

Elix<sup>®</sup>

The Standard for Analytical-Grade Water



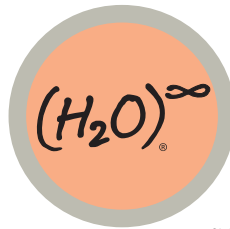
WaterPurification  
Systems



# The pure water solution

*Production of consistently-pure water quality is a daily requirement for the laboratory.*

## concept



The production of pure water is indispensable in any laboratory. However, for most users, the production of pure water also involves high costs and extensive maintenance due to inefficient or outdated water purification systems. Furthermore, most water purification systems cannot guarantee the production of consistently-pure water quality.

Millipore has developed Elix water purification systems as the ideal solution to meet each laboratory's daily application needs for pure water. Elix systems are fed directly with potable tap water and combine complementary purification technologies in a compact system design that is easy to operate, reliable, and enables total control of the water produced at a low operating cost.



With more than three decades of experience in water purification, our aim is to develop systems that meet all particular laboratory requirements. Working closely with users who rely on pure and ultrapure water in their daily work, we analyze their requirements and develop appropriate solutions.

## philosophy

The solution includes not only quality products and reliable service, but also the experience Millipore offers in defining, planning and installing complete water purification chains - from pretreatment to storage and distribution. At Millipore our philosophy is to provide pure water solutions.

Quality water is the key to all laboratory applications.

# the requirements

Use of consistently-pure water quality is crucial for successful reproducibility in laboratory applications. This is the reason why, depending upon your activity, regulatory bodies have defined several levels of water purity.

Elix system water meets or exceeds Type II water quality (corresponding to analytical-grade water) as defined by CAP, NCCLS and ISO® 3696/BS 3997. Elix UV system water also complies with the Purified Water requirements from the European and U.S. Pharmacopoeia.

These high standards have to be met every day in many fields of activity, including:

- Food and Beverage industries
- Chemical industry
- Cosmetic industry
- Electronic industry
- Metalworking industry
- Pharmaceutical industry
- Synthesis industry
- Clinical area



*You can rely on the quality of Elix system water!*

# Elix systems

The water produced by Elix systems meets the highest standards and ensures consistent quality. With easy operation and maintenance, Elix systems have set a new trend in the pure water market.

## Technical assets of Elix systems

- No softener required (or softening ion-exchange resin cartridges)
- Ion-exchange resins are continuously regenerated by an electrical current
- Constant flow rate and high water recovery
- Complete 4-step purification process using complementary technologies
- Excellent control of water quality at each purification step


## Resulting in direct day-to-day benefits

- Ease-of-use (no question about water hardness or when the cartridge change is due)
- Peace of mind (no time wasted on changing cartridges, regeneration and cleaning)
- Safe and clean
- Pure water available on demand (constant flow rate in all seasons)
- Low running costs
- Optimum inorganic, organic and microbiological purity - all types of contaminants are eliminated
- Reliable water quality

The following pages give a detailed overview of the Elix system and its advantages in daily laboratory use.

Characteristics of Elix system water	
Resistivity	> 5 MΩ·cm*, typically 10 to 15 MΩ·cm
Conductivity	< 0.2 μS/cm*, typically 0.067 to 0.10 μS/cm
TOC typically	< 30 ppb
Bacteria count	< 1 cfu/ml**
* [CO <sub>2</sub> ] ≤ 30 ppm in feedwater	
** only valid for Elix systems with UV lamp	





# Elix system water - always available to meet your daily needs

## applications

Pure water from an Elix system is ideal for a broad range of uses:

- Microbiological media preparation
- Buffer preparation
- Hydroponics
- Manufacturing chemical and biochemical reagents
- Pharmaceutical laboratory use of purified water (according to US and European Pharmacopoeia)
- Feed for laboratory equipment
  - Washing machines
  - Clinical analyzers
  - Stability chambers, Humidifiers, Autoclaves, Weathering Test Equipment instruments, Hydrogen gas generators
- Feed to Milli-Q® ultrapure water systems



*Pure water  
is needed  
throughout  
the laboratory.*

For all of these applications, using Elix systems ensures that appropriate water quality has been produced.



Bench-operated, wall-mounted or bench-integrated, Elix systems are designed to fit your space requirements.

A complete range of Elix systems and specially-designed storage reservoirs are available to meet the needs of laboratories requiring anywhere from 10 to 200 liters of pure water per day.

Larger systems, based on the same principle, are available for users with needs of up to 5000 liters per day.



# Benefits that count



*With Elix systems, control of water purity is built-in to every step of the purification process - ensuring that water quality will be a constant in your applications - not an additional variable.*

## facilitating work

- A unique and easy-to-install prefiltration pack unit (plug-and-use concept) includes three types of purification media.
- Self-maintenance of the reverse osmosis membrane
- Self-regeneration of the ion-exchange resins by an electrical current
- System functions are accessible from a user-friendly keypad. The information is displayed in the chosen language on an easy-to-read alphanumeric backlit screen. The screen angle can be adjusted.



*Elix systems lower the cost of pure water.*

## lowering running costs

- The unique and patented Elix module does not need a softener or softening ion-exchange resin cartridges.
- Continuous electrodeionization integrated into the system eliminates the need for costly regeneration and/or resin exchange.
- Elix systems consume up to 500 times less energy than conventional distillation equipment.
- Advanced reverse osmosis (RO) technology reduces water consumption by more than 50 %.
- Replacement of the pretreatment pack is calculated based upon the actual amount of water pretreated.

Together these lead to a significant reduction in regular running costs.



# The secret of consistent flow schematic

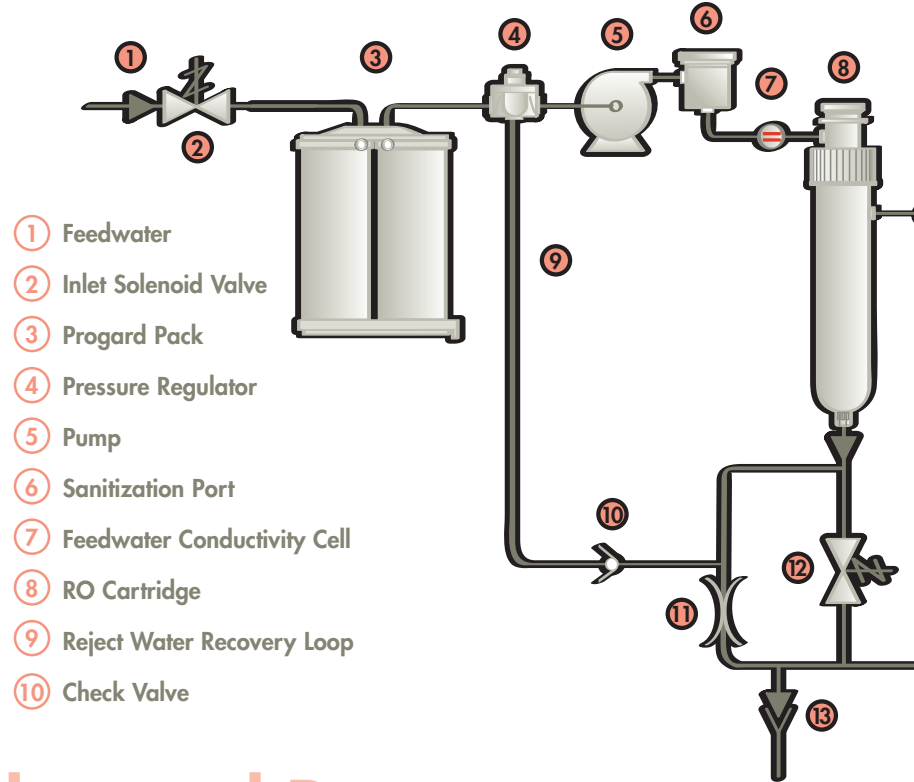
*The purification steps in Elix systems complement one another. The purification sequence optimizes the benefits of each technology.*

## Pretreatment

The first purification step with the Progard™ pretreatment pack removes:

- Particles (1 µm filter)
- Free chlorine and colloids from tap water (Activated Carbon filter)

An anti-scaling compound that prevents the reverse osmosis membrane from scaling in hard water areas is included.

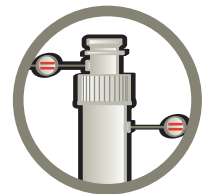


## Advanced Reverse Osmosis

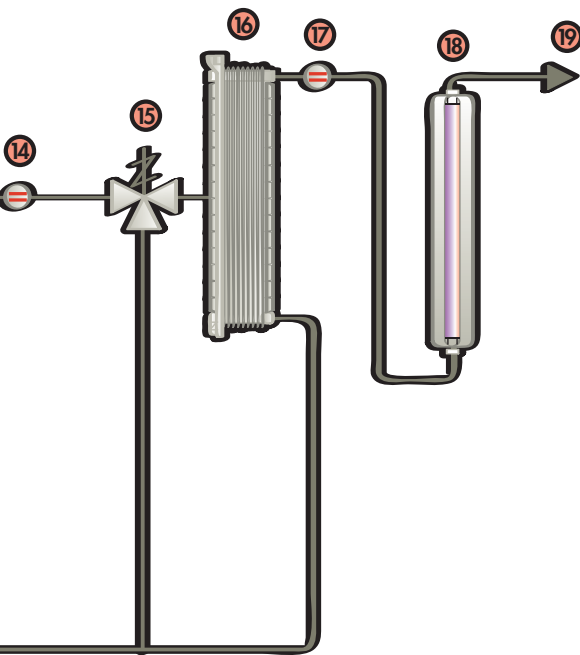
In the second purification step, the reverse osmosis unit removes 95-99 % of inorganic ions and 99 % of all dissolved organic substances (MW>100 Dalton), as well as microorganisms and particles.

Two built-in advanced features result in two major benefits:

- High water recovery is achieved by recycling part of the reject water to the RO membrane feedwater stream.
- Constant product flow rate is achieved through the use of a unique temperature control feature in the built-in booster pump. Standard reverse osmosis-based systems suffer from a decline in product flow rate as water temperature decreases. In Elix systems, as the temperature decreases, pump pressure increases to maintain a steady product flow rate.



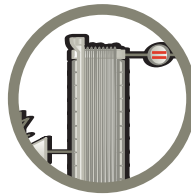
# water quality



- ⑪ Capillary Tubing
- ⑫ Flush Solenoid Valve
- ⑬ Reject
- ⑭ Permeate Conductivity Cell
- ⑮ Permeate Divert Valve
- ⑯ Elix Module
- ⑰ Product Resistivity Cell
- ⑱ UV Lamp
- ⑲ Product Water

## Elix Module

In the third purification step, the Elix module removes the remaining ions. Ion-exchange resins contained in the module are continuously regenerated by means of an electrical current.



- This self-regeneration technique eliminates the need to interrupt water production to carry out hazardous chemical regeneration or costly resin replacement.
- It also provides the advantage of using resins of the highest quality at all times; resins do not degrade as they are never chemically regenerated or moved outside the system.

## Ultraviolet Lamp



During the last treatment step, water is sanitized through a 254 nm UV lamp in a stainless steel cartridge.

Regardless of the flow rate, the powerful UV lamp leads to a log reduction value of 5, which means that a bacterial count of 100,000 cfu/ml in incoming water is reduced to 1 cfu/ml after

exposure to ultraviolet light. This demonstrates that the Elix system produces optimum water quality for applications sensitive to bacteria.

For applications in which bacterial pollution is not a significant factor, all Elix systems are also available without a UV lamp.

## optimized control of water quality

After each purification step, relevant parameters are checked:

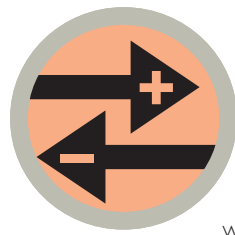
- Feed pressure, feedwater quality
- RO pressure, RO water quality, RO membrane efficiency (% ion rejection)
- Elix system water quality and temperature (using the same accurate coaxial resistivity cell as the one used in Milli-Q ultrapure water systems)

# The difference: patented Elix module



*A unique technology  
guarantees pure water at  
minimal costs.*

## principle

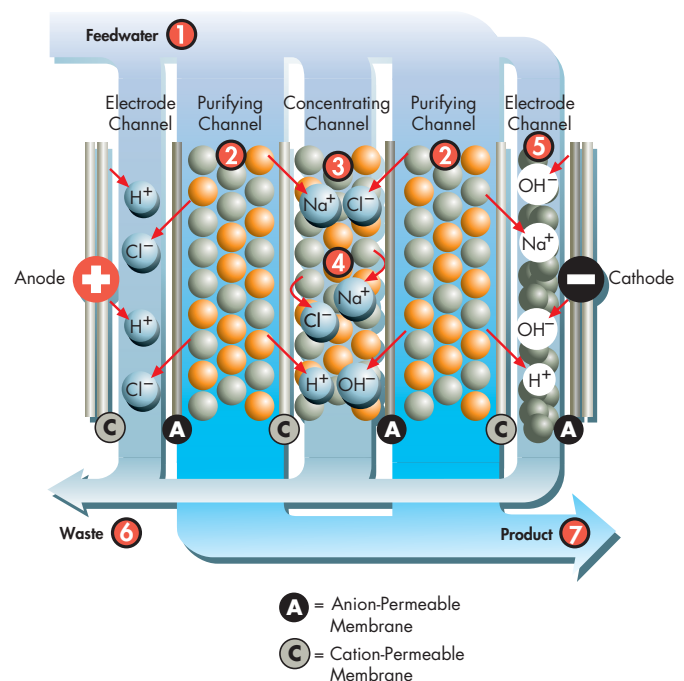


While water passing through the Elix module is purified, ion exchange resins are continuously regenerated via an electrical current applied within the module itself.

This process only requires a very low amount of water and energy, and needs no special maintenance or chemical regeneration that would deteriorate the resin beads.

All these advantages have made Elix technology the new standard for the production of pure water that is replacing both distillation and conventional deionization units in the laboratory.

- 1 Feedwater enters the Elix module and is split into three flow channels. One part flows over the electrodes (electrode channels), another through the resin-bed sandwiched between an anion-permeable membrane and a cation-permeable membrane (purifying channels), and the third part flows through the concentrating channel.
- 2 Electronic-grade mixed bed ion exchange resin captures dissolved inorganic ions.
- 3 Electrical current across the module pulls captured cations out of the purifying channels through the cation-permeable (C) membranes towards the cathode, and anions through the anion-permeable membrane (A) towards the anode. Ion exchange resins on both sides of the membrane enhance the transfer of ions through the cation and anion-permeable membranes.
- 4 The cation-permeable membrane prevents anions from proceeding towards the anode, and the anion-permeable membrane prevents cations from proceeding towards the cathode. The result is a concentration of ions in this compartment.
- 5 Activated carbon beads next to the cathode avoid scaling issues by lowering the local pH at the electrode surface.
- 6 Concentrated ions are flushed from the system into the waste stream.
- 7 Purified water leaves the module.



# Control for peace of mind and ease-of-use

*Elix systems are easy to operate - just turn the system on and everything else is done automatically. All system functions are easily viewed on the built-in backlit display.*

## automatic control and maintenance

- Quality parameters, routine maintenance reminders (such as pack replacement or sanitization) and alarms are automatically displayed in a choice of seven different languages.
- The self-maintenance functions for the reverse osmosis membrane and the cleaning cycles ensure optimum final quality and are completely transparent to the user:
  - Automatic flush mode - cleans the RO membrane surface with a high waterflow.
  - Automatic rinsing mode - RO permeate is diverted to drain until the quality meets expectations.
  - Automatic cleaning cycle - sanitization of the RO membrane (frequency of the cleaning can be adjusted depending on local feedwater quality).



*All Elix systems are manufactured in an ISO 9001 and 14001 certified manufacturing site, and in voluntary agreement with the requirements of cGMP (current Good Manufacturing Practices).*

## Elix systems are adapted to GLP requirements

GLP (Good Laboratory Practices) requires the recording and storage of the laboratory data to ensure traceability.

The Elix system built-in real-time clock guarantees complete traceability with the date and time appearing on all reports delivered by the system.

Reliability of the displayed resistivity measurement is ensured by:

- Low cell constant (0.01 cm<sup>-1</sup>) and flow-through design of the resistivity cell
- Temperature measurement with a 0.1 degree increment
- Possibility of checking the conductivity of Elix product water according to USP 28 <645> specifications

Elix systems are developed for ease-of-use in a validated laboratory environment. Our Access Service™ qualification program provides the necessary workbooks and certificates, and is thoroughly supported by Millipore's certified customer care engineers.

PRES: 4.3bar 70%  
PRODUCT: >15MΩcm

PRES: 4.3bar 70%  
PERMEATE: 4.0µS

### Examples of messages from the Elix system:

- Conductivity of feedwater (compensated to 25 °C or non-compensated)
- Conductivity of reverse osmosis permeate (compensated to 25 °C or non-compensated)
- Percentage of rejection of ions by the reverse osmosis membrane (%)
- Resistivity or conductivity of product water (compensated to 25 °C or non-compensated)
- Temperature of product water
- Change UV lamp
- Change Pack
- Progard Pack not in place
- Feedwater pressure too low



# Detailed specifications of Elix systems

## Feedwater Requirements

Water quality	Potable tap water
Conductivity	< 2000 $\mu\text{S}/\text{cm}$ for maximum performance
Temperature	2 – 35 °C
Fouling index	Progard 1: < 5 Progard 2: < 12*
Total chlorine	Progard 1: < 1 ppm Progard 2: < 3 ppm
Minimum feedwater pressure	1.0 bar (15 psi)
Maximum feedwater pressure	6.0 bar (90 psi)

\*If the Fouling index is > 12, additional prefiltration is recommended.

## Monitoring Standards

### Cell Constant of Measuring Cells

Feedwater conductivity	0.35 $\text{cm}^{-1}$
Permeate conductivity	0.35 $\text{cm}^{-1}$
Product water resistivity	0.01 $\text{cm}^{-1}$

### Additional Standard

Measuring and compensation of product water temperature	$\pm 0.1$ °C increments
Electronic connection	RS232 interface

## General System Specifications

Dimensions	455 x 255 x 315 (height x width x depth in mm) (18" x 10" x 12.4")		
Operating weight	Elix 3	15 kg (33.2 lb)	
	Elix 5	15 kg (33.2 lb)	
	Elix 10	16 kg (35.4 lb)	
Electrical data	120 V/230 V ~ 50/60 Hz		
Apparent output	100 VA Maximum		
Nominal output	80 W Maximum		
	35 W average nominal output in operation		



## Performance

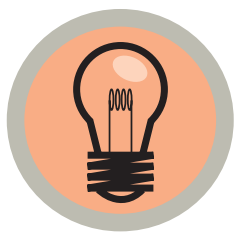
	Elix 3	Elix 5	Elix 10
<b>Daily Needs</b>	<b>10 to 60 liters</b>	<b>50 to 100 liters</b>	<b>100 to 200 liters</b>
Product flow rate $\pm 15\%$ 7 °C < T < 30 °C	3 l/h	5 l/h	10 l/h
Resistivity of product water (compensated to 25 °C)*	> 5 M $\Omega$ -cm typically 10 to 15 M $\Omega$ -cm	> 5 M $\Omega$ -cm typically 10 to 15 M $\Omega$ -cm	> 5 M $\Omega$ -cm typically 10 to 15 M $\Omega$ -cm
Conductivity of product water (compensated to 25 °C)*	< 0.2 $\mu\text{S}/\text{cm}$ typically 0.067 to 0.10 $\mu\text{S}/\text{cm}$	< 0.2 $\mu\text{S}/\text{cm}$ typically 0.067 to 0.10 $\mu\text{S}/\text{cm}$	< 0.2 $\mu\text{S}/\text{cm}$ typically 0.067 to 0.10 $\mu\text{S}/\text{cm}$
TOC typically	< 30 ppb	< 30 ppb	< 30 ppb
Bacteria count**	< 1 cfu/ml	< 1 cfu/ml	< 1 cfu/ml
Silicate content	> 99.9 % retention	> 99.9 % retention	> 99.9 % retention
Water recovery	15 %	18 %	24 %

\*[CO<sub>2</sub>]  $\leq$  30 ppm in feedwater: typical resistance 10-15 M $\Omega$ -cm

[CO<sub>2</sub>] > 30 ppm in feedwater: typical resistance > 2 M $\Omega$ -cm

\*\*valid for Elix systems with UV lamp

# A full solution tailored to each individual need



*Millipore  
not only supplies  
the laboratory with  
analytical-grade water  
systems, but also offers a complete  
range of total water system  
solutions for pretreatment,  
storage and distribution,  
and production of  
ultrapure water.*

## pure water storage

Millipore has developed reservoirs specifically designed to store pure water that are available for capacities of 30, 60 and 100 liters. Millipore's reservoirs protect the quality of the pure water from immediate degradation (typically experienced when water is stored in carboys) by respecting certain fundamental design rules:

- 100 % drainable with conical bottom (for complete and easy cleaning and rinsing)
- Opaque (to limit bacterial growth)
- PE material (for low extractables)
- Vent filter for removal of volatile organics, bacteria and CO<sub>2</sub> from the incoming air
- Protected overflow (to avoid back contamination from the drain)
- Use of the optional Automatic Sanitization Module (ASM) ensures effective prevention of bacterial growth and biofilm formation.

## long term benefits

Elix systems are designed to keep pace with possible changes in laboratory requirements at all times. All systems can be upgraded to a higher flow rate.

For more sensitive applications, the addition of a Milli-Q ultrapure water system - fed with Elix system water - guarantees the best water quality. For more details on the impact of feedwater quality on the production of ultrapure water request the Technical Note RD004.

Additional information about our ultrapure water system range can be obtained from our Application and Technical Service Specialists, who will be happy to help you find the water system best suited to your laboratory needs.

