



# **Preparative Chromatography Solutions** Performance and flexibility fitting your needs

Whatever the complexity or the scale of your purification process is, the BUCHI preparative chromatography systems are designed to fulfill your changing needs. Together with a broad range of high performance flash chromatography columns, we provide you the optimized solution suited to your purification workflow.



"Quality in your hands" is the guiding principle that shapes our philosophy and our actions. It challenges us to provide outstanding services that are precisely tailored to your needs. This means that we must stay in close contact with our customers. That is why we keep in touch and continue to work very hard to understand you and your business even better.

We help you by providing high-quality products, systems, solutions, applications and services that offer you added value. This allows you to focus entirely on your processes and your work.



#### Easy

You handle complex processes, do challenging work and want to focus on what is essential. We support you by providing carefully designed solutions as well as instruments and systems that are easy to operate.



#### Competent

You need products, systems, solutions, applications and services that are precisely tailored to your needs. We have the technological expertise and decades of experience needed to provide competent support and work with you to continually improve our market services.



#### Reliable

You want to be able to rely completely on your partner for products, systems, solutions, applications and services. We guarantee the quality and functionality of our equipment and will continue to help you quickly and efficiently whenever something does not operate to your satisfaction.



# Cost-effective

You want to achieve the best possible results using efficient solutions. We help you to handle your jobs and processes economically. We strive to create a high level of economic benefit and maximum added value for you.



#### Safe

You are working in an environment in which safety is a high priority. By collaborating closely with you, we do everything in our power to make our products, systems, solutions, applications and services as safe as possible for people and the environment.



#### Global

You value personalized service and short communication channels. As an international family-owned business with our own subsidiaries and qualified distributors, we have a presence wherever our customers are located. Our local staff and the large number of satisfied customers around the world give you the assurance that you are working with the right partner.



#### Sustainable

You prefer a partner who acts responsibly when it comes to current environmental challenges. We support environmentally friendly processes and manufacture products that have a long service life. We utilize advanced technologies in order to conserve energy and water and leave the smallest environmental footprint possible.



#### Flexible purification solutions tailored to your needs From synthesis or extraction to pure compound isolation

For more than 30 years, BUCHI preparative chromatography equipment has been widely used for the purification of high value products. Compounds such as "Active Pharmaceutical Ingredients" (APIs) or specialty chemicals are generated by organic synthesis, biochemical process or extraction. The end result must always be further concentrated and purified. BUCHI chromatography solutions allow the purification of compounds from a few milligrams up to several hundred grams.

#### Pharmaceutical



Purification of APIs after organic synthesis (Medicinal Chemistry) Screening of natural compounds: isolation of various components after extraction Biotechnology: purification after fermentation process

### Chemicals



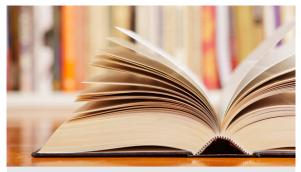
Purification after synthesis Preparative isolation of a compound from a formulation

#### Food



Nutraceuticals: isolation of dietary supplements from natural compounds

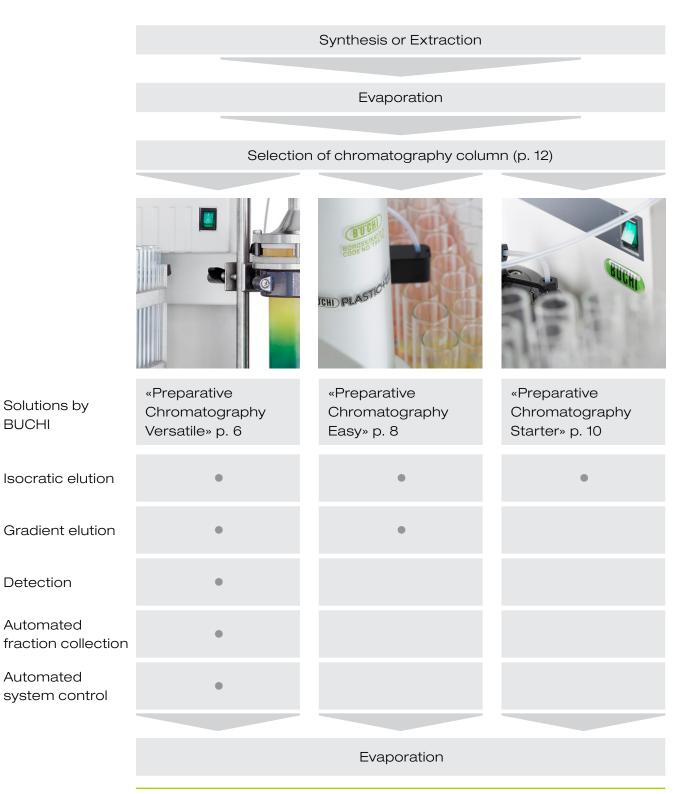
# Academia



Preparative chromatography education Purification after synthesis or extraction

# Purification process

The isolation of one or more components from a complex mixture usually requires multiple steps if purity and high recovery rates are targeted. Flash chromatography is used to perform a first fast separation. The collected fractions are then later reinjected in a preparative HPLC system to achieve the target purity.



Discover our preparative chromatography solutions: www.buchi.com/chromatography/solutions





### Solution «Preparative Chromatography Versatile» Powerful, flexible and modular flash chromatography system

You have complex samples such as extracts of natural compounds to purify and need to scale up the purification process in order to cope with a large sample load. The Sepacore<sup>®</sup> X50 Flash Chromatography system provides an optimum flexibility to use high efficiency columns whatever the packing and column size is.



SepacoreControl Software

# Your most important benefits

#### High performance flash purification

- High efficiency at up to 50 bar (725 psi). No limitation in selection of columns for normal / reverse phase separation mode (incl. small particle size silica)
- Time saving when optimizing the detection conditions with the simultaneous monitoring of 4 wavelengths in UV-Vis range
- $\cdot$  Recognition of eluting compounds with on-line UV scan
- · Every single compound can be collected thanks to the multisignal monitoring for peak detection and fraction collection

#### Flexible

- · Easy modular system expansion: control via integrated touch screen or separate computer
- · Possibility to add an additional fraction collector for extended collection capacity, ELS universal detection
- · Free choice of fraction collection vessel and pattern to suit changing application requirements

#### Scalable

- · Sample injection scalable from a few milligrams up to hundred grams on flash cartridges up to 800 g or glass columns
- $\cdot$  Stable performance when scaling up using a flow rate up to 250 ml/min

#### Your solution «Preparative Chromatography Versatile»



- Sepacore<sup>®</sup> X50 system including: Binary gradient pumping system 250 ml/min, 50 bar (725 psi), liquid or solid sample injection, UV-Vis detection, fraction collection, Control Software
- $\cdot$  Sepacore  $^{\scriptscriptstyle (\! 8\!)}$  prepacked flash cartridges  $^*$
- $\cdot$  Glass columns
- $\cdot$  ELS detection

\* Optional self-filling of empty cartridges with the Cartridger®



- · Reference applications
- · Laboratory chromatography guide
- · Customized application support
- · Practical workshops, trainings and seminars
- Minimized downtime thanks to our service hotline

"The high pressure rating of the Sepacore<sup>®</sup> system allows to reproduce some HPLC methods, such as for the preparative separation of diastereoisomers." Provider of products and services for the pharmaceutical industry, UK



#### Solution «Preparative Chromatography Easy» First step into controlled chromatography

You routinely purify your samples on an open glass column and have to cope with a limited resolution and a long separation time. As a first step toward automation, we offer a small system allowing to control the flow rate and the eluent composition. The «Preparative Chromatography Easy» purification system addresses the requirements specific to the isolation of compounds from a synthesis mixture.



# Your most important benefits

#### Improved separation

- · Fine-tuned separation efficiency using gradient elution
- · Controlled separation optimization with precise monitoring of the eluent composition
- · Increased purity of the collected fractions with a higher resolution of the separation

#### Time and money savings

- Reduced elution time from hours to minutes with controlled flow rate and solvent composition allowing to reduce the fraction volumes for a faster evaporation
- · Decreased purification cost with lower solvent consumption
- $\cdot$  Low initial investment with upgrade possibilities

#### Easy and safe

- · Intuitive control of pumping parameters: no training required
- · Minimized solvent exposure

# Your solution «Preparative Chromatography Easy»



- Sepacore<sup>®</sup> «Easy Synthesis» purification system including: Binary gradient pumping system 250 ml/min 10 bar (145 psi)\*, Injection valve (up to 5 ml sample), System stand with cartridge holder and connectors, Set of silica flash cartridges
- · Sepacore® prepacked flash cartridges\*\*
- · Fraction collection racks



- · Reference applications
- · Laboratory chromatography guide
- $\cdot$  Customized application support
- $\cdot$  Practical workshops, trainings and seminars
- Minimized downtime thanks to our service hotline
- \* Similarly, the «Easy Extract» purification system allows you to purify larger sample volumes on glass column at a pressure up to 50 bar (725 psi)
- $^{\star\star}$  Optional self-filling of empty cartridges with the Cartridger  $^{\scriptscriptstyle (\! \! \ensuremath{\mathsf{m}}\xspace)}$

Find out more about the Sepacore® purification systems: www.buchi.com/purification-systems





# Solution «Preparative Chromatography Starter» Efficient and upgradable purification start-up system

You are looking for a cost-effective yet high performance initial system to run your purifications which could later evolve with your needs. We provide a basic flash pumping system allowing you to take full advantage of your columns' separation potential.



# Your most important benefits

#### Cost effective

- · Save time running unattended separations
- · Decrease solvent consumption by reducing elution time
- · Controlled flow rate and elution composition allow to significantly reduce the separation time and consequently the solvent consumption

#### Easy to use

- · Straightforward user interface: easy programming of parameters, no training required
- · Easy maintenance: all connections and functional parts are easily accessible
- Avoid running out of solvent: the monitoring of the solvent consumption prevents the column from getting dry

#### Upgradable

- · Gradually upgrade the configuration from a manual to a fully automated chromatography system
- $\cdot$  Modular system expands according to budget and applications:
  - $\cdot$  Basic isocratic flash system
  - $\cdot$  Gradient flash system
  - · Gradient flash system including detection and fraction collection, with or without computer control

# Your solution «Preparative Chromatography Starter»



- Pumping module, up to 250 ml/min, 10 bar (145 psi)\*
- · Glass columns
- · Cartridger<sup>®</sup> and empty cartridges



- · Reference applications
- · Laboratory chromatography guide
- $\cdot$  Customized application support
- $\cdot$  Practical workshops, trainings and seminars
- Minimized downtime thanks to our service hotline

\* Optional pumping module up to 50 bar (725 psi)

"The easier, more flexible, unsupervised instrument requires less time and manpower to do efficient research." Dr. XianWen Yang, Professor of South China Institute of Oceanology, Chinese Academy of Sciences, Guangzhou, China



**The best solution for your need** Comparison by customer needs, application and characteristics

	Sepacore® X50	Easy Purification	Basic Flash	Pump C-605 C-601
Needs/Solutions Page				
«Preparative Chromatography 6 Versatile»	•			
«Preparative Chromatography Easy»		٠		
«Preparative Chromatography Starter» 10			٠	Second optional
Your needs				
Throughput	٠			
Automation	٠			
Modularity	٠	٠	٠	•
Flexibility (applications)	٠	٠	٠	
Scale up	٠	٠	٠	
Compactness		٠	٠	•
Economical		٠	٠	٠
Characteristics				
Maximum pressure bar (psi)	50 (725)	10 (145) or 50 (725)	10 (145) or 50 (725)	10 (145) or 50 (725)
Maximum flow rate (ml/min)	250	250	250	250
UV detection	200 – 840 nm 4 wave length			



• 2	٠	• 2	• 2	Optional	٠	•
Optional	Optional	Optional	Optional	Optional	Optional	٠
Optional	Optional	Optional	Optional	٠	٠	Optional

			٠			•
٠			٠		٠	٠
•	•	٠	٠	٠	٠	٠
•	•	٠	٠	٠	٠	
		٠			٠	٠
				•	٠	٠
				٠	٠	

			10 (145) <sup>3</sup>	50 (725) <sup>3</sup>	16 (225) <sup>3</sup>
250	250 <sup>4</sup>	250	According to cartridge size	According to column size	According to cartridge size
200 – 840 nm 4 wave length					
4	0	0	4		

<sup>1</sup> Including Control Unit C-620 <sup>2</sup> Included in X50 <sup>3</sup> Variable with column size <sup>4</sup> When equipped with flow splitter

#### **Flash chromatography column for any solution** Choose the column for your need

You have to deal with a large variety of samples in terms of complexity, purity or polarity and the amount of sample to purify may also vary to a large extent. The type of columns you select must not only allow you to perform the separation, but also be compatible with your economical requirements. We have a column for almost any flash chromatography application: prepacked or empty cartridges, glass columns.

# Time and cost savings: Sepacore® Flash cartridges

#### Speed up your purification process

- Optimized separation in only one run: high resolution separation with high quality silica and optimized packing process
- Fast separation with high flow rate: minimized pressure build-up thanks to a tight range of silica particle size

#### Efficient separation at controlled cost

- Ready to use cartridge: no need to fill a column for each separation
- Purification performed at once: always one cartridge available for your application with the broad range of sizes and packing types



#### Broad range and extensive choice of sorbents:

From 4 g up to 330 g, plus 800 and 1500 g for silica and C18. High performance silica HP (15 – 40  $\mu m)$  for challenging separations

	Packing (g)									
	4	12	25	40	80	120	220	330	800	1600
Silica	•	•	•	•	•	٠	٠	•	٠	•
Silica HP	•	٠	•	•	•	٠	-	-	-	-
C18	•	•	•	•	•	٠	٠	•	٠	•
Amine	•	٠	•	•	•	•	٠	•	-	-
Cyano	•	•	•	•	•	٠	٠	•	-	-
Diol	•	٠	•	٠	•	٠	٠	٠	-	-
Cation exchange	•	•	•	•	•	٠	٠	•	-	-

# Ultimate flexibility with optimized economy: self-packed cartridges

# Cartridger<sup>®</sup>: a unique solution for fast and easy packing of polypropylene cartridges

- $\cdot$  Less than a minute required to pack a cartridge
- Homogeneous packing: patented process using fluidized silica provides high performance cartridges

#### Flexible and cost saving solution

- $\cdot$  Free choice of silica
- · On demand cartridge packing: no storage
- · Reusable polypropylene cartridges

### Visibility and scale-up: glass columns

#### Visibility

- $\cdot$  Follow up of the separation of colored compounds
- $\cdot$  Visual observation of the packing status

#### Maximum scale up flexibility

- $\cdot$  Sample loading up to more than 300 g
- $\cdot$  High efficiency purification with back pressure up to 50 bar
- $\cdot$  Free choice of sorbent

#### Broad range to suit most applications

Glass column size (g), (estimation for silica 40 - 63  $\mu m)$ 



Diameter (mm)	Length (mm)					
	100	230	460	920		
15	9	20	40	80		
26	25	65	130	260		
36	-	115	235	470		
49	-	230	460	920		
70	-	470	940	1800		
100	_	935	1850	3700		



#### **Case Study**

Sepacore® for the separation of plant extracts



#### Customer: University of Basel, Switzerland

The Division of Pharmaceutical Biology at the University of Basel in Switzerland is a center of excellence for natural product and medicinal plant research. It belongs to the Departement of Pharmaceutical Sciences, a leading research and teaching center in drug discovery & development, drug therapy and drug safety. Research groups collaborate and teach in the areas of lead discovery, molecular mechanisms of drug action and drug toxicity, rational drug design, pharmacotherapy, and the safe use of drugs.

#### Application: Separation of plant extracts

The investigation of bioactive compounds contained in plants requires several steps of extraction and separation before the active substances can be obtained in a pure form for further chemical and biological characterization. In the course of this process, compounds with a broad range of polarity have to be separated.

#### Equipment: Sepacore®

A Sepacore<sup>®</sup> System with 50 bar pumps, UV detector and fraction collector is used to separate active compounds with a broad range of polarity from plant extracts. The separation is done on prepacked silica gel (40 – 63  $\mu$ m) and C18 (40 – 63  $\mu$ m) cartridges from BUCHI.

#### Benefit / Conclusion:

Sepacore<sup>®</sup> cartridges enable a good separation of compounds with a broad range of polarity, as typically found in plant extracts. Despite lower resolution compared to MPLC on glass columns, pre-packed cartridges are an attractive alternative for the purification of extracts and crude fractions due to their ease of use and speed of separation. Thanks to the open and modular system concept, Sepacore<sup>®</sup> forms a flexible and easy to use chromatography system with a wide range of chromatography glass columns and prepacked cartridges.

"Due to their separation power and ease of use, Sepacore® cartridges represent a very effective complement to HPLC for the purification of bioactive plant metabolites." Prof. Dr. M. Hamburger, Division of Pharmaceutical Biology, University of Basel, Switzerland



#### **Case Study**

Discovery and development of sea drugs



#### Customer: South China Institute of Oceanology, China

The South China Sea Institute of Oceanology (SCSIO) is one of the largest marine research institutes in China and one of the knowledge innovation institutes under the Chinese Academy of Sciences (CAS). The research at SCSIO focuses on the interaction among hydrosphere, lithosphere, atmosphere and biosphere as well as their structures and evolutions in the tropical marginal seas to understand their environment and to exploit their marine resources.

#### Application: Separation and purification of natural compounds

Several compounds isolated from various marine organisms (microorganisms, algae, fungi, invertebrates, and vertebrates) are currently under study at an advanced stage of clinical trials, either directly or in the form of analogues deduced from structure-activity relationships. Some of them have already been marketed as drugs. The goal is to efficiently separate and purify different natural compounds from marine organisms to find components with high biological activity.

#### Equipment: Sepacore®

For highly effective separation and purification of natural compounds from marine substances, the filling ODS 50 um YMC was used, but the pressure could be very high. BUCHI Sepacore<sup>®</sup> can provide 50 bar solutions help us solve this problem. Flexible injection systems can load up to 100 g of sample.

#### Benefit/Conclusion: Unsupervised work, robust and durable

Compact design, high degree of flexibility, preparative detectors, easy to operate, no downtime, good visibility, wide range of flow rates, flexible injection systems, variety of column sizes. BUCHI Sepacore<sup>®</sup> can be used to achieve results in a variety of separation and purification processes.

"The easier, more flexible, unsupervised instrument requires less time and manpower to do efficient research."

Dr. XianWen Yang, Professor of South China Institute of Oceanology, China

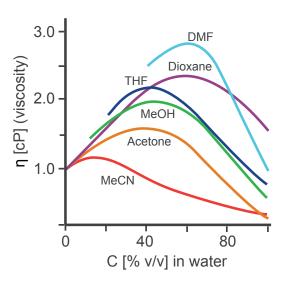


#### **Benefit from 40 years of chromatography experience** Frequently asked questions

# What are the benefits of a 50 bar (725 psi) pumping system?

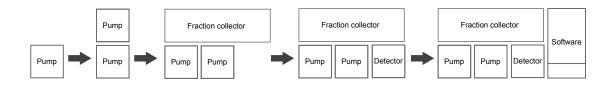
It allows running reversed phase separations even at high flow rates. The solvents used in reversed phase applications (such as water / MeOH) have a higher viscosity than the ones used for normal phase separations: in particular the mixtures of water and methanol have a viscosity twice as large as water alone. This is the reason why only a medium pressure pump can be used for high scale reversed phase purifications.

Such a medium pressure is also useful to work with smaller particle size columns: BUCHI Silica HP is 15  $\mu$ m instead of 40 - 63  $\mu$ m for other standard packing materials and the back pressure generated significantly grows when the particle size decreases: Back pressure = k / (particle size)<sup>2</sup>.



# What are the upgrade possibilities of the BUCHI purification solutions?

The unique modularity of the Sepacore<sup>®</sup> systems allows you to gradually upgrade your configuration from a manual to a fully automated chromatography system. Each module can be individually controlled and the initial system expanded according to budget and applications.

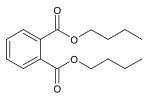


# What is the advantage of the silica HP cartridges?

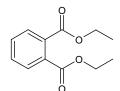
The Sepacore<sup>®</sup> silica HP sorbent is designed for challenging separations or when a higher purification throughput is required. Decreasing the sorbent particle size brings the following advantages:

- $\cdot$  High separation efficiency for difficult separations
- $\cdot$  Higher throughput with larger flow rates and same efficiency
- · Higher loading capacity

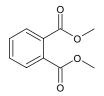
The following example illustrates the benefits of using the Silica HP sorbent compared to the standard Silica:



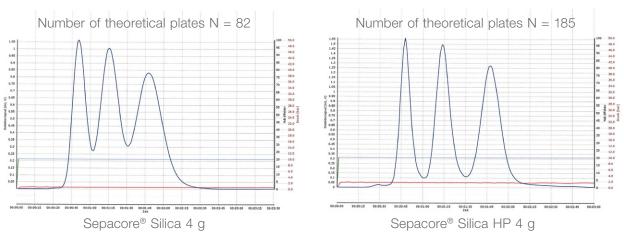
a) Dibutylphthalate



b) Diethylphthalate



c) Dimethylphthalate



Separation of dimethyl-, diethyl- and dibutylphthalate Hexane / Ethyl acetate 80/20, 10 ml/min

#### How many times can a flash cartridge be reused?

Generally the silica flash cartridges cannot be reused because some compounds might bind to the packing and potentially contaminate a further separation. However, the same compound can be reinjected several times (usually up to 5 times) on the Sepacore<sup>®</sup> Flash cartridges because of the high quality of the packing process. The cartridges packed with functionalized silica (C18, Diol, Amine, Cyano) can be reused several times if the column was properly rinsed at the end of the separation.



### **Complete your preparative chromatography portfolio** Complementary and related products

The following products are the ideal complements to your purification system. Most of our customers use them in their isolation and purification process.

# Laboratory Rotary Evaporator



The Rotavapor® R-210 / R-215 features a complete evaporation solution offering maximum safety for your compound.

# Parallel Evaporator



The Syncore® Analyst parallel evaporator efficiently and safely evaporates the fractions collected with your preparative chromatography system.

# Industrial Rotary Evaporator



Use the BUCHI industrial rotavapors R-220 SE or R-250 for solvent recycling when performing large scale purifications.

# Soxhlet Extraction



Automate your solid-liquid extraction process using the Extraction Unit B-811.

# SpeedExtractor



Optimize your extraction process with the Speed-Extractor E-914 or E-916, the best in its class for pressurized extraction.

# Melting Point



Check the purity of your compounds using the M-560 or M-565 Melting Point product for melting point or boiling point determination.

### Vacuum Pump



Easy to use, reliable, silent and compact V-700 Vacuum Pump for all your evaporation processes.

# **Recirculating Chiller**

Mixer



Sustainable cooling in accordance with economical and ecological needs is achieved with the Recirculating Chillers F-108 and F-114.



For optimal extraction, prepare your sample using the B-400 Mixer for an efficient homogenization.

# Mini Spray Dryer



The Mini Spray Dryer B-290 is the product of choice for the quick and gentle drying to powder of liquid solutions.

# Nano Spray Dryer



The Nano Spray Dryer B-90 revolutionizes today's spray drying possibilities with the unique ability to generate particle sizes in the nano range for milligram sample quantities at high yields.

# Encapsulator



Encapsulate your active ingredients in a matrix for protection or controlled release using the Encapsulator B-390 or B-395 Pro.



#### **Support and customer service** From feasibility to preventive maintenance

You value an efficient and personalized service. Our network of professional application specialists and service technicians as well as a large number of satisfied customers around the world give you the assurance that you are working with the right partner.

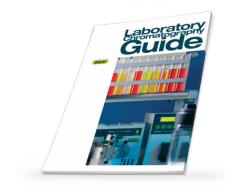


# Improve your applications

A team of highly qualified specialists can support you for application development. Some applications and publications are available on our web site as examples to help you find the right configuration and separation parameters for your samples.

Discover our application: www.buchi.com/applications





# Learn more about Chromatography

More than 30 years of experience in preparative chromatography are summarized in the BUCHI Laboratory Chromatography Guide. This reference book covers all important topics such as stationary phases, column packing, mobile phases, detection, upscaling.

Find more information: www.buchi.com/chromatography





#### Discover our numerous case studies

BUCHI offers over 130 different case studies. By using real information, the online case studies bring to life the complexities of business and give you an understanding of the wide range of the applications supported by our products, systems, solutions and services.

Discover our case studies: www.buchi.com/casestudies





# Profit from workshops, trainings and seminars

We regularly offer practical seminars and workshops, often in cooperation with other partners in the field of sample preparation and analysis. Customer contributions thereby underline how our solutions facilitate the daily routine. We also attend many local and international scientific and industrial congresses.

Find an overview of our activities: www.buchi.com/events



### Use your product most effectively

We help you to set your product properly into operation. We provide thorough Installation/Operation Qualification (IQ/OQ) services to ensure compliance with FDA, GLP/GMP standards or GAMP guidelines. Whether it is because of an initial installation, requalification or relocation, we provide professional compliance verification.

Find out more about our services: www.buchi.com/service-support



#### Minimize downtimes

Avoid products downtimes with preventative maintenance and tailored service packages. We offer a product warranty of two years and guarantee ten years of spare parts availability.

Get in touch with us: www.buchi.com/warranty



#### **Global Network**

Our subsidiaries and qualified distribution partners ensure proximity where ever you are. Since we are familiar with your requirements, we use our experience and knowledge to provide first-rate solutions.

Get in touch with us: www.buchi.com/worldwide



# **BUCHI Laboratory Solutions**

Discover the benefits of our different solutions



Laboratory **Evaporation Solutions** 



Industrial **Evaporation Solutions** 



Spray Drying & Encapsulation Solutions



Parallel Evaporation Solutions



Preparative Chromatography Solutions



Digestion and Distillation Solutions



Solutions for Protein Determination



Extraction Solutions



NIRSolutions™

# **Quality in your hands**

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