ELGA VEOLIA

BUYER'S GUIDE

Research & Development

Choosing the right water purification system for scientific research

WATER TECHNOLOGIES

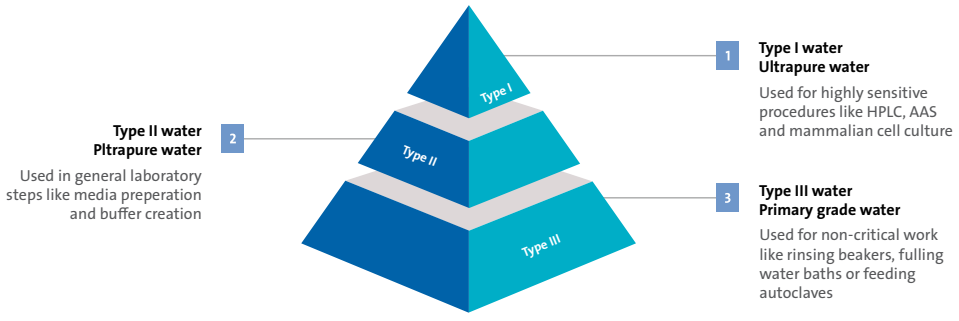
Choosing the right water purification system for scientific research

Water is the reagent of choice for researchers working in many scientific disciplines. In fact, the average laboratory uses around 35 million liters of water every year for research, analysis and processing purposes. Labs usually source their water from a mains supply, but contaminants and impurities can compromise the integrity of results. Insufficiently pure water can adversely affect samples and reagents, and even damage equipment, and its interference in so many aspects of lab work can distract researchers from what they do best – scientific discovery.

The importance of water purity

What's in my water?

A range of hidden 'extras' can be present in mains water, including particulates, inorganic ions, dissolved gases, microorganisms and organic compounds. However, the degree of contamination can range from being perfectly adequate for purpose to adversely critical for certain applications. For this reason, laboratory water is categorized in grades, using several properties to define purity.

	Type III	Type II	Type II*	Type I	Type I*
					
Inorganics (resistivity at 25 °C)	>0.05 MΩ.cm	>1 MΩ.cm	>10 MΩ.cm	>18 MΩ.cm	18.2 MΩ.cm
Total organic carbon (TOC)	<200 ppb	<50 ppb	<50 ppb	<10 ppb	<5 ppb
Bacteria	<1,000 CFU/ml	<100 CFU/ml	<10 CFU/ml	<10 CFU/ml	<1 CFU/ml
Endotoxin	-	-	-	<0.03 EU/ml	<0.03 EU/ml

[1]*Facts & Figures. The British In Vitro Diagnostics Association (BIVDA). https://www.bivda.org.uk/The-IVD-Industry/Facts-Figures.*

The impact of impurities on your research

Contaminants found in source water can disrupt almost every aspect of a laboratory workflow:

Particulates can adsorb pathogens and block filters, chromatography columns and osmosis membranes;

Microorganisms are a significant problem for applications that require sterile conditions;

Dissolved gases can modify the ionic composition of solutions – affecting their pH, altering rates of biochemical reactions and forming bubbles that impede flow;

Inorganic ions can interfere with protein-protein interactions and highly sensitive analytical techniques, leading to inaccurate results;

Organic compounds can support the growth of a wide variety of microorganisms that may disrupt biological applications and sensitive analytical techniques.

All of these impurities can affect the accuracy and reliability of research results, so a constant and consistent supply of high purity water from a purification system is simply essential.

Organizational risks resulting from poor quality lab water

All laboratories are human systems, so water quality impacts much more than just research outputs. Water impurities that adversely affect laboratory protocols can also have detrimental effects on operational efficiency, team morale, professional reputations, career progression, equipment longevity, servicing costs and – of course – confidence in research outputs. An effective water purification system therefore needs to integrate smoothly into laboratory processes.

Ideally, purification equipment should produce water that is suitable for every lab technique. Aside from this requirement, the simplicity, reliability and adaptability of a water purification system are integral to the user experience it delivers. Several features of the product – including its durability, ease of use, simplicity of maintenance and environmental impact – will also affect the team working with the system. The best water purification systems should therefore offer quality that is beyond question, supported by a global service network.

Water purification technologies

It is essential that laboratories have the right choice of water to meet their requirements.

Type III water is recommended for non-critical work, such as glassware rinsing, water baths, autoclave and disinfector feeds, as well as environmental chambers and plant growth rooms. Type III purification systems can also be used to feed Type I/I+ systems.

Type II water is usually used for general laboratory applications, such as preparing media, pH solutions and buffers, and for certain clinical analysers. It is also common for Type II purification systems to be used as a feed to a Type I/I+ system.

Type II+ water is used for general laboratory applications requiring higher inorganic purity.

Type I water is often referred to as ultrapure water, and is used for some of the most water-critical applications in the lab. These include high performance liquid chromatography (HPLC) mobile phase preparation, as well the preparation of blanks and sample dilution for other key analytical techniques including gas chromatography (GC), atomic absorption spectrophotometry (AAS) and inductively coupled plasma mass spectrometry (ICP-MS). Ultrapure water is also required for molecular and microbiology applications, as well as mammalian cell culture and in-vitro fertilisation (IVF).

Type I+ water goes beyond the purity requirements of Type I water, and is usually produced in two stages, pretreatment and polishing.

Advanced purification equipment can be used to create pure water from potable water supplies. Different technologies work to eliminate specific types of impurities, often in combination with each other, so choosing a water purification system with the right functionality is key to supplying the optimal level of water quality for your lab applications.

Type I water (ultrapure water)

Ultraviolet (UV) purification

The UV-C wavelength alters the DNA and RNA of bacteria to prevent replication, and photo-oxidizes organic impurities, resulting in charged species which can then be removed by ion exchange.

Type II water (purified water)

Deionization (DI)

This process removes total dissolved solids from water using ion exchange. It controls the electric charge of ions in water by attracting solid ions, and replacing them with water.

Type III water (primary grade/RO water)

Reverse osmosis (RO)

This water purification process uses a partially permeable membrane to separate ions, unwanted molecules and larger particles from potable water. It can remove up to 99 % of impurities to prevent damage to DI packs.

Summary

Choosing the right water purification system is crucial for laboratories looking to boost their research results. The right water purification system will improve the productivity, efficiency and accuracy of your lab's workflows, but the wrong system can result in lengthy and costly downtime from extensive cleaning and replacing of parts, as well as reagent wastage and unforeseen expenditure in the long run.

Whether your lab needs pure or ultrapure water, ELGA has the system for you, offering:

- quality beyond question
- a user experience that supports your team
- a global service network to ensure that your purification equipment continues to benefit your research in the long term

Choosing the ideal water purification system for scientific research

What factors should you consider before choosing a water system for your lab?

Some laboratory applications are more sensitive to impurities than others, but whether you need primary grade water for simple routine washing and rinsing, or ultrapure water for the most critical science and analytical applications, ELGA has the system for you. We have developed a step-by-step guide to help you choose the water purification system that is best suited to your laboratory's needs.

Step one: consider what level of water purification you need.

What grades of water quality do your laboratory applications require?
What technologies are needed to meet your requirements?
What is the source and quality of your feed water?

Challenge	Solution
Your highly sensitive research applications require ultrapure water	You need a water purification system capable of producing ASTM Type 1 water: • Resistivity at 25 °C: 18.2 MΩ.cm • Conductivity at 25 °C: 0.056 mS/cm • TOC: <1 mg/l • Sodium: <1 mg/l • Silica: <3 mg/l • Chloride: <1 mg/l Your water purification system should be constructed from the highest quality components to guarantee optimal purity. It should provide recirculation through RO, DI and UV technologies, as well as microfiltration (MF) and ultrafiltration (UMF) steps, to ensure that high quality water feeds your lab equipment.
Your laboratory receives poor quality feed water that needs pretreatment to achieve efficient purification.	It is essential to use the right kind of feed water when using a Type I or Type I+ water purification system to obtain ultrapure water. Choose a supplier that offers a complete purification package including all pre- and post-treatment steps. Prefiltration reduces the number of incoming particulates found in municipal water, protecting mechanical parts of the water purifier from damage.

Step two: consider your laboratory's throughput and water demands.

Is the purification system delivering water for a single use or multiple uses?
How much pure water is required per hour?
How quickly must the water be delivered to your instruments?

Challenge

An efficient water purification system must meet lab volume requirements, while keeping stored water free from microbial contamination.

You are looking to install a water purification system that serves a large group of users or provides different grades of water across multiple laboratories from a single mains supply.

You need efficient water dispensing to enhance productivity.

Solution

Your water purification system should include a storage reservoir with a composite vent filter (CVF) to protect stored water from airborne CO2 and bacteria, guaranteeing a supply of quality water in sufficient volumes to ensure laboratory productivity.

Make sure that your chosen water purification system allows you to connect several dispensing points to deliver water for multiple uses. In addition, check whether additional point of use filters are available to further 'polish' Type I water by removing endotoxins, RNases, DNases and bacteria at these dispense points.

Choose a system with user-friendly, ergonomic dispensing heads for simple, straightforward access to high quality water.

Step three: consider your laboratory's budget, focusing on value rather than cost.

What will the cost of ownership be over five years?
How often do consumables need to be replaced?

Challenge

You operate with and adhere to a tight annual budget, so you want the lowest possible cost of ownership and predictable running costs.

Solution

To avoid any surprises, choose a supplier that offers a pre-installation site survey and provides realistic information on the cost of ownership. In addition, select an instrument that incorporates built-in technologies like electrodeionization (EDI) to significantly reduce running costs and consumable requirements. This will minimize the cost of purified water over the lifetime of the unit.

Step four: consider the available space in your laboratory.

Where will the system be located in your lab?
What is the overall footprint of the purification system(s) and its components?

Challenge

Lab space is at a premium and only a small area is available for a water purification unit.

Solution

Compact water purification systems have a built-in wrap-around reservoir and flexible design, so they can be installed under benches or mounted on the wall to minimize their footprints. An optimal system will offer a wide range of dispensing configurations to make the most of the available lab space.

Step five: consider your laboratory's uptime requirements.

What quality guarantee does the water purification provider offer?
What kind of warranty and maintenance service is available?
How will your laboratory manage in the event of instrument downtime?

Challenge	Solution
Your laboratory operates 24/7 and therefore you need a high performing water purification system that lasts.	To prolong the longevity of your equipment, choose a water purification system that incorporates preventive steps – such as EDI or additional enhanced DI technologies – to reduce the ionic load on downstream technologies.
You need reliability and ease of use, while demanding schedules limit the time you can spend on water unit maintenance.	The most efficient water purification systems monitor water purity right up to the point of use, and alert you when components are nearing the end of their life cycle to minimize disruption to laboratory processes. Look for a solution with an easy-to-read display screen, so that you can easily check the quality of your water.
It is essential that your lab instrumentation does not experience downtime.	It is important to choose reliable equipment with long warranties as standard, and good service and support to back it up. Look for a supplier that offers a remote monitoring service, to ensure a preemptive response if any downtime is anticipated.

Step six: consider your laboratory's operations, now and in the future.

Can the system be expanded if demand increases?
Do the systems meet your sustainability targets?

Challenge	Solution
You want the ability to increase your pure water output as demand on your laboratory grows.	Look for water purification systems with a modular design, so that you can add additional capacity without expanding the footprint if your demands for pure water increase.
You need a sustainable water purification system to save energy and future-proof your laboratory.	Water purification is a resource-intensive process, so choose products designed to have the lowest possible impact on the environment. Your equipment should save you water and energy, reduce plastic use and chemical waste, and eliminate mercury.

What can you expect from ELGA?

Absolute focus on water purification:
The quality of ELGA water is guaranteed to the very last drop, so you can be confident that your clinical analyzers are receiving consistent (and guaranteed) water purity.

Proven efficacy:
ELGA is a trusted name and supplier with proven efficacy in helping to progress a wide range of scientific disciplines worldwide.

Smart and simple design:
ELGA water purification systems fit seamlessly into the lab without taking up valuable bench space.

Ease of use and simplicity:
Minimal training is required to quickly get your teams using ELGA products efficiently. Ease of use also minimizes the risk of user error.

Equipment that is easy to self-maintain:
Any minor issues can be resolved quickly, without interruptions to your workflow.

Maximal uptime:
Ordering consumables and ensuring uptime is easy through ELGA's smart technology.

Access to a global network of water technologists:
ELGA is part of Veolia, the largest environmental management agency in the world.

ELGA LabWater: dedicated to discovery

ELGA has been working with scientists since 1937 to guarantee pure and ultrapure water for their experiments and laboratory work. We designed the PURELAB® product range to meet any one of your requirements for water quality, giving you peace of mind that your water purity is in good hands.

Introducing PURELAB®

PURELAB® Water Purification Systems are engineered for simplicity of use, operation and maintenance, and designed to provide a constant and reliable supply of high quality water that acts as a buffer and reagent for cutting-edge research.

The PURELAB Range

PURELAB® Quest (entry-level range)

- An all-in-one system that completes the full purification process to the required water specification
- Type I to III water quality options
- Designed for small laboratories with low water usage
- Up to 1.2 l/min dispense flow rate
- Most suitable for labs that do not have a ring main and need pure water for only one point of use
- Multiple quality sensors to constantly monitor ultrapure and pure water
- Compact design to optimize valuable lab space
- In-built auto-recirculation to manage biofilm, ensuring reliable water quality and optimal readings
- Simple to use (plug-and-play installation and quick maintenance)

PURELAB® flex (mid-tier range)

- A water 'polisher' that requires RO or RO/DI feed water
- Type I to III water quality options
- Designed for small laboratories with low to mid water usage
- Up to 2.0 l/min dispense flow rate
- Most suitable for labs that need multiple points of dispense or have a ring main installed
- Compact design to optimize valuable lab space
- Flexible handheld dispenser to accommodate any container size
- Real-time TOC monitoring
- Simple to use (plug-and-play installation and quick maintenance)

PURELAB® flex 1	Designed as a dispensing and monitoring system when connected to a reservoir or distribution loop. Also works as a simple DI system.
PURELAB® flex 2	Produces ultrapure water from a prepurified feed, which is ideal for analytical and life science applications.
PURELAB® flex 3	Produces ultrapure water from potable tap water in a single unit.
PURELAB® flex 4	Produces ultrapure water from prepurified water. Manual filling capability and integrated seven liter reservoir, so it can operate independently from a fixed water source in temporary locations. Particularly suited for small volumes of water where stable TOC levels are critical.
PURELAB® flex 5 and 6	Provides ultrapure water from potable water or RO water. Designed to couple directly with analytical chemistry systems, delivering complete automation in a single unit.

PURELAB® Chorus (premium tier range)

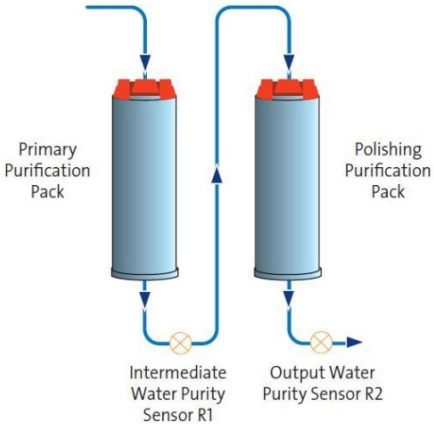
- Type I+ to Type III water quality options
- Designed for small laboratories with relatively high water usage
- Provides up to 30 l/h of purified water
- PureSure® technology for optimal water purity
- Modular design to optimize valuable lab space
- Range of dispensing solutions, reservoir sizes and purification packs
- In-built auto-recirculation to manage biofilm, ensuring reliable water quality and optimal readings
- Real-time TOC monitoring
- Intuitive menu navigation to minimize the risk of error

PURELAB® Chorus 1 Complete	Delivers ultrapure water from a potable tap water supply. Ideal for laboratories needing up to 480 liters of 18.2 MΩ.cm ultrapure water.	
PURELAB® Chorus 1	Consistently delivers Type I+ or Type I water. Underpinned by PureSure® deionization technology.	Combine PURELAB® Chorus products to form a complete water purification system: • Chorus 2 and 3 can be used to supply feed water for a Chorus 1 • Chorus 2 provides Type II pure water directly from a potable tap water supply • Chorus 3 provides Type III primary grade water for glassware washing or general laboratory applications
PURELAB® Chorus 2	Dispenses up to 480 l/day of pure (Type II) water from a potable water supply for general laboratory applications.	
PURELAB® Chorus 2+	Features ELGA's patented recirculating EDI technology. Provides additional filtration of bacteria and inorganics for sensitive analytical and life science applications above that of basic laboratory work.	
PURELAB® Chorus 3	Produces general laboratory grade water with the flexibility to suit your requirements. Can also be used as a feed to other ELGA water systems.	

Additions to the MEDICA® range

HUBGRADE

HUBGRADE is an online equipment reporting and management service designed to digitally connect ELGA water systems for the lab of the future.



PURESURE® TECHNOLOGY

PureSure® technology consists of a double purification pack and monitoring system, using an enhanced DI process that relies on ion exchange (IX) resins to guarantee water quality. The technology will provide advance warning when the first DI pack has been fully exhausted. When this occurs, the system switches over to the secondary DI pack, ensuring that water continues to meet the required specification and allowing the laboratory to replace the DI pack at a convenient time, without interrupting its workflow or causing downtime.

PURELAB® DISPENSERS

Halo dispensers are required for Chorus 1 units. They are available in standard, advanced and flexible options, and can be bolted onto units or wall mounted.

Remote dispensers are additional free-standing dispensing options with in-built monitors to provide maximum reassurance of water quality.

PURELAB® POINT OF USE (POU) FILTERS

Sub-micron filters can be fitted to most ELGA PURELAB® systems. The purification loop passes just before the filter, ensuring that as much of the system as possible is protected by recirculation.

ELGA VEOLIA

Dedicated to Discovery

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ELGA Labwater are specialists in the engineering, service & support of water purification systems.

Unrivalled product design has achieved international recognition and awards.

Worldwide technical service teams support science & healthcare globally with specialist expertise.

Global digital performance monitoring from Hubgrade ensures laboratory work is uninterrupted.

A global supply chain supports clients from regional centres on every continent.

To find your nearest ELGA representative, go to *www.elgalabwater.com* and select your country for contact details.

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GOOD DESIGN AWARD 2021

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