartridges is desired. We can work with you to determine a larger format cartridge up to 50 kg, sufficient for processing up to hundreds of kg of final product.

- » 5 x 1 g/15 mL SPE cartridge Biotage® MP-TMT
- » 5 x 1 g/15 mL SPE cartridge ISOLUTE® Si-TMT
- » 5 x 1 g/15 mL SPE cartridge ISOLUTE® Si-Thiol
- » 5 x 1 g/15 mL SPE cartridge ISOLUTE® Si-Trisamine
- » 5 x 1 g/15 mL SPE cartridge ISOLUTE® SCX-2



Biotage metal Scavengers are Cleanest in Class

We analyzed metal scavengers from various suppliers, as supplied. Biotage metal scavengers were consistently demonstrated to be the cleanest available. Metal scavengers from other suppliers were found to contain class I and class II metals following independent testing.

	As	Cd	Co	Cr	Cu	Hg	Li	Mo	Ni	Sb	Sn	V
MP-TMT	0	0.5	0	2	2.2	0	0	2	2	0	9	0
Si-Thiol	0 (13)*	1.1	0	2	1.5	0 (4)*	0	4	0	0	0	1 (13)*
Si-TMT	0	1.3	0	4	2.4	3	0	1	0	0	0	2
SCX-2	0	0.6	0	2	1.2	3	0	2	0	0	0	0
Si-Trisamine	0	0.7	0	2	1.2	0	0	0	0	0	0	1

* Data from competitive metal scavengers tested under identical conditions.

Biotage Metal Scavengers

Biotage® MP-TMT

Product Note: PPS371

[Download](#) ↓

Capacity: 0.66 mmol/g

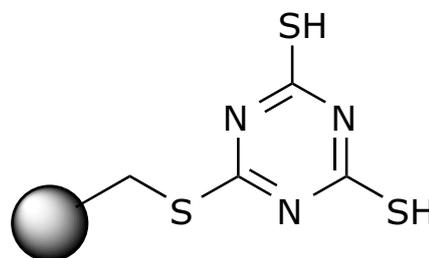
Bulk Density: 450 g/L

Target Metals: Ag Cu Ni Pd Rh Ru V Zn

Applications: Biotage® MP-TMT is a macroporous polystyrene-bound equivalent of 2,4,6-trimercaptotriazine (TMT).

MP-TMT scavenges residual palladium from palladium catalyzed reactions and has also shown to remove other metals.

MP-TMT is mechanically very robust, non-swelling and provides enhanced access to reactive sites resulting in optimal scavenging, higher recoveries and less solvent usage.



ISOLUTE® Si-Thiol

Product Note: PPS374

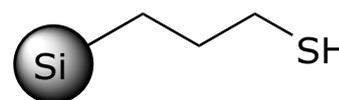
[Download](#) ↓

Capacity: 1.3 mmol/g

Bulk Density: 700 g/L

Target Metals: Ag Cu Fe Hg Pb Pd Pt Rh Sn V Zn

Applications: ISOLUTE® Si-Thiol is the silica-bound equivalent of 1-propanethiol, which is useful for scavenging a variety of metals used in organic chemistry including Pd, Pt, Cu, Hg, Ag and Pb. The versatility of this scavenger makes it a workhorse product for the industry.



ISOLUTE® SCX-2 (Si-Propylsulfonic Acid)

Product Note: PPS373

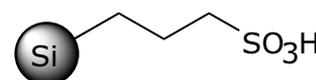
[Download](#) ↓

Capacity: 0.66 mmol/g

Bulk Density: 700 g/L

Target Metals: Cd Co Cu Fe Ni Rh Ru V Zn

Applications: ISOLUTE® SCX-2 is a strong cation exchanger, and thus can be used in the scavenging of many alkaline metals, typically in +1 oxidation states but is also effective for transition metals such as ruthenium.



ISOLUTE® Si-Trisamine

Product Note: PPS372

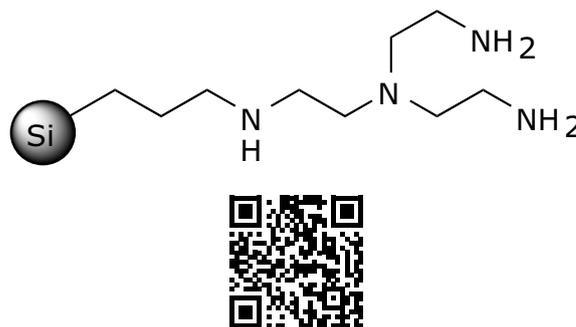
[Download](#) ↓

Capacity: 1.6 mmol/g

Bulk Density: 700 g/L

Target Metals: Cr Co Cu Fe Ni Pd Rh Ru V Zn

Applications: ISOLUTE® Si-Trisamine is a silica bound propyl-tris(2-aminoethyl)-amine. Si-Trisamine is a very powerful scavenger of transition metals (+II oxidation states) as well as electrophiles from aqueous or organic solutions.



ISOLUTE® Si-TMT

Product Note: PPS378

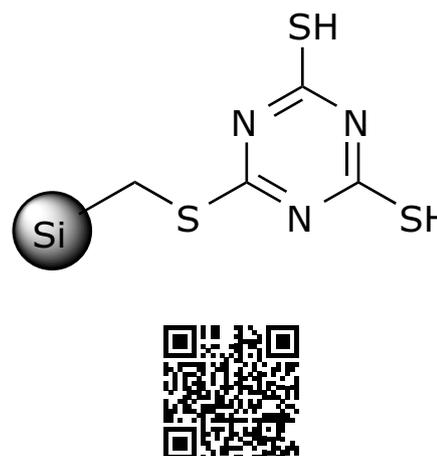
[Download](#) ↓

Capacity: 0.3 mmol/g

Bulk Density: 700 g/L

Target Metals: Ni Pd Pt St Rh Ru V Zn

Applications: ISOLUTE® Si-TMT is the silica bound equivalent of 2,4,6-trimercaptotriazine (TMT). Si-TMT has been shown to efficiently scavenge residual palladium from palladium-catalyzed reactions. The chemistry of Si-TMT is similar to that of the resin bound counterpart, however the silica is additionally amenable to being packed in column format, due to its smaller particle size.



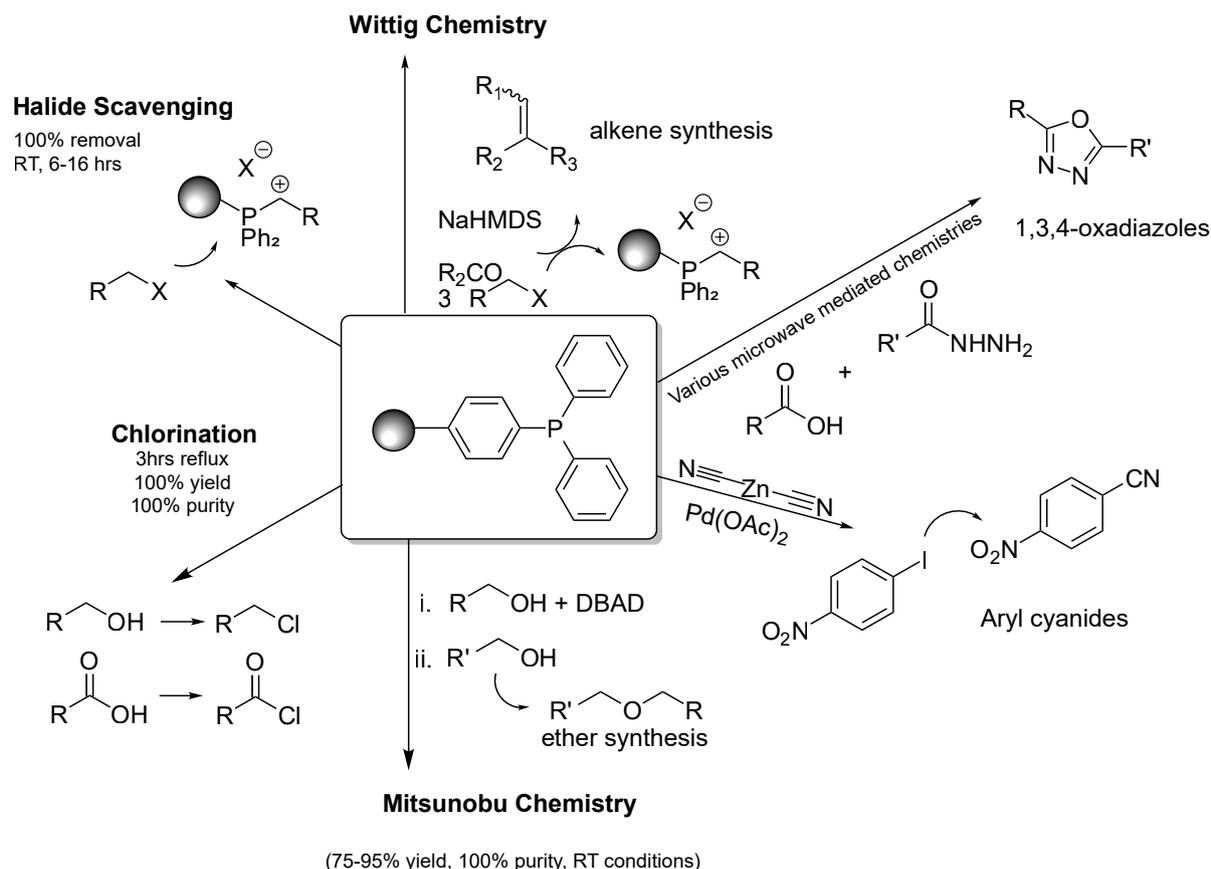
Availability

Biotage Metal scavengers are available in bulk and column formats. Please inquire.





Reagents and Scavengers



Efficient Delivery of Reagent to Reactions

Polymer supported reagents are functionalized polymers that perform synthetic transformations in a similar manner to their small molecule, non-bound counterparts, however, they provide the added advantage of heterogeneity, meaning that they are very easy to remove from reactions afterwards for example by simple filtration techniques.

Making the Impossible Possible

Resins and silicas are heterogeneous, meaning that we can lock away products and completely selectively release them later (or lock away by-products, and only let product through). Processes that are energy and labor intensive, such as solvent switching, can be achieved in a matter of seconds at room temperature and at normal atmospheric pressure. High boiling point solvents such as DMF and DMSO can be removed from amine mixtures and replaced with more volatile solvents. The other side of this coin is that some resins, such as the patented MP-Triacetoxyborohydride resin, is self-driving, and itself can drive its own reactions to completion, by virtue of its unique combination of chemo-polymeric properties.

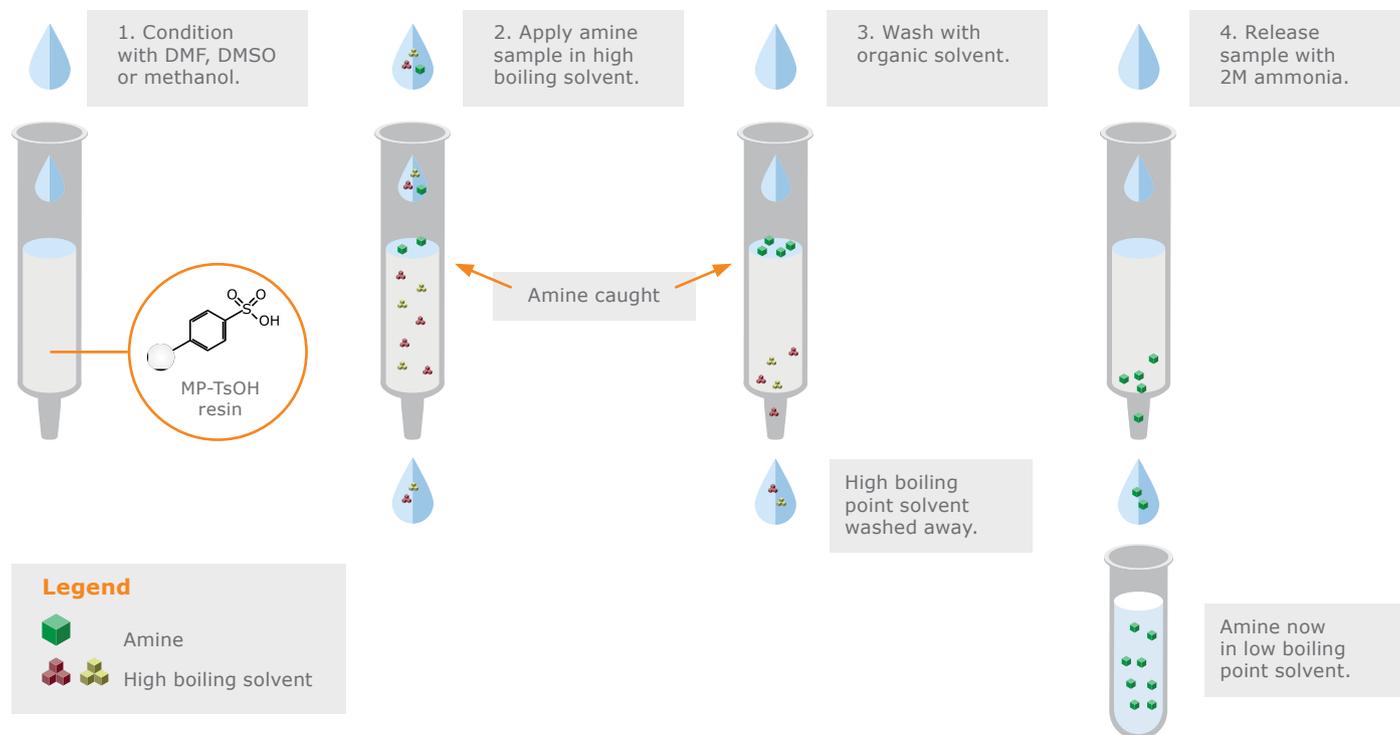
Re-cycle and Re-use

Being easy to recover after a reaction, many resins and supported products are also additionally compliant with the principles of green chemistry, by being recyclable or operating in a catalytic mode. While many resins are used once, for reasons of industry preference or regulation, Biotage can support clients who need guidance on how to re-use, by providing technical guidance.

Non-Toxic, No Smells and Easier To Handle

Once bound to the resin (or silica) the vapor pressure of volatile or toxic reaction components is virtually eliminated so bound resins and silica scavengers are especially good for capturing

High Boiling Point Solvent Removal



compounds such as isocyanates, or nucleophilic amines/ anilines.

Drive Reactions With Excess Reagent/Scavenger

Adding more reagents will drive a reaction to completion, but the excess reagents will need to be separated afterwards, involving additional purification steps. With a resin bound strategy, the resin (or silica) supported reagent is heterogeneous, it does 'see' the solution, but it is completely insoluble, so removing excess after the reaction is just a case of filtering using simple and readily available laboratory equipment.

Reduce Processing Steps and Mitigate Impurity Risks

Even if by-products are not toxic or do not have a stench, they may still be difficult to separate, co-elute, or mask other target products in a mixture. PS-Triphenylphosphine resin for example performs the chemistry you would expect, but the PS-Triphenylphosphine oxide by-product is 100% resin bound, and is thus easily removed by filtration afterwards. No more issues with large UV signals masking the intended product, giving false reaction performance indicators.

Thermally and Mechanically Stable

Resin reagents or scavengers work well with overhead stirring or mechanical shaking. They withstand temperatures up to approx. 150 °C (i.e. microwave chemistry heating conditions). Silica supported reagents and scavengers are mechanically stable, and may also be stirred but are more often packed into fixed bed formats for flow through applications. Silica can withstand 150–200 °C temperatures, so as long as the intended chemistry is compatible, the resin or silica option is an efficient delivery vehicle for the chemistry of the project.

Scale-Up and Formats

Additionally, Biotage has a flexible cartridge packing facility to accommodate many scale-up paths and options, from grams to multi-kg and in a variety of formats for processing.

Long Shelf-Life

Polymer supported reagents and scavengers are stable. By definition they only take part in the reactions they were designed for, so side reactions and degradation is much less of an issue compared to small molecule chemistry. In real terms the shelf-life of a functionalized polymer may be indefinite, so we recommend a nominal 1 year expiry for annual re-testing or other QA perspectives, the product is stored in cool dry conditions.

Biotage offer a range of resins and scavengers which can be used to underpin key transformations or steps in processes. The following chart is a summary of the powerful chemistries that are supported.

	Scavengers					Reagents						
	MP-Carbonate	MP-TsOH/SCX 2	MP-Trisamine	PS-Isocyanate/ MP-Isocyanate	PS- Benzaldehyde	PS-TsNHNH ₂	PS-PPh ₃ -Pd	PS-PPh ₃	PS-TBD	MP- Borohydride	MP-Triacetoxy Borohydride	MP- Cyanoborohydride
Amide Synthesis												
C-C Bond Formation: Suzuki, Still, Sonogashira							✓					
Reaction Quenching: Removing Nucleophiles				✓	✓							
Reaction Quenching: Removing Electrophiles			✓			✓						
Wittig, Mitsunobu, Alkylation								✓				
Oxidation												
Solvent Switching/Acid Base	✓	✓										
Reduction/Reductive Amination										✓	✓	✓
Halogenation								✓				
Etherification									✓			

Reagents and Scavengers

For Full Details Please See Individual Product Technical Notes

Legend



Supported Reagents

Biotage® PS-PPh₃-Pd

Technical Note: PPS401

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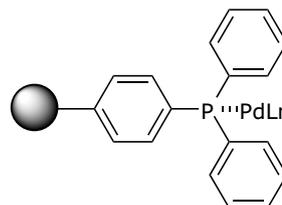
Applications: Catalyst for Suzuki, Sonogashira, Stille, Buchwald-Hartwig, Negishi.

Typical Conditions: Various, for example 0.5 mol% catalyst, 16 hours, 75 °C.

Polymer Type: PS (Gel)

Compatible Solvents (Swelling Data): DMF (3.5 mL/g), THF (4.1 mL/g), DCM (4.9 mL/g)

Part Numbers: 800473 (1 g sample); 800474 (10 g); 800475 (25 g); 800476 (100 g)



Biotage® PS-Triphenylphosphine

Technical Note: PPS389

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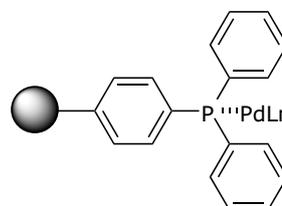
Applications: Wittig, Mitsunobu, chlorination of acids and alcohols, scavenging of alkyl halides.

Typical Conditions: Mitsunobu – 1.0 equiv. of alcohol, 1.5 equiv. of phenol, 2.2 equiv. of resin, 1.5–2 equiv. of DEAD or DIAD, stir at RT. Wittig – 2 equiv. of ylide resin, 8 equiv. of NaHMDS/THF, wash resin with THF, add 1.0 equiv. carbonyl compound in THF at RT.

Polymer Type: PS (Gel)

Compatible Solvents (Swelling Data): DMF (3.5 mL/g), THF (4.1 mL/g), DCM (4.9 mL/g), benzene (3.1 mL/g)

Part Numbers: 800378 (10 g); 800379 (25 g); 800380 (100 g); 800381 (1000 g); 800510 (3 g sample)



Biotage® PS-TBD

Technical Note: PPS382

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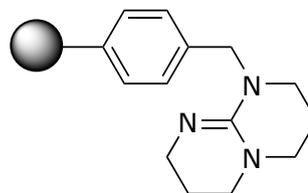
Applications: Alkylation of phenols and amines; esterification of carboxylic acids, alkylation of active methylene compounds, dehalogenation of organic halides, Williamson ether synthesis.

Typical Conditions: Add 2–3 equiv. of resin relative to the limiting reagent or acid species. Form on resin enolate, wash resin and add sub stoichiometric electrophile to complete the high purity displacement of product from the resin. Can be heated to accelerate.

Polymer Type: PS (Gel)

Compatible Solvents (Swelling Data): DCM (7.6 mL/g), DMF (3.5 mL/g), THF (6.6 mL/g), MeOH (6.6 mL/g), MeCN (2.5 mL/g)

Part Numbers: 800421 (10 g); 800422 (25 g); 800423 (100 g); 800424 (1000 g); 800513 (3 g sample)



Biotage® MP-Borohydride

Technical Note: PPS390

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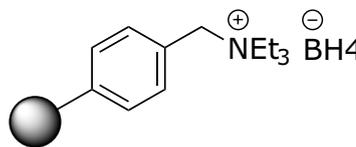
Applications: Reduction of carbonyl compounds, azides and oximes, reductive amination, reduction of conjugated enones to unsaturated alcohols.

Typical Conditions: 1.0 mmol carbonyl compound in EtOH or MeOH plus 0.5 mmol of MP-BH₄ resin stirred at RT for 1–16 hours. Products isolated by filtration to remove the resin.

Polymer Type: MP (macroporous) resin

Compatible Solvents (Swelling Data): THF (2.9 mL/g), DCM (3.4 mL/g), MeOH (3.4 mL/g), DMF (2.9 mL/g)

Part Numbers: 800401 (10 g); 800402 (25 g); 800403 (100 g); 800404 (1000 g); 800512 (3 g sample)



Biotage® MP-Cyanoborohydride

Technical Note: PPS392

[Download](#) ↓

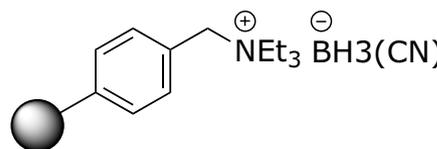
Applications: Reductive amination, reductive methylation of primary and secondary amines, reduction of imines, reduction of conjugated enones to unsaturated alcohols.

Typical Conditions: Add 2–3 equiv. of the scavenger relative to the acid chloride, 1–4 hours, 20 °C. If there is an additional resin bound base present (i.e. cocktail methodology), the number of equiv. can be decreased 50%. Can be heated to accelerate scavenging.

Polymer Type: MP (Macroporous) resin

Compatible Solvents (Swelling Data): THF (2.9 mL/g), DCM (3.4 mL/g), MeOH (3.4 mL/g), DMF (2.9 mL/g)

Part Numbers: 800405 (10 g); 800406 (25 g); 800407 (100 g); 800408 (1000 g); 800511 (3 g sample)



Biotage® MP-Triacetoxyborohydride

Technical Note: PPS391

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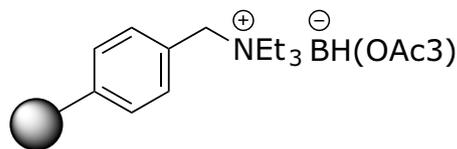
Applications: Reductive amination with primary or secondary amines.

Typical Conditions: 1.0 mmol of carbonyl compound, 1.2 mmol of amine in THF, 2.5 mmol of resin, stir 1–16 hours at RT. PS-Benzaldehyde or PS/MP-Isocyanate can be added afterwards to scavenge amine. Filter to remove resin.

Polymer Type: MP (Macroporous) resin

Compatible Solvents (Swelling Data): THF (2 mL/g), DMF (2 mL/g), NMP (2 mL/g)

Part Numbers: 800413 (10 g); 800414 (25 g); 800415 (100 g); 800416 (1000 g); 800517 (3 g sample)



Supported Scavengers

Biotage® MP-TsOH

Technical Note: PPS398

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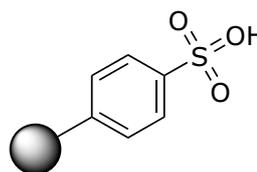
Applications: Catch and release purification of amines, solvent switch, acid catalysis.

Typical Conditions: 2–3 equiv. of resin compared to amine, wash, release with 2M methanolic ammonia. The silica form can also be packed into a column and used in a flow through format.

Polymer Type: MP (Macroporous) resin

Compatible Solvents (Swelling Data): DCM (3.0 mL/g), THF (3.1 mL/g), DMF (3.1 mL/g), MeOH (3.1 mL/g)

Part Numbers: 800461 (10 g); 800462 (25 g); 800463 (100 g); 800464 (1000 g); 800498 (3 g sample)



Biotage® MP-Carbonate

Technical Note: PPS386

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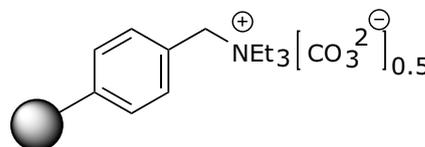
Applications: General base, ammonium or TFA salt neutralization, scavenging acids and acidic phenols.

Typical Conditions: 3 equiv relative to substrate, 0.5–2 h, 20 °C ammonia. The silica form can also be packed into a column and used in a flow through format.

Polymer Type: MP (Macroporous) resin

Compatible Solvents (Swelling Data): DCM (3.0 mL/g), DCE (3.0 mL/g), THF (3.0 mL/g), THF (2.8 mL/g), DMF (2.9 mL/g), EtOH

Part Numbers: 800267 (10 g); 800268 (25 g); 800269 (100 g); 800314 (1000 g); 800493 (3 g sample)



Biotage® PS-Isocyanate

Technical Note: PPS400

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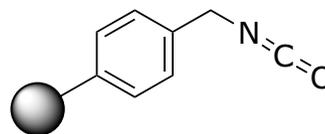
Applications: Scavenging nucleophiles including primary amines, hydrazines and reducing agents.

Typical Conditions: Add 2–3 equiv. relative to the excess nucleophile. Organic solvents, 1–16 hours at RT. May be heated to accelerate.

Polymer Type: PS (Gel)

Compatible Solvents (Swelling Data): DCM (4.5 mL/g), DMF (4.5 mL/g), THF (4.7 mL/g), MeOH (3.9 mL/g), water (4.7 mL/g)

Part Numbers: 800495 (3 g sample), 800260 (10 g); 800261 (25 g)



Biotage® MP-Isocyanate

Technical Note: PPS399

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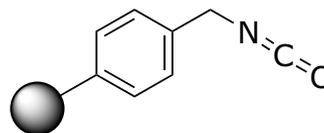
Applications: Scavenging nucleophiles including primary amines, hydrazines and reducing agents.

Typical Conditions: Add 2–3 equiv. relative to the excess nucleophile. Organic solvents, 1–16 hours at RT. May be heated to accelerate.

Polymer Type: MP (macroporous) resin

Compatible Solvents (Swelling Data): DCM (4.5 mL/g), DMF (4.5 mL/g), THF (4.7 mL/g), MeOH (3.9 mL/g), water (4.7 mL/g)

Part Numbers: 801504 (3 g sample), 801409 (10 g); 801410 (25 g)





Scale-up and Method Development Resources

Scale-up and Method Development Resources

Scale-up Flash Column Part Numbers

Size (nominal)	KP-C18-HS	SFAR C18	KP-Sil	SFAR 60	HP-Sphere
5	FSLs-1118-0006	FSUD-0401-0006	FSKS-1107-0005	FSRS-0445-0005	FSUS-0442-0005
10	FSLs-1118-0012	FSUD-0401-0012	FSKS-1107-0010	FSRS-0445-0010	FSUS-0442-0010
25	FSLs-1118-0030	FSUD-0401-0030	FSKS-1107-0025	FSRS-0445-0025	FSUS-0442-0025
50	FSLs-1118-0060	FSUD-0401-0060	FSKS-1107-0050	FSRS-0445-0050	FSUS-0442-0050
100	FSLs-1118-0120	FSUD-0401-0120	FSKS-1107-0100	FSRS-0445-0100	FSUS-0442-0100
200	FSLs-1118-0240	FSUD-0401-0240	FSKS-1107-0200	FSRS-0445-0200	FSUS-0442-0200
350	FSLs-1118-0400	FSUD-0401-0400	FSKS-1107-0350	FSRS-0445-0350	FSUS-0442-0350
750	FSL0-1118-0950	FSUL-0401-0950	FSK0-1107-0750	FSK0-0445-0750	FSUL-0442-0750
1500	FSL0-1118-1850	FSUL-0401-1850	FSK0-1107-1500	FSK0-0445-1500	FSUL-0442-1500
FL75M	FL0-1118-19040	FSUL-0401-19040	FK0-1107-19045	F75M-0445-19045	F75M-0442-19045
FL75L	FL0-1118-19070	FSUL-0401-19070	FK0-1107-19075	F75L-0445-19075	F75L-0442-19075
FL150M	FL0-1118-25070	FSUL-0401-25070	FK0-1107-25075	F150M-0445-25075	FL150M-0442-25075
FL150L	FL0-1118-25150	FSUL-0401-25150	FK0-1107-25155	F150L-0445-25155	F150L-0442-25155
FL400M	FL0-1118-50070	FSUL-0401-50070	FK0-1107-50070	F400M-0445-50070	F400M-0442-50070
FL400L	FL0-1118-50150	FSUL-0401-50150	FK0-1107-50150	F400L-0445-50150	F400L-0442-50150

Column Volume Chart

	KP-C18-HS (40-60 std)	SNAP C18 ULTRA/Sfär C18 (HP Sphere C18) (30 micron)	KP-Sil (40-60 std)	Sfär 60 Silica (KP-Sphere) (60 micron)	HP-Sphere (25 micron)	Sfär HC Silica (20 micron)
50 g SNAP/Sfär	75	80/71	70	80	90	80
100 g SNAP/Sfär	145	150/141	133	150	160	150
340 g/350 g SNAP/Sfär	510	520/503	470	540	580	530
750 g	1180	1210	1145	1250	1230	1250
1500 g	2360	2410	2260	2500	2450	2500
FL75M	510	520	500	575	575	575
FL75L	1020	1040	1000	1150	1150	1150
FL150M	4050	4100	3500	4400	4400	4400
FL150L	8100	8200	7000	8800	8800	8800
FL400M	29200	32400	28000	31500	31500	31500
FL400L	58400	64800	56000	63000	63000	63000

This data is for guidance purposes and should be verified by practical experiments as part of normal process development.

Mass Guidance for Loading Purposes

	KP-C18-HS (40-60 std)	SFAF C18 (HP- Sphere C18) (30 micron)	KP-Sil (40-60 std)	Sfär 60 Silica (KP-Sphere) (60 micron)	HP-Sphere (25 micron)	Sfär HC Silica (20 micron)
50 g	62	57	53	51	51	51
100 g	121	110	102	99	98	98
340 g/350 g	429	380	363	352	348	348
750 g	950	850	800	780	750	750
1500 g	1900	1700	1600	1560	1500	1500
FL75M	425	380	360	350	345	345
FL75L	850	760	720	700	690	690
FL150M	3400	3000	2850	2850	2775	2775
FL150L	6800	6000	5700	5600	5550	5550
FL400M	24300	22100	20550	19950	19750	19750
FL400L	48600	44200	41100	39900	39500	39500

This data is for guidance purposes and should be verified by practical loading experiments as part of normal process development.

SFAR HC	KP-NH	ISOLUTE-NH2	Carbon	HP20	HP20ss
FSUS-0443-0005	FSAD-0909-0005	FSNO-0454-0005	FSCS-4021-0005	FSHS-2030-0005	FSHS-2530-0005
FSUS-0443-0010	FSAD-0909-0011	FSNO-0454-0011	FSCS-4021-0010	FSHS-2030-0010	FSHS-2530-0010
FSUS-0443-0025	FSAD-0909-0028	FSNO-0454-0028	FSCS-4021-0025	FSHS-2030-0025	FSHS-2530-0025
FSUS-0443-0050	FSAD-0909-0055	FSNO-0454-0055	FSCS-4021-0050	FSHS-2030-0050	FSHS-2530-0050
FSUS-0443-0100	FSAD-0909-0110	FSNO-0454-0110	FSCS-4021-0100	FSHS-2030-0100	FSHS-2530-0100
FSUS-0443-0200	FSAD-0909-0220	FSNO-0454-0220	FSCS-4021-0200	FSHS-2030-0200	FSHS-2530-0200
FSUS-0443-0350	FSAD-0909-0380	FSNO-0454-0380	FSCS-4021-0350	FSHS-2030-0350	FSHS-2530-0350
FSUL-0443-0750	FSNO-0909-0900	FSNO-0454-0900	FSCS-4021-0750	FSHS-2030-0750	FSHS-2530-0750
FSUL-0443-1500	FSNO-0909-1800	FSNO-0454-1800	FSCS-4021-1500	FSHS-2030-1500	FSHS-2530-1500
F75M-0443-19045	FPNH-75M	FPNH-0454-19040	C1YR-4021-19043	FT6-2030-19045	FT6-2530-19040
F75L-0443-19075	FPNH-75L	FPNH-0454-19070	C1YR-4021-19073	FT6-2030-19075	FT6-2530-19070
F150M-0443-25075	FPNH-150M	FPNH-0454-25070	C1YR-4021-25075	FT6-2030-25075	FT6-2530-25070
F150L-0443-25155	FPNH-150L	FPNH-0454-25150	C1YR-4021-25155	FT6-2030-25155	FT6-2530-25150
F400M-0443-50070	FPNH-400M	FPNH-0454-50070	C1YR-4021-50075	FT6-2030-50070	FT6-2530-50070
F400L-0443-50150	FPNH-400L	FPNH-0454-50150	C1YR-4021-50155	FT6-2030-50150	FT6-2530-50150

Column Dimensions for Calculations

KP-NH (60 micron)	Isolute amino (40-60 std)	Carbon (4021)
60/56	75	52
115/111	145	105
410/396	510	380
1080	1120	880
2190	2279	1750
575	505	390
820	1025	1025
3230	4070	3090
6460	8140	6180
25840	32150	24720
51680	64300	49440

KP-NH (60 micron)	Isolute amino (40-60 std)	Carbon (4021)
47	61.75	37
91	120	75
322	424	250
321	423	560
643	846	1125
745	981	250
1430	1882	500
2570	3383	2025
5140	6766	4050
18277	24058	14400
36555	48116	28850

	Inner Diameter (cm)	Length (cm)	L/D ratio	Cylinder Volume (mL)
Sfär 5 g	1.55	4.4	2.32	7
Sfär 10 g	2.05	5.50	2.68	18
Sfär 25 g	2.91	7.40	2.54	49
Sfär 50 g	3.85	7.90	2.05	92
SNAP 50 g	3.90	8.10	2.08	97
Sfär 100 g	3.85	15.70	4.08	183
SNAP 100 g	3.90	15.70	4.03	187
Sfär 200 g	5.80	14.60	2.52	386
Sfär 200 g	7.10	16.80	2.37	665
Sfär 350 g	5.80	24.60	4.24	650
750 g	8.20	29.10	3.55	1,536
1500 g	10.70	32.80	3.07	2,948
FL75M	7.50	15.00	2.00	662
FL75L	7.50	30.00	4.00	1,325
FL150M	15.00	30.00	2.00	5,299
FL150L	15.00	60.00	4.00	10,598
FL400M	40.00	30.00	0.75	37,680
FL400L	40.00	60.00	1.50	75,360

Flow Rate Development Tool (Linear Flow Rate Normalized, mL/min)

	Target (FL400L)@ 2L/min	Target (FL400L)@ 4L/min	Target (FL400L)@ 6L/min
Sfär 5 g	3	6.5	10.0
Sfär 10 g	5	11	16
Sfär 25 g	11	21	32
Sfär 50 g	19	37	57
SNAP 50 g	19	38	57
Sfär 100 g	19	37	57
SNAP 100 g	19	38	57
Sfär 200 g	42	84	126
SNAP 340 g	63	126	189
750 g	84	168	252
1500 g	143	286	429
FL75M	70	141	211
FL75L	70	141	211
FL150M	281	563	844
FL150L	281	563	844
FL400M	2000	4000	6000
FL400L	2000	4000	6000

This data is for guidance purposes and should be verified by practical experiments as part of normal process development. Please note that this calculation is based on linear velocity. The back-pressure experiences is a function solvent, sample, stationary phase size and various other parameters, so flow rate scale up analysis should always be conducted in connection with back-pressure (either experimentally or by calculation).

Solvent Polarity Index

Polarity Index	Solvent	BP (°C)
0	cyclohexane	80.7
0	Heptane	
0	n-hexane	68.9
0.3	n-decane	174.1
0.4	i-octane	99.2
0.4	octane	99.2
1.7	butyl ether	142.2
1.7	carbon tetrachloride	76.5
1.8	triethyl amine	89.5
2.2	i-propyl ether	68.3
2.3	toluene	101.6
2.4	xylene, p-	138
2.9	t-butyl methyl ether	55.2
3	benzene	80.1
3.3	benzyl ether	288.3
3.4	dichloromethane	40
3.4	methylene chloride	39.8
3.4-4.4	chloroform	61.2
3.7	dichloroethane	83.4
3.7	ethylene dichloride	83.5
3.9	butanol, 1-	117.2
3.9	i-butyl alcohol	117.7
4.2	tetrahydrofuran	66
4.3	ethyl acetate	77.1
4.3	propanol, 1-	97.2
4.3	propanol, 2-	82.4-117.7
4.4	methyl acetate	56.3
4.5	cyclohexanone	155.7
4.5	methyl ethyl ketone (MEK)	80
4.5	nitrobenzene	210.8
4.6	benzotrile	191.1
4.8	dioxane, 1,4-	101
4.8	dioxane, p	101.3
5.2	ethanol	78.3
5.3	nitroethane	114
5.3	pyridine	115.3
5.4	acetone	56.3
5.5	benzyl alcohol	205.5
5.7	methoxyethanol, 2-	124.6
6.2	acetic acid	117.9
6.2	acetonitrile	81.6
6.4	dimethyl formamide, N,N-	153
6.5	dimethyl sulfoxide	189
6.6	methanol	64.7
7.3	formamide	210.5
9	water	100

Solvent Miscibility Guide

UV cutoff @ 1 AU (nm)	Viscosity @ 20 °C (cPoise)	Solvent	Acetone	Acetonitrile	Dimethylformamide	Dimethylsulfoxide	1,4-Dioxane	Ethanol	Isopropanol	Methanol	Tetrahydrofuran	Water	Benzene	n-Butanol	Carbon Tetrachloride	Chloroform	Cyclohexane	1,2-dichloroethane	Dichloromethane	Ethyl Acetate	Diethyl ether	Heptane	Hexane	Isooctane	Methyl tert-butyl ether	Butanone	Pentane	Toluene	Xylene	
330	0.36	Acetone																												
190	0.38	Acetonitrile																												
268	0.92	Dimethylformamide																												
268	2.24	Dimethylsulfoxide																												
215	1.37	1,4-Dioxane																												
210	1.20	Ethanol																												
120	2.30	Isopropanol																												
205	0.59	Methanol																												
215	0.55	Tetrahydrofuran																												
200	1.00	Water																												
280	0.65	Benzene																												
254	0.73	n-Butanol																												
263	0.97	Carbon Tetrachloride																												
245	0.57	Chloroform																												
200	1.00	Cyclohexane																												
225	0.79	1,2-dichloroethane																												
235	0.44	Dichloromethane																												
260	0.45	Ethyl Acetate																												
220	0.32	Diethyl ether																												
200	0.42	Heptane																												
200	0.31	Hexane																												
215	0.50	Isooctane																												
210	0.27	Methyl tert-butyl ether																												
329	6.45	Butanone																												
200	0.23	Pentane																												
285	0.59	Toluene																												
290	0.61	Xylene																												

■ Miscible

■ Immiscible or sparingly soluble

Example 1:

A 25 g Biotage® cartridge was used to develop a 2.3 gram purification. The requirement is now to purify 125 g. The scale-up factor is then 54.3. We therefore move right in the chart on the 25 g row to the interval between 32 and 60. The appropriate large scale cartridge is in the 800–2500 g range, which corresponds to the Biotage® Flash 150M cartridge.

Example 2:

A 100 g Biotage® cartridge was used to develop a 6.5 gram purification. The requirement is now to purify 900 g. The scale-up factor is then 138. We therefore move right in the chart on the 100 g row to the interval between 50 and 200. The appropriate large scale cartridge is in the 5–20 kg range, which corresponds to the Biotage® Flash 400M cartridge.

Development Cartridge Size	4.6 x 250	20 - 32 - 40 - 48 - 80 - 136 - 160 - 300 - 320 - 600 - 1000 - 2000 - 8000 - 16000
	5 g	10 - 16 - 20 - 24 - 40 - 68 - 80 - 150 - 160 - 300 - 500 - 1000 - 4000 - 8000
10 g	5 - 8 - 10 - 12 - 20 - 34 - 40 - 75 - 80 - 150 - 250 - 500 - 2000 - 4000	
25 g	2 - 3 - 4 - 5 - 8 - 14 - 16 - 30 - 32 - 60 - 100 - 200 - 800 - 1600	
30 g	2 - 3 - 3.5 - 4 - 7 - 12 - 14 - 25 - 27 - 50 - 83 - 167 - 667 - 1333	
45 g	1.1 - 1.8 - 2.2 - 3 - 4.5 - 7.5 - 9 - 17 - 18 - 33 - 56 - 111 - 444 - 888	
50 g	1.6 - 2 - 2.4 - 4 - 6.8 - 8 - 15 - 16 - 30 - 50 - 100 - 400 - 800	
80 g	1.25 - 1.5 - 2.5 - 4.3 - 5 - 9.5 - 10 - 19 - 31 - 62 - 250 - 500	
100 g	1.2 - 2 - 3.4 - 4 - 7.5 - 8 - 15 - 25 - 50 - 200 - 400	
120 g	1.7 - 2.8 - 3.5 - 6.5 - 7 - 12 - 21 - 42 - 167 - 333	
200 g	1.7 - 2 - 3.8 - 4 - 7.5 - 13 - 25 - 100 - 200	
340 g	1.2 - 2.2 - 2.4 - 4.4 - 7.4 - 15 - 60 - 120	
400 g	1.9 - 2 - 3.8 - 6.3 - 13 - 50 - 100	
750 g	1.1 - 2 - 3.5 - 7 - 27 - 54	
800 g	1.9 - 3.1 - 6.2 - 25 - 50	
1.5 kg	1.7 - 3.3 - 13.5 - 27	
2.5 kg	2 - 8 - 16	
5.0 kg	4 - 8	
20 kg	- 2	
40 kg	-	

Required Large Scale Media Mass						
	50 g - 80 g - 100 g - 120 g - 200 g - 340 g - 400 g - 750 g - 800 g - 1.5 kg - 2.5 kg - 5 kg - 20 kg - 40 kg	400-800 g	800-2500 g	2.5-5 kg	5-20 kg	20-40 kg
Range	50-400 g	400-800 g	800-2500 g	2.5-5 kg	5-20 kg	20-40 kg
Cartridge Size	400 g	800 g	2.5 kg	5 kg	20 kg	40 kg
	SNAP 340 g/75M	SNAP XL/75L	150M	150L	400M	400L

Available Cartridge Options	50-400 g	400-800 g	800-2500 g	2.5-5 kg	5-20 kg	20-40 kg
						

Service Solutions

Our products are designed to last, however we do understand that our clients work in environments (for example cGMP) that demand annual or refresher verification of system integrity and compliance. Whether it is re-using capital between campaigns, or commissioning a system that has been in longer term storage, your peace of mind matters to us, and we have a variety of options that can support your verification or re-validation process.

Health Check Kit for Biotage Flash 75/150 Systems

» This is a kit, consisting of all the commonly used o-rings and tubing in a flash 75 or 150 system.

Health Check Kit for Biotage Flash 400 Systems

» This is a kit, consisting of the commonly used and product contact o-rings in a flash 400 systems.

Health Check Package

» In connection with the kits above, we can inspect your system, as if we were installing it as new. Although there are no guarantees that a system that has been off-warranty, will pass, we can apply our OQ procedures and provide you with an up to date set of documentation in support of your PQ.

System Qualification

We offer qualification services to a selected range of products. Contact your local biotage office and representative or talk to our specialist below to find out more.

Qualification Components

IQ – Installation Qualification

A certified Biotage service engineer will carry out and perform the installation and documentation required and defined in the IQ documentation.

OQ – Operational Qualification

A certified Biotage service engineer will carry out and perform the qualification and documentation required and defined in the OQ documentation.

RQ – Re-qualification

A certified Biotage service engineer will carry out and perform a re-qualification after a system health check.





Biotage[®]



Dedicated Service

Ordering Information

Quantity = 1 unless specified.

Part number	Description
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Flash Systems and Accessories

Flash Purification Systems

ISO-1LSV	Isolera [®] LS, One Channel, Ext Col. Bed, 200-400 nm UV
ISO-1LSW	Isolera [®] LS, One Channel, Ext Col. Bed, 200-800 nm UV-VIS
SF-022-19041	Flash 75M system
SF-022-19071	Flash 75L system
SF-022-25071	Flash 150M system
SF-022-25151	Flash 150L system
SF-521-50070	Flash 400M system
SF-521-50150	Flash 400L system

Compression Modules and Barrels

FB-012-19040SP	Flash 75M Radial Compression Barrel
FC-022-19041SP	Flash 75M Radial Compression Module
FB-012-19070SP	Flash 75L Radial Compression Barrel
FC-022-19071SP	Flash 75L Radial Compression Module
FB-012-25070SP	Flash 150M Radial Compression Barrel
FC-022-25071SP	Flash 150M Radial Compression Module
FB-012-25150SP	Flash 150L Radial Compression Barrel
FC-022-25151SP	Flash 150L Radial Compression Module
FB-012-50070-22SP	Flash 400M Radial Compression Barrel
FC-022-50070-22SP	Flash 400M Radial Compression Module
FB-012-50150-22SP	Flash 400L Radial Compression Barrel
FC-022-50150-22SP	Flash 400L Radial Compression Module

Solvent Reservoirs

FN-001-41201	1 Litre Solvent Reservoir
FN-004-41201SP	4 Litre Solvent Reservoir
FN-012-41201SP	12 Litre Solvent Reservoir
FN-037-41200SP	37 Litre Solvent Reservoir
FN-060-41200SP	60 Litre Solvent Reservoir

Flash 75/150 O-Rings and Gaskets

415891SP	GASKET, 3", PTFE/EPDM, 1 pack
01644SP	Gasket, Sanitary 1.5 EPDM
01642SP	Gasket, Sanitary 1.5 Poly
01643SP	Gasket, Sanitary 1.5 Viton
01616SP	Gasket, Sanitary 3 EPDM
01615SP	Gasket, Sanitary 3 Viton
00778SP	O-Ring, 155
01420SP	O-Ring, 264 Viton

Flash 400 O-Rings and Gaskets

06875SP	O-Ring, 2-222 Chemraz
03010SP	O-Ring, 223 Chemraz
03019SP	O-Ring, 387 Ethylene Propylene
03020SP	O-Ring, 387 Viton

Part number	Description
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03020-KSP	O-ring, 387, Kalrez
03011SP	O-Ring, 460 Ethylene Propylene
02939SP	O-Ring, 460 Viton
02939-KSP	O-Ring, 460, Kalrez
08648SP	O-Ring, 9460 Chemraz 505

Sample Injection Modules (SIMs)

SIM-0502	Stainless steel Biotage SIM for Flash 75, 500 mL
SIM-1002	Stainless steel Biotage SIM for Flash 150, 1000 mL
SIM-2002	Stainless steel Biotage SIM for Flash 150, 2000 mL
FBS-1025SP	Frits & sealing rings assy SIM 100/500 used with frit holder #FSS-0075
415891SP	GASKET, 3", PTFE/EPDM, 1 pack
01644SP	Gasket, Sanitary 1.5 EPDM
01642SP	Gasket, Sanitary 1.5 Poly
01643SP	Gasket, Sanitary 1.5 Viton
01616SP	Gasket, Sanitary 3 EPDM
01615SP	Gasket, Sanitary 3 Viton
FSS-0150	Holder, Frit SS Sim Flash 150
FSS-0075	Holder, Frit SS SIM Flash 75
01903	Kit, Tubing SIM

V-Band Clamps

08526	Clamp Assembly V-Band 3 Inch Solvent Reservoir
08527	Clamp Assembly V-Band Flash 75
01520	Clamp, Chain
01419SP	Clamp, V-Band 8 Flash150

Other – 75/150/400 Toolbox

03332	Adapter, Assy 1/4Tx1/8T
01428	Cartridge, Extractor Flash 150
02846	Indicator, Press Flash 150&75
01416	Endcap, Bottom Flash 150
01417	Endcap, Top Flash 150
FGD-15075SP	Kit, Grounding Assembly Flash
02838	Kit, Luer Lock Adapter F75
AM-190SP	Manifold, Air
NF-15075	Nut, & Ferrules Flash 75
FL150-FRAC-TUBE	Replacement fraction collection assembly for Flash 150
FIV-VLV-1000	Valve, 3-Way injection valve for Flash 75/150 systems
FIV-150-0000	Valve, Injection Flash 150i
FIV-075-0000	Valve, Injection Flash 75i
02331SP	Flash 400 Clamps Kit
02332SP	Flash 400, Head, TOP
02338SP	Flash 400, Head, Bottom
03000SP	VALVE, 3-WAY With Connectors (Flash 400)

Part number	Description
Tubing	
1903	Kit, Tubing SIM
01487SP	Tubing, 1/4"ODX.040 WALL, FEP, 24 foot, 215 Psi, BLUE
00547SP	Tubing, 1/4"ODX.040 WALL, FEP, 24 foot, 215 Psi, GREEN
00089SP	Tubing, 1/4"ODX.040 WALL, FEP, 24 foot, 215 Psi, OPAQUE/WHITE
00546SP	Tubing, 1/4"ODX.040 WALL, FEP, 24 foot, 215 Psi, RED
01354SP	Tubing, 1/4"ODX.040 WALL, FEP, 24 foot, 215 Psi, YELLOW
UV Monitor and Parts	
416243SP	10M Fibre optic cable, 2 pk
416241SP	3M Fibre optic cable, 2 pk
416242SP	5M Fibre optic cable, 2 pk
416244SP	Bar mount kit (ATEX Tablet)
416239SP	Flow Cell, 2 mm, 1/4" SS for Biotage® Flash 75/150 systems
416240SP	FlowCell, TriClamp, 2 mm, 1/2" SS for Biotage® Flash 400 systems
416245SP	Harness mount kit (ATEX Tablet)
416251SP	Spare Battery, 3-Cell (2160 mAh) (1 pack)
416238SP	Test Cell, stray light filter, fiber optic connector
UV-FL150	UV Monitor for Biotage® FLASH 150 system [UV Monitor, Tablet, SW, Fibre Optics, Flow Cell, Connections, Tablet Holder]
UV-FL400	UV Monitor for Biotage® FLASH 400 system [UV Monitor, Tablet, SW, Fibre Optics, Flow Cell, Connections, Tablet Holder]
UV-UPGRD FL150/400	UV Monitor upgrade for Biotage® Flash 400 (from 150), [Flow Cell, Connections]
LS Racks and Collection Bottles	
08743	Bottles for Biotage® 240 mL bottle racks, 240 mL with Caps. Qty 84
411935	Bottles for Biotage® 480 mL bottle racks, 480 mL with Caps, Qty 24
411794	Isolera Rack 120 mL, 4/cs
411789	Isolera Rack 13 x 100, 4/cs
411790	Isolera Rack 16 x 100, 4/cs
411791	Isolera Rack 16 x 150, 4/cs
411792	Isolera Rack 18 x 150, 4/cs
411793	Isolera Rack 25 x 150, 4/cs
411934	Isolera Rack Tray, 240 mL, 1/cs
411929	Isolera Rack Tray, 480 mL, 1/cs

Part number	Description
LS Tubing and Connectors	
413027	3-way large bore stainless steel injection valve for Isolera systems
413267SP	Cartridge Inlet Tube
412518SP	Cartridge Outlet Tube
412896	Conductive PTFE tubing for Isolera® LS funnel rack
412628	Isolera® LS solvent reservoir filter, 1/4"
413019	Isolera® LS, External tubing kit
413017	Isolera® LS, Solvent inlet tubing kit (S1 to S4 incl filters)
412537	Male Luer outlet fitting for SNAP 750 g and 1500 g cartridges
412891SP	Sample Pump Inlet/Outlet Tubing Kit
412482	Sample pump tube, ChemSure
412480	Sample pump tube, PharMed
413218	Tube Isolera® LS, Solvent line 1 (replaces p/n 412351)
413219	Tube Isolera® LS, Solvent line 2 (replaces p/n 412352)
413220	Tube Isolera® LS, Solvent line 3 (replaces p/n 412353)
413221	Tube Isolera® LSS, Solvent line 4 (replaces p/n 412354)
412537	Male Luer outlet fitting for SNAP XL 750 g and 1500 g cartridges
412358	Female Luer outlet fitting for SNAP XL 750 g and 1500 g cartridges
LS Column Holders	
415337SP	Column Holder Sfär 200 g/350 g
415343SP	Column Holder Sfär 50 g/100 g
LS Funnel Rack – Maximize Collection Volumes	
412919	Biotage® ISOLERA LS Funnel rack (incl. 1 rack and grounding cable)
412918	Biotage® ISOLERA LS Funnel rack cart with leak detector
412842	Biotage® ISOLERA LS Funnel-rack Septa
412896	Conductive PTFE tubing for Isolera® LS funnel rack
FNRK-032	Isolera® LS funnel rack kit containing 1 portable cart, 2 funnel racks, leak detector, collection vessel tray and stabilizing rods
412920	Septa for funnel rack bottle caps. Qty 8.

Part number	Description	Qty.	Part number	Description	Qty.
Flash Columns and Bulk Media					
Normal Phase (nominal) 50–60 micron KP-Sil					
FSKS-1107-0005	Biotage® Sfär with KP-Sil 5 g	20			
FSKS-1107-0010	Biotage® Sfär with KP-Sil 10 g	20			
FSKS-1107-0025	Biotage® Sfär with KP-Sil 25 g	20			
FSKS-1107-0050	Biotage® Sfär with KP-Sil 50 g	10			
FSKS-1107-0100	Biotage® Sfär with KP-Sil 100 g	10			
FSKS-1107-0200	Biotage® Sfär with KP-Sil 200 g	4			
FSKS-1107-0350	Biotage® Sfär with KP-Sil 350 g	4			
FSKO-1107-0750	Biotage® SNAP XL KP-SIL 750 g	2			
FSKO-1107-1500	Biotage® SNAP XL KP-SIL 1500 g	2			
FK0-1107-19045	Flash 75M Cartridge with KP-Sil	2			
FK0-1107-19075	Flash 75L Cartridge with KP-Sil	2			
FK0-1107-25075	Flash 150M Cartridge with KP-Sil	2			
FK0-1107-25155	Flash 150L Cartridge with KP-Sil	2			
FK0-1107-50070	Flash 400M Cartridge with KP-Sil	1			
FK0-1107-50150	Flash 400L Cartridge with KP-Sil	1			
Normal Phase – 60 micron Sfär 60 (KP-Sphere)					
FSRS-0445-0005	Biotage® Sfär Silica - 60 µm 5 g	20			
FSRS-0445-0010	Biotage® Sfär Silica - 60 µm 10 g	20			
FSRS-0445-0025	Biotage® Sfär Silica - 60 µm 25 g	20			
FSRS-0445-0050	Biotage® Sfär Silica - 60 µm 50 g	10			
FSRS-0445-0100	Biotage® Sfär Silica - 60 µm 100 g	10			
FSRS-0445-0200	Biotage® Sfär Silica - 60 µm 200 g	4			
FSRS-0445-0350	Biotage® Sfär Silica - 60 µm 350 g	4			
FSKO-0445-0750	SNAP XL 750 g with Biotage Sfär 60	2			
FSKO-0445-1500	SNAP XL 750 g with Biotage Sfär 60	2			
F75M-0445-19045	Flash 75M cartridge with Sfär 60	2			
F75L-0445-19075	Flash 75L cartridge with Sfär 60	2			
F150M-0445-25075	Flash 150M cartridge with Sfär 60	2			
F150L-0445-25155	Flash 150L cartridge with Sfär 60	2			
F400M-0445-50070	Flash 400M cartridge with Sfär 60	1			
F400L-0445-50150	Flash 400M cartridge with Sfär 60	1			
Normal Phase – 25 micron HP-Sphere (Also Known as SNAP ULTRA Silica)					
FSUS-0442-0005	Biotage® Sfär with HP-Sphere 5 g	20			
FSUS-0442-0010	Biotage® Sfär with HP-Sphere 10 g	20			
FSUS-0442-0025	Biotage® Sfär with HP-Sphere 25 g	20			
FSUS-0442-0050	Biotage® Sfär with HP-Sphere 50 g	10			
FSUS-0442-0100	Biotage® Sfär with HP-Sphere 100 g	10			
FSUS-0442-0200	Biotage® Sfär with HP-Sphere 200 g	4			
FSUS-0442-0350	Biotage® Sfär with HP-Sphere 350 g	4			
FSUL-0442-0750	Biotage® SNAP XL ULTRA 750 g	2			
FSUL-0442-1500	Biotage® SNAP XL ULTRA 750 g	2			
F75M-0442-19045	Flash 75M cartridge with HP-Sphere	2			
F75L-0442-19075	Flash 75L cartridge with HP-Sphere	2			
F150M-0442-25075	Flash 150M cartridge with HP-Sphere	2			
F150L-0442-25155	Flash 150L cartridge with HP-Sphere	2			
F400M-0442-50070	Flash 400M cartridge with HP-Sphere	1			
F400L-0442-50150	Flash 400L cartridge with HP-Sphere	1			
Normal Phase - 20 micron Sfär HC					
FSUS-0443-0005	Biotage® Sfär Silica HC - High Capacity 20 µm 5 g	20			
FSUS-0443-0010	Biotage® Sfär Silica HC - High Capacity 20 µm 10 g	20			
FSUS-0443-0025	Biotage® Sfär Silica HC - High Capacity 20 µm 25 g	20			
FSUS-0443-0050	Biotage® Sfär Silica HC - High Capacity 20 µm 50 g	10			
FSUS-0443-0100	Biotage® Sfär Silica HC - High Capacity 20 µm 100 g	10			
FSUS-0443-0200	Biotage® Sfär Silica HC - High Capacity 20 µm 200 g	4			
FSUS-0443-0350	Biotage® Sfär Silica HC - High Capacity 20 µm 350 g	4			
FSUL-0443-0750	SNAP XL 750 g with Biotage Sfär HC	2			
FSUL-0443-1500	SNAP XL 1500 g with Biotage Sfär HC	2			
F75M-0443-19045	Flash 75M cartridge with Sfär HC	2			
F75L-0443-19075	Flash 75L cartridge with Sfär HC	2			
F150M-0443-25075	Flash 150M cartridge with Sfär HC	2			
F150L-0443-25155	Flash 150L cartridge with Sfär HC	2			
F400M-0443-50070	Flash 400M cartridge with Sfär HC	1			
F400L-0443-50150	Flash 400L cartridge with Sfär HC	1			
Reversed Phase – 50 micron KP-C18-HS					
FSLS-1118-0006	Biotage® Sfär with KP-C18-HS 6 g	2			
FSLS-1118-0012	Biotage® Sfär with KP-C18-HS 12 g	2			
FSLS-1118-0030	Biotage® Sfär with KP-C18-HS 30 g	2			
FSLS-1118-0060	Biotage® Sfär with KP-C18-HS 60 g	2			
FSLS-1118-0120	Biotage® Sfär with KP-C18-HS 120 g	2			
FSLS-1118-0240	Biotage® Sfär with KP-C18-HS 240 g	1			
FSLS-1118-0400	Biotage® Sfär with KP-C18-HS 400 g	1			
FSLO-1118-0950	Biotage® SNAP XL KP-C18-HS 950 g	1			
FSLO-1118-1850	Biotage® SNAP XL KP-C18-HS 1850 g	1			
FLO-1118-19040	Flash 75M cartridge with KP-C18-HS	1			
FLO-1118-19070	Flash 75L cartridge with KP-C18-HS	1			
FLO-1118-25070	Flash 150M cartridge with KP-C18-HS	1			
FLO-1118-25150	Flash 150L cartridge with KP-C18-HS	1			
FLO-1118-50070	Flash 400M cartridge with KP-C18-HS	1			
FLO-1118-50150	Flash 400L cartridge with KP-C18-HS	1			
Reversed Phase – 30 micron Sfär C18/HP-Sphere C18					
FSUD-0401-0006	Biotage® Sfär C18 D - Duo 100 Å 30 µm 6 g	2			
FSUD-0401-0012	Biotage® Sfär C18 D - Duo 100 Å 30 µm 12 g	2			
FSUD-0401-0030	Biotage® Sfär C18 D - Duo 100 Å 30 µm 30 g	2			
FSUD-0401-0060	Biotage® Sfär C18 D - Duo 100 Å 30 µm 60 g	2			
FSUD-0401-0120	Biotage® Sfär C18 D - Duo 100 Å 30 µm 120 g	2			
FSUD-0401-0240	Biotage® Sfär C18 D - Duo 100 Å 30 µm 240 g	1			
FSUD-0401-0400	Biotage® Sfär C18 D - Duo 100 Å 30 µm 400 g	1			
FSUL-0401-0950	Biotage® SNAP XL Ultra C18 950 g	1			
FSUL-0401-1850	Biotage® SNAP XL Ultra C18 1850 g	1			

Part number	Description	Qty.	Part number	Description	Qty.
FSUL-0401-19040	Flash 75M with HP-Sphere C18	1			
FSUL-0401-19070	Flash 75L with HP-Sphere C18	1			
FSUL-0401-25070	Flash 150M with HP-Sphere C18	1			
FSUL-0401-25150	Flash 150L with HP-Sphere C18	1			
FSUL-0401-50070	Flash 400M with HP-Sphere C18	1			
FSUL-0401-50150	Flash 400L with HP-Sphere C18	1			
Speciality Phase – 60 micron KP-NH					
FSAD-0909-0005	Biotage® Sfär KP-Amino D - Duo 50 µm 5 g	20			
FSAD-0909-0011	Biotage® Sfär KP-Amino D - Duo 50 µm 11 g	20			
FSAD-0909-0028	Biotage® Sfär KP-Amino D - Duo 50 µm 28 g	20			
FSAD-0909-0055	Biotage® Sfär KP-Amino D - Duo 50 µm 55 g	10			
FSAD-0909-0110	Biotage® Sfär KP-Amino D - Duo 50 µm 110 g	10			
FSAD-0909-0220	Biotage® Sfär KP-Amino D - Duo 50 µm 220 g	4			
FSAD-0909-0380	Biotage® Sfär KP-Amino D - Duo 50 µm 380 g	4			
FSN0-0909-0900	Biotage® SNAP XL KP-NH 900 g	1			
FSN0-0909-1800	Biotage® SNAP XL KP-NH 1800 g	1			
FPNH-75M	Flash 75M cartridge with KP-NH	1			
FPNH-75L	Flash 75L cartridge with KP-NH	1			
FPNH-150M	Flash 150M cartridge with KP-NH	1			
FPNH-150L	Flash 150L cartridge with KP-NH	1			
FPNH-400M	Flash 400M cartridge with KP-NH	1			
FPNH-400L	Flash 400L cartridge with KP-NH	1			
Specialty Phase – 50 micron ISOLUTE NH (also Known as ISOLUTE AMINO or ISOLUTE FLASH NH2)					
FSN0-0454-0005	Biotage® Sfär with ISOLUTE Flash-NH2 5 g	20			
FSN0-0454-0011	Biotage® Sfär with ISOLUTE Flash-NH2 11 g	20			
FSN0-0454-0028	Biotage® Sfär with ISOLUTE Flash-NH2 28 g	20			
FSN0-0454-0055	Biotage® Sfär with ISOLUTE Flash-NH2 55 g	10			
FSN0-0454-0110	Biotage® Sfär with ISOLUTE Flash-NH2 110 g	10			
FSN0-0454-0220	Biotage® Sfär with ISOLUTE Flash-NH2 220 g	4			
FSN0-0454-0380	Biotage® Sfär with ISOLUTE Flash-NH2 380 g	4			
FSN0-0454-0900	Biotage® SNAP XL ISOLUTE NH2, 900 g	1			
FSN0-0454-1800	Biotage® SNAP XL ISOLUTE NH2, 1800 g	1			
FPNH-0454-19040	Flash 75M cartridge with ISOLUTE Flash-NH2	1			
FPNH-0454-19070	Flash 75L cartridge with ISOLUTE Flash-NH2	1			
FPNH-0454-25070	Flash 150M cartridge with ISOLUTE Flash-NH2	1			
FPNH-0454-25150	Flash 150L cartridge with ISOLUTE Flash-NH2	1			
FPNH-0454-50070	Flash 400M cartridge with ISOLUTE Flash-NH2	1			
FPNH-0454-50150	Flash 400L cartridge with ISOLUTE Flash-NH2	1			
Speciality Phase – Carbon (also Known as WAC/Activated Carbon)					
FSCS-4021-0005	Biotage® Sfär with Activated Carbon 3 g	20			
FSCS-4021-0010	Biotage® Sfär with Activated Carbon 6 g	20			
FSCS-4021-0025	Biotage® Sfär with Activated Carbon 15 g	20			
FSCS-4021-0050	Biotage® Sfär with Activated Carbon 30 g	10			
FSCS-4021-0100	Biotage® Sfär with Activated Carbon 60 g	10			
FSCS-4021-0200	Biotage® Sfär with Activated Carbon 120 g	4			
FSCS-4021-0350	Biotage® Sfär with Activated Carbon 210 g	4			
FSCS-4021-0750	SNAP XL 750 g with Activated Carbon	2			
FSCS-4021-1500	SNAP XL 1500 g with Activated Carbon	2			
C1YR-4021-19043	Flash 75M cartridge with Activated Carbon	10			
C1YR-4021-19073	Flash 75L cartridge with Activated Carbon	10			
C1YR-4021-25075	Flash 150M cartridge with Activated Carbon	2			
C1YR-4021-25155	Flash 150L cartridge with Activated Carbon	2			
C1YR-4021-50075	Flash 400M cartridge (13 kg) with Activated Carbon	2			
C1YR-4021-50155	Flash 400L cartridge (26 kg) with Activated Carbon	2			
Speciality Phase – HP-20					
FSHS-2030-0005	Biotage® Sfär with HP-20	20			
FSHS-2030-0010	Biotage® Sfär with HP-20	20			
FSHS-2030-0025	Biotage® Sfär with HP-20	20			
FSHS-2030-0050	Biotage® Sfär with HP-20	20			
FSHS-2030-0100	Biotage® Sfär with HP-20	2			
FSHS-2030-0200	Biotage® Sfär with HP-20	1			
FSHS-2030-0350	Biotage® Sfär with HP-20	1			
FSHS-2030-0750	SNAP XL 750 g with HP-20	1			
FSHS-2030-1500	SNAP XL 1500 g with HP-20	1			
FT6-2030-19045	Flash 75M with HP-20	2			
FT6-2030-19075	Flash 75L with HP-20	2			
FT6-2030-25075	Flash 150M with HP-20	2			
FT6-2030-25155	Flash 150L with HP-20	2			
FT6-2030-50070	Flash 400M with HP-20	1			
FT6-2030-50150	Flash 400L with HP-20	1			
Speciality Phase – HP-20ss					
FSHS-2530-0005	Biotage® Sfär with HP-20ss	2			
FSHS-2530-0010	Biotage® Sfär with HP-20ss	2			
FSHS-2530-0025	Biotage® Sfär with HP-20ss	2			
FSHS-2530-0050	Biotage® Sfär with HP-20ss	2			
FSHS-2530-0100	Biotage® Sfär with HP-20ss	2			
FSHS-2530-0200	Biotage® Sfär with HP-20ss	1			
FSHS-2530-0350	Biotage® Sfär with HP-20ss	1			
FSHS-2530-0750	SNAP XL 750 g with HP-20ss	1			
FSHS-2530-1500	SNAP XL 1500 g with HP-20ss	1			

Part number	Description	Qty.	Part number	Description	Qty.
FT6-2530-19040	Flash 75M with HP20ss	1			
FT6-2530-19070	Flash 75L with HP20ss	1			
FT6-2530-25070	Flash 150M with HP20ss	1			
FT6-2530-25150	Flash 150L with HP20ss	1			
FT6-2530-50070	Flash 400M with HP20ss	1			
FT6-2530-50150	Flash 400L with HP20ss	1			
Scaling Columns					
S1K0-1107-93050	KP-SIL 4.6 mm x 250 mm	1			
S1L0-1118-93050	KP-C18-HS 4.6 mm x 250 mm	1			
S1N0-0909-93050	Amino KP-NH 4.6 mm x 250 mm	1			
S1UL-0401-93050	HP-Sphere C-18 4.6 x 250 mm	1			
SFT6-2530-93050	HP20SS, 4.6 x 250 mm	1			
Bulk Purification Media					
K0-1107-05000	KP-Sil	5 kg			
L0-1118-01000	KP-C18-HS	1 kg			
L0-1118-05000	KP-C18-HS	5 kg			
9454-1000	ISOLUTE FLASH NH2	1 kg			
9800-1000	ISOLUTE HM-N	1 kg			
9800-5000	ISOLUTE HM-N	5 kg			
Metal Scavenging					
Metal Scavenging Screening Kits					
K-MS-3	Metal Scavenging Screening Kit – Flow/SPE	1			
K-MS-2	Metal Scavenging Toolkit – Batch	1			
MP-TMT					
801506	Biotage [®] MP-TMT	3 g			
801469	Biotage [®] MP-TMT	10 g			
801470	Biotage [®] MP-TMT	25 g			
801471	Biotage [®] MP-TMT	100 g			
801472	Biotage [®] MP-TMT	1 kg			
801473	Biotage [®] MP-TMT	5 kg			
801474	Biotage [®] MP-TMT	10 kg			
801475	Biotage [®] MP-TMT,	25 kg			
Si-TMT					
9538-0003	ISOLUTE [®] Si-TMT	3 g			
9538-0010	ISOLUTE [®] Si-TMT	10 g			
9538-0025	ISOLUTE [®] Si-TMT	25 g			
9538-0100	ISOLUTE [®] Si-TMT	100 g			
9538-1000	ISOLUTE [®] Si-TMT	1 kg			
9538-5000	ISOLUTE [®] Si-TMT	5 kg			
9538-10000	ISOLUTE [®] Si-TMT	10 kg			
9538-25000	ISOLUTE [®] Si-TMT	25 kg			
Si-Thiol					
9180-0010	ISOLUTE [®] Si-Thiol, 10 g	10 g			
9180-0025	ISOLUTE [®] Si-Thiol, 25 g	25 g			
9180-0100	ISOLUTE [®] Si-Thiol, 100 g	100 g			
9180-1000	ISOLUTE [®] Si-Thiol 1 kg	1 kg			
9180-5000	ISOLUTE [®] Si-Thiol, 5 kg	5 kg			
9180-10000	ISOLUTE [®] Si-Thiol, 10 kg	10 kg			
9180-25000	ISOLUTE [®] Si-Thiol, 25 kg	25 kg			
			SCX-2		
			9536-0010	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	10 g
			9536-0025	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	25 kg
			9536-0100	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	100 g
			9536-0500	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	500 g
			9536-1000	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	1 kg
			9536-5000	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	5 kg
			9536-10000	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	10 kg
			9536-25000	ISOLUTE [®] Si-Propylsulfonic Acid (SCX-2)	25 kg
			Si-Trisamine		
			9495-0010	ISOLUTE [®] Si-Trisamine	10 g
			9495-0025	ISOLUTE [®] Si-Trisamine	25 g
			9495-0100	ISOLUTE [®] Si-Trisamine	100 g
			9495-1000	ISOLUTE [®] Si-Trisamine	1 kg
			9495-5000	ISOLUTE [®] Si-Trisamine	5 kg
			9495-10000	ISOLUTE [®] Si-Trisamine	10 kg
			9495-25000	ISOLUTE [®] Si-Trisamine	25 kg
			Reagents and Scavengers		
			MP-Borohydride		
			800512	MP-Borohydride	3 g
			800401	MP-Borohydride	10 g
			800402	MP-Borohydride	25 g
			800403	MP-Borohydride	100 g
			800404	MP-Borohydride	1 kg
			MP-Cyanoborohydride		
			800511	MP-Cyanoborohydride	3 g
			800405	MP-Cyanoborohydride	10 g
			800406	MP-Cyanoborohydride	25 g
			800407	MP-Cyanoborohydride	100 g
			800408	MP-Cyanoborohydride	1 kg
			MP-Triacetoxymborohydride		
			800517	MP-Triacetoxymborohydride	3 g
			800413	MP-Triacetoxymborohydride	10 g
			800414	MP-Triacetoxymborohydride	25 g
			800415	MP-Triacetoxymborohydride	100 g
			800416	MP-Triacetoxymborohydride	1 kg
			PS-PPh3-Pd		
			800473	PS-PPh3-Pd	1 g
			800474	PS-PPh3-Pd	10 g
			800475	PS-PPh3-Pd	25 g
			800476	PS-PPh3-Pd	100 g

Part number	Description	Qty.	Part number	Description	Qty.
PS-TBD			MP-Isocyanate		
800513	PS-TBD	3 g	801504	MP-Isocyanate	3 g
800421	PS-TBD	10 g	801409	MP-Isocyanate	10 g
800422	PS-TBD	25 g	801410	MP-Isocyanate	25 g
800423	PS-TBD	100 g	801411	MP-Isocyanate	100 g
800424	PS-TBD	1 kg	801412	MP-Isocyanate	1 kg
PS-Triphenylphosphine/PS-PPh3			MP-Trisamine		
800510	PS-Triphenylphosphine	3 g	801505	MP-Trisamine	3 g
800378	PS-Triphenylphosphine	10 g	801397	MP-Trisamine	10 g
800379	PS-Triphenylphosphine	25 g	801398	MP-Trisamine	25 g
800380	PS-Triphenylphosphine	100 g	801399	MP-Trisamine	100 g
800381	PS-Triphenylphosphine	1 kg	801400	MP-Trisamine	1 kg
PS-TsNHNH2			MP-Carbonate/MP-CO3		
800497	PS-Ts-NHNH2	3 g	800493	MP-Carbonate	3 g
800270	PS-Ts-NHNH2	10 g	800267	MP-Carbonate	10 g
800271	PS-Ts-NHNH2	25 g	800268	MP-Carbonate	25 g
800272	PS-Ts-NHNH2	100 g	800269	MP-Carbonate	100 g
800317	PS-Ts-NHNH2	1 kg	800314	MP-Carbonate	1 kg
PS-Benzaldehyde			PS-DEAM		
800502	PS-Benzaldehyde	3 g	800430	PS-DEAM	10 g
800360	PS-Benzaldehyde	10 g	800431	PS-DEAM	25 g
800361	PS-Benzaldehyde	25 g	800432	PS-DEAM	100 g
800362	PS-Benzaldehyde	100 g	800433	PS-DEAM	1 kg
800363	PS-Benzaldehyde	1 kg	MP-TsOH		
PS-Isocyanate			800498	MP-TsOH	3 g
800495	PS-Isocyanate	3 g	800461	MP-TsOH	10 g
800260	PS-Isocyanate	10 g	800462	MP-TsOH	25 g
800261	PS-Isocyanate	25 g	800463	MP-TsOH	100 g
800262	PS-Isocyanate	100 g	800464	MP-TsOH	1 kg
800311	PS-Isocyanate	1 kg			

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