

# Milli-Q<sup>®</sup> Reference Water Purification System

The reference for ultrapure water systems



# Ultrapure water by Merck Millipore

Scientists today face many challenges. As always, they need to deliver high quality technical results. But now, they must do so at a faster pace, while meeting increasing standards and often operating in laboratories with limited space.

Merck Millipore designed the Milli-Q® Reference system to address these needs. From pure water, the system produces ultrapure water adapted to your specific applications and exceeding the requirements of the most demanding norms.

We've achieved all this with a new purification strategy. Water is purified in a first step to reach a resistivity of 18.2 MΩ.cm at 25 °C and a TOC value below 5 ppb. This water is sent through a small recirculation loop to the Application-Pak, where a final purification step, critical for specific experiments, removes contaminants just before water leaves the system.

The flow schematic on the next page shows how the water is purified and delivered by the system.



## Convenience in water delivery

The Milli-Q® Reference system delivers water the way scientists need it for convenience and time savings, improving laboratory efficiency.



Easily prepare solutions with the low flow function to precisely adjust the meniscus in volumetric flasks.



The 75 cm long tubing reaches the sink for easy glassware washing.

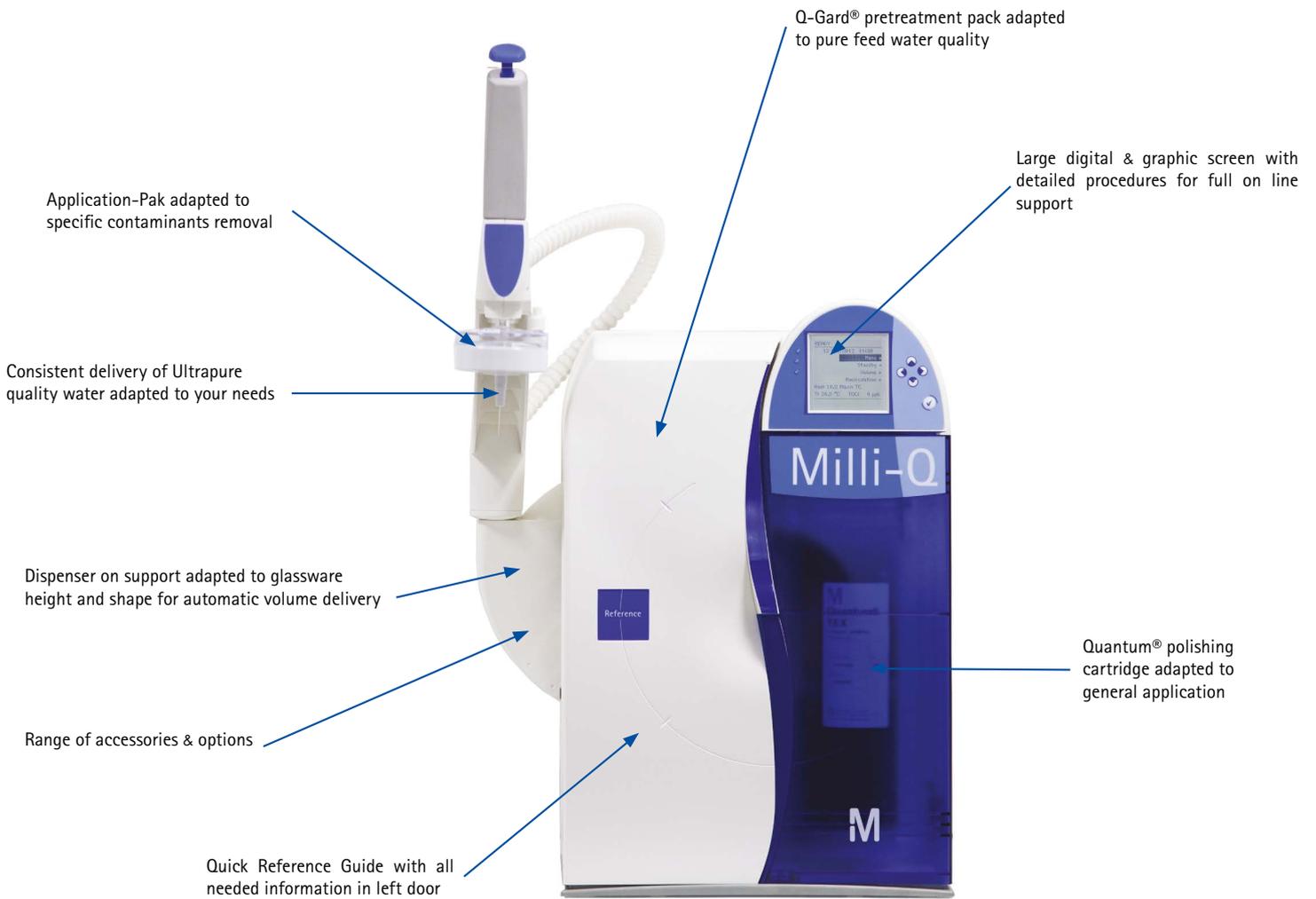


Save time with the volumetric function, automatically delivering the water volume that you need, designed to fit the height & shape of all laboratory glassware.

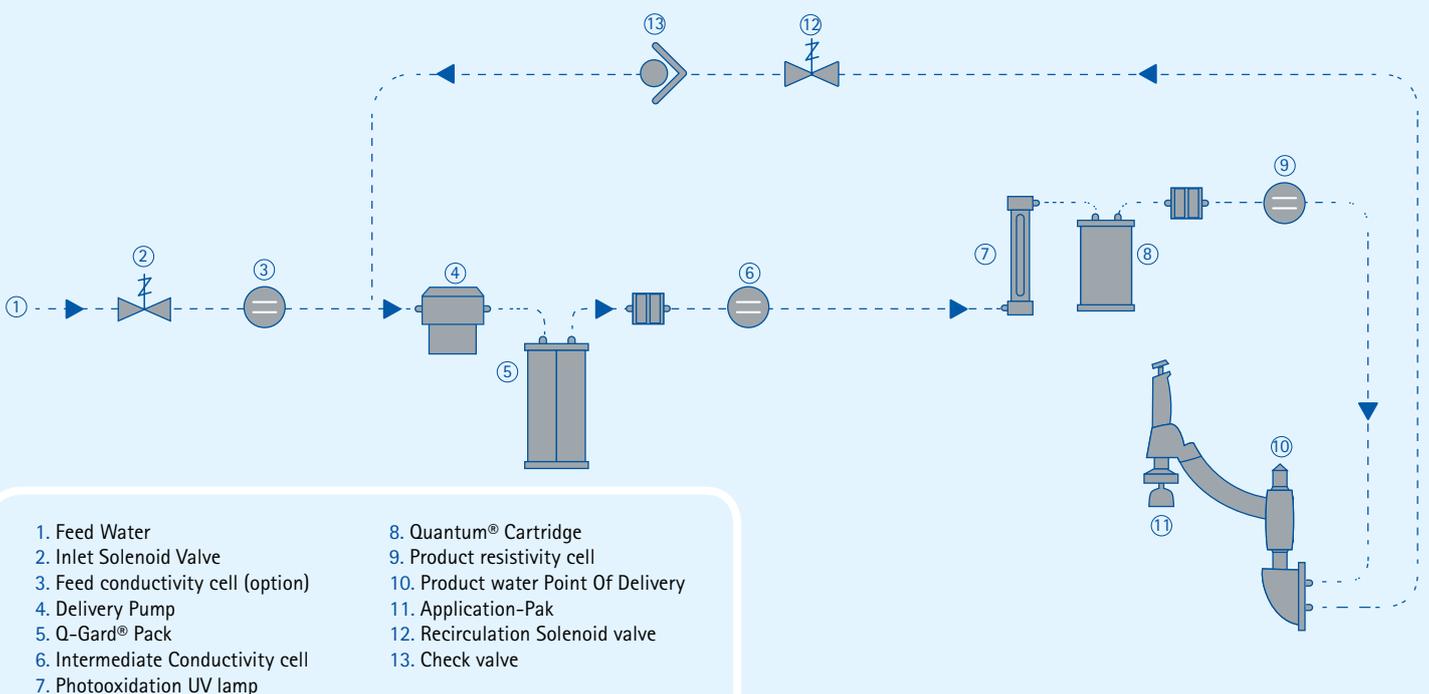


Deliver water hands-free using the footswitch option for more convenience.

# Milli-Q® Reference System at a glance



## Inside the Milli-Q® Reference System



## EASY ACCESS TO INFORMATION

Access to water system data is structured simply, so you can save time instead of searching endless numbers for the one you want.

The **Main Screen** on the production unit delivers detailed information in (local language) on system operation and performance. Clear graphics help you perform specific tasks such as maintenance. From the same screen, you can even print reports on the system's water quality and history.

Fields related to critical information such as the definition of water quality set points are accessible only to the designated responsible user and are protected by an identification code and a password.

Alerts & alarms are clearly visible on the system's main screen and can be enhanced by a buzzer.



A **Quick Reference Guide** located in the door of the Milli-Q® Reference water system provides additional support for retrieving information. The system comes with a complete and detailed user manual in 8 languages on CD-ROM. A printed manual contains essential information (in local language).

# Easy and reduced maintenance

Maintaining the Milli-Q® Reference system won't take time away from your research. Maintenance frequency is minimal, and the procedures are simplified to the utmost.



Q-Gard®  
Pretreatment  
Pack



Quantum®  
Polishing Cartridge



Application-Pak

- You can replace the Q-Gard® pretreatment pack or the Quantum® polishing cartridge in less than 5 minutes. These consumables have an RFID tag, automatically registering the catalog and lot number of the new unit in the system's memory, so that you can quickly and easily maintain traceability.
- Replacing the Application-Pak takes less than 2 minutes.
- The UV lamp built inside the system is designed to last at least 2 years.
- The system will alert you to replace consumables or schedule service visits at least 15 days before maintenance is actually required, so you'll never be without the water you need.

## Service

Merck Millipore provides a comprehensive range of service programs performed by certified Merck Millipore field service support engineers to thoroughly maintain and validate your Milli-Q® system, complying with your industry's regulatory standards.

The service program portfolio covers all maintenance requirements such as installation, customized user training, scientific and technical support, troubleshooting, preventive maintenance visits, and all validation requirements using ad hoc calibrated equipment, procedures, workbooks and suitability tests within a GXP's environment.

## TOTAL WATER SOLUTIONS

To get the best results from your Milli-Q® Reference system, Merck Millipore recommends feeding it with pure water produced by RiOs™ (Type 3) or Elix® (Type 2) water systems.



# Milli-Q® Reference system water specifications

A report on conformity of Milli-Q® Reference water quality to Type 1 water quality as described by ASTM®, ISO® 3696 and CLSI® norms and to Purified Water as described in USP and EP is available upon request.

## Feed Water Specifications

Parameter	Value & Unit
Feed water quality	Elix®, RiOs™, distilled or DI water with conductivity < 100 µS/cm and TOC < 50 ppb
Feed water connection	1/2 in Gaz M
Feed water pressure*	0 – 0.3 bar
Feed water temperature	5 – 35 °C

\* For pressure above 0.3 bar, a pressure regulator needs to be installed upstream of the system; for pressures between 0 and -0.2 bar, the system will operate, but product flow rate may be lower.

## Product Water Quality

Parameter	Value & Unit
Manual dispense flow rate	Adjustable between 50 and 2000 mL/min
Automatic dispense volume	100 mL 250 mL to 5 L by 250 mL increments 5 L to 60 L by 1 L increments
Volumetric dispense accuracy	3 % for volumes between 250 mL and 60 L
Volumetric dispense dispersion	CV < 3% for volumes between 250 mL and 60 L
Resistivity <sup>1</sup>	18.2 MΩ.cm at 25 °C
TOC <sup>2</sup>	≤ 5 ppb (µg/L)
Bacteria <sup>3</sup>	< 0.01 CFU/mL
Pyrogens (endotoxins) <sup>4</sup>	< 0.001 EU/mL (pyrogen-free)
RNases <sup>4</sup>	< 1 pg/mL (RNase-free)
DNases <sup>4</sup>	< 5 pg/mL (DNase-free)

<sup>1</sup> Resistivity can be displayed temperature-compensated at 25 °C or non-temperature-compensated as required by USP

<sup>2</sup> TOC spec – Test conditions: Milli-Q® Reference system equipped with Q-Gard® T1 pack and Quantum® TEX cartridge, feedwater produced by Elix® system with resistivity > 1 MΩ.cm at 25 °C, TOC < 30 ppb. Product water quality may vary due to local feed water conditions.

<sup>3</sup> Results with Millipak® filter

<sup>4</sup> Results with Biopak® final polisher in place

These values (validated with Elix® feed water) are typical and may vary depending on the nature and concentration of contaminants in the feed water.

## Safety

The Milli-Q® Reference system is tested by an independent and accredited company for compliance with the CE directives related to safety and electromagnetic compatibility. The report can be consulted on demand.

The Milli-Q® Reference system is built using components and practices recommended by UL and has been cUL marked. The registration can be verified on the UL web site (<http://www.ul.com>).

## Milli-Q® Reference System Dimensions

Parameter	Value & Unit
System footprint	1195 cm <sup>2</sup> (185 in <sup>2</sup> )
System height	497 mm (19.56 in) 713 mm (28.07 in)
System width	332 mm (13.07 in) 413 mm (16.25 in)
System depth	360 mm (14.17 in) 458 mm (18.03 in)
System weight (packaged)	19 kg (41.88 lb)
System weight (empty)	14.5 kg (31.96 lb)
System weight (with water)	19.5 kg (42.99 lb)
Dispenser delivery loop length	750 mm (29.52 in)
Electrical power supply cable length	290 cm (114.1 in)
Electrical power supply voltage	100 – 230 V ± 10 %
Electrical power supply frequency	50 – 60 Hz ± 10 %
Feed water connection	1/2 in. Gaz F
Data connection	Ethernet (RJ45)

## Q-POD® Accessory Dimensions

Parameter	Value & Unit
Q-POD® height	579 mm (23.50 in)
Q-POD® diameter	230 mm (9.05 in)
Dispenser delivery loop length	800 mm (31.49 in)
Q-POD® weight (packaged)	7.2 kg (15.87 lb)
Q-POD® weight (empty)	5 kg (11.02 lb)
Q-POD® weight (with water)	5,5 kg (12.12 lb)
Loop & cable to system length	290 cm (114.1 in)
Data connection	Parallel Port (25-pin D-Sub) for print-out

## Certification

The Milli-Q® Reference system is delivered with a Certificate of Conformity ensuring that it has been built and tested fully assembled following Merck Millipore Standard Operating Procedures and a Certificate of Calibration for the temperature and resistivity meters built in the system. The Milli-Q® Reference consumables are automatically delivered with a Certificate of Quality. Merck Millipore's manufacturing site is ISO® 9001 v.2000 and ISO® 14001 certified.

## Accessories

Customize your Milli-Q® Reference system to meet your specific needs.

### Space Savers

Save your bench space for your crucial experiments by removing the arm and dispenser from the Milli-Q® Reference system and mounting it on the Q-POD® support. Place the water purification cabinet under your bench, or high on a wall, freeing your bench for your research. More space savers include:

- Milli-Q® Reference Wall Mounting Bracket
- Q-POD® Wall Mounting Bracket
  - Increase access to water from your bench
  - Save even more space

### Q-POD® Dispenser: Water delivery at your fingertips

The ultrapure water produced in the cabinet is sent in a small recirculation loop to the outlet of the Q-POD® dispenser. Water is delivered from the Q-POD® outlet

The Q-POD® dispenser is loaded with convenient features:

- Variable water flow (slow flow to 2 L/min) controlled by plunger
- Hand-held gun dispensing option to facilitate washing applications
- Volumetric dispense control with + and - buttons to select dispensed volume
- Multicolor graphic display shows at a glance that the water quality is within specification and the system is operating without alarms.
- Printer connection to instantly record water quality history



### System Protectors

Sensors can help keep your Milli-Q® Reference system running with minimal vigilance on your part.

- **Water Sensor** – Placed on the floor, this sensor stops water feed to the system if there is water on the floor. No more water spills, even if users forget to stop water delivery while filling containers.
- **Feed Water Conductivity Meter** – If ionic contamination of feed water exceeds specifications, causing high conductivity, an alarm will alert you.
- **Level Sensor** – If your Milli-Q® Reference system is fed from a Merck Millipore tank, this electronic connector transfers tank level information to the Milli-Q® system. The sensor stops water feed from an empty tank and lets you check water levels in the tank before sourcing water, preventing air from entering the system.
- **Silicone Q-POD® Cover** – The Q-POD® dispenser is designed to operate in a wet environment. However, this silicone cover protects your Q-POD® from harsh chemicals, solutions or solvents.

### Footswitch

Connect the footswitch to the base of the Q-POD® dispenser or directly to the Milli-Q® system for hands-free water delivery: press once to start and once to stop.

# Storage Tanks and Accessories

## Storage with a Difference



### Guarantee the purity of your stored water

Pure water requires a storage system to prevent the degradation of your water quality. Merck Millipore's 30-, 60-, and 100-liter polyethylene (PE) storage tanks are designed to maintain consistent purity of stored water and provide effective protection against airborne contaminants.\*

### Prevent contamination

Water stagnancy can cause bacterial proliferation. Our optimal Automatic Sanitization Module (ASM) provides the ideal solution for the prevention of bacterial growth and biofilm formation on the inner surface of the storage tank. In addition, our advanced vent filter protects pure water from airborne contamination.

### Distribute your stored water where it is needed

To provide pure water for use with all of their applications, laboratories need to be able to distribute stored water from their water purification system storage tanks.

- For distribution of **non-pressurized pure water**, a valve is conveniently located on the front of the Merck Millipore storage tanks.
- For convenient **distribution of pressurized pure water** from the storage tank, an E-POD® point-of-delivery dispenser can be connected to an Elix® Advantage or Milli-Q® Integral water purification system.
- For **automatic feed** of pure water, distribution valves on the base of the storage tank allow connection to other laboratory equipment such as glassware washing machines. Distribution pumps are also available if needed.

*\* A complete line of storage tanks is available, ranging in capacity from a few liters to several hundred liters. Your nearest Merck Millipore office will be able to guide you in the choice of the tank best suited to your needs.*

# Optimized pure water storage

The main concern when storing pure water is degradation of water purity over time. Only a strict choice of storage tank materials, associated with a careful design and appropriate protection against airborne contaminants, can ensure consistent water quality during storage.

## Innovative storage tank design

Merck Millipore 30-, 60-, and 100-liter polyethylene storage tanks incorporate the latest technical developments and advanced features for stored water of consistent purity.

All tanks have a small footprint and are designed for wall-mounting if required. Underbench installation is also possible for some models.

### Unique features

- Polyethylene selected for its minimum release of extractables
- Opaque walls block sunlight to prevent algae development
- Smooth inner surface prevents biofilm formation
- Cylindrical shape minimizes surface area in contact with water
- Conical bottom allows complete draining for cleaning and rinsing
- Pure water smoothly fed in at the bottom of the tank prevents absorption of carbon dioxide
- Front valve enables manual dispense of pure water
- Distribution valves permit connection to other laboratory equipment
- Hermetically sealed lid blocks air from entering the tank
- Large top opening allows manual cleaning during sanitization procedure
- Compact space-saving design

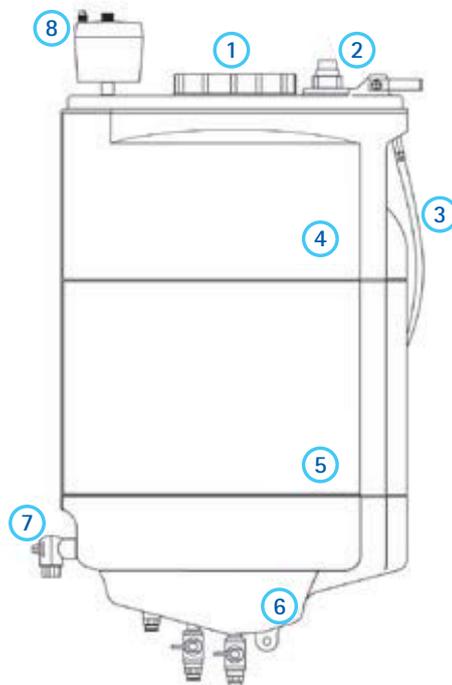
### Fail-safe protection

- Sensor rod float switch system for automatic storage tank refill and indication of water level (% full)
- Overflow connected to the drain, in the unlikely event of a water system malfunction
- Direct display of stored water level on water purification system units
- Water sensor

## Storage tanks designed for efficiency

### Designed for efficiency

1. Hermetically sealed lid
2. Sensor rod float switch
3. Sanitary overflow
4. Blow-molded storage tank
5. Cylindrical shape
6. Conical bottom with distribution valves
7. Front dispensing valve
8. Advanced vent filter



For details of the tests performed during the storage tank development process, please request the publication "R&D Notebook 1: Optimizing the storage of purified water for laboratory applications" (Ref. No.: RDO01EN00) from your local Merck Millipore representative.

# Storage Tank Accessories

In order to help ensure optimum purity and distribution of your stored water, Merck Millipore offers a range of accessories and connections for your storage tank, including the following items:

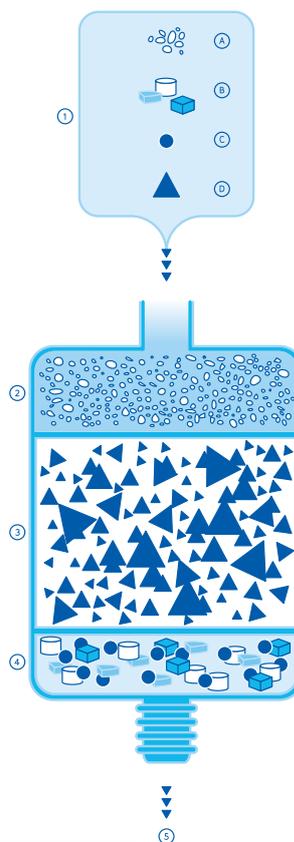
- Advanced Vent Filter
- Automatic Sanitization Module
- Air Gap Device
- E-POD® pure water remote dispenser
- Washer Distribution Kit
- Water Sensor
- Lab Close Kit

## Advanced vent filter: important protection against airborne contaminants

Air is contaminated by carbon dioxide, particles, microorganisms, and volatile organic compounds that come mainly from the laboratory atmosphere. To protect pure water from all these contaminants, Merck Millipore has developed an advanced storage tank vent filter that includes:

- Activated carbon to adsorb volatile organics (including lab solvents such as acetone, chloroform, and methanol)
- A soda-lime bed to remove CO<sub>2</sub>
- A Durapore® hydrophobic membrane for particle and bacteria retention

This advanced vent filter is recommended for the protection of high-resistivity water, such as Elix® product water, during storage. To protect RiOs™ reverse osmosis-quality water, a Durapore® 0.45 µm hydrophobic membrane vent filter is also available.



Advanced storage tank vent filter

1. Airborne Contaminants
  - A. Volatile Organics
  - B. Particles
  - C. Bacteria
  - D. CO<sub>2</sub>
2. Volatile Organics absorption
3. CO<sub>2</sub> removal
4. Particle and Bacterial retention
5. Storage tank inlet  
Purified air enters the storage tank

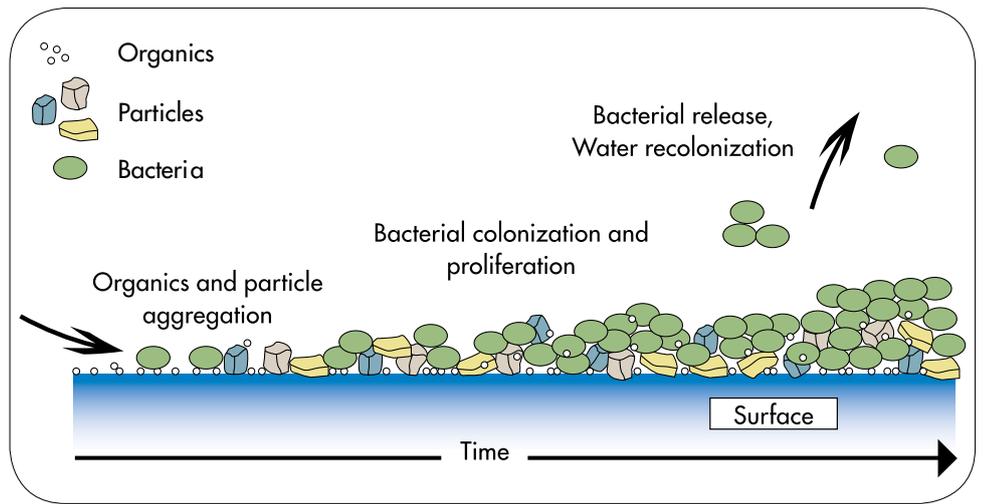


Complete Merck Millipore water purification chain with the ASM and water sensor

**Automatic Sanitization Module (ASM):**  
say "No!" to bacterial proliferation

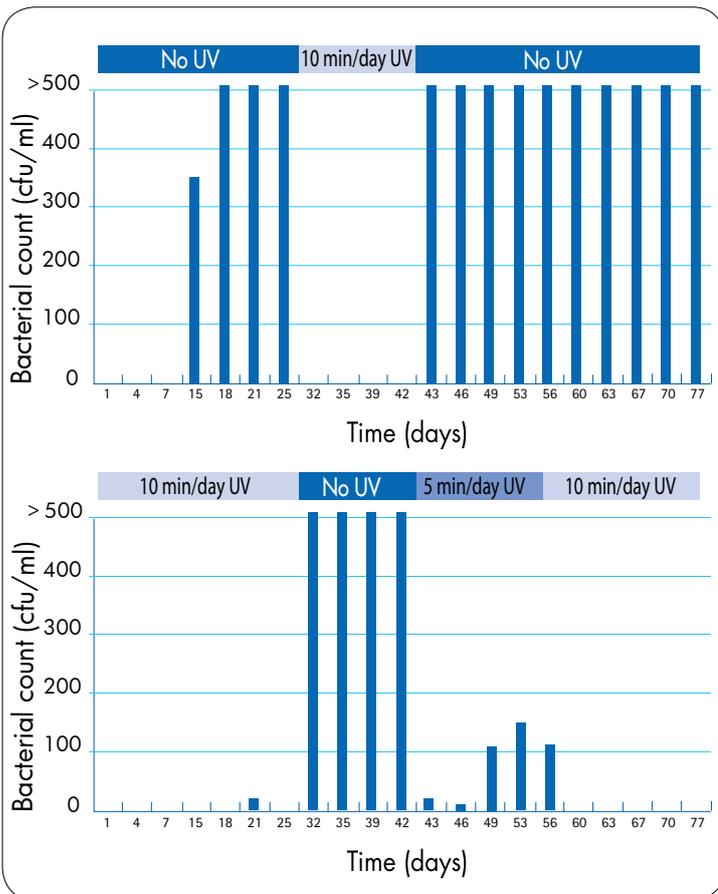
Maintaining high purity water with low bacteria levels during storage is critical. If left to proliferate, trace levels of microorganisms present in pure water compromise water purity. This bacterial contamination is responsible for the formation of a biofilm – an accumulation of organic material made up of active and dead organisms, on the inner walls of the storage tank.

Even though chemical sanitization and mechanical scrubbing may be periodically performed, this biofilm is difficult to remove and is a frequent source of recontamination in stored water.



Biofilm formation over time

Merck Millipore's ASM is designed to prevent the growth and proliferation of bacteria and the resulting biofilm on the inner surface of Merck Millipore PE storage tanks. The ASM makes use of the germicidal properties of an ultraviolet (UV) light at 254 nm, which is fitted inside the tank.



Germicidal effectiveness of the UV lamp

**The ASM provides full flexibility for guaranteed results**

- 254 nm UV lamp; selected for its germicidal effectiveness
- Pre-programmed intervals of 10-min / day automatic UV illumination for optimized efficiency
- Additional programmable and manual UV exposure possible to meet critical application requirements
- Up to 45 min /day of UV exposure for total flexibility
- Program daily time settings, UV cycles, and UV lamp operation displayed on the Millitrack® e-Solution dashboard
- UV lamp exchange alarm for easy maintenance
- Compact design allowing installation on top of the storage tank

**10 minutes of daily UV exposure is sufficient**

During development of the ASM, the UV lamp exposure cycles were optimized by examining the resulting bacterial reduction after exposure.

Two 60-liter storage tanks were fed by an intentionally contaminated reverse osmosis water purification system. The tanks were then emptied and refilled each day and alternately equipped with an ASM into which variable illumination times were programmed.

As shown in the graphs, 10 minutes per day of UV exposure were enough to make the tanks return to their original low bacterial levels.

### Air gap device for protection against bacteriological contamination

Water purification systems and storage tanks sometimes require a connection to the drain.

Drains are typically dirty environments contaminated by microorganisms, and in particular, bacteria. Therefore, when the outlet of the water system reject tubing is pushed into the drain, there is a risk that bacteria could contaminate the inside of the reject tubing, and then progressively move to the water system.

One way to prevent this from occurring is to install an air gap device on the reject tubing. This allows the reject water flow to move through the tubing without touching the inside of the contaminated drain environment. Installing an air gap device is an easy and safe way to prevent the development of bacteria above the air gap level.



*Air Gap Device*

### E-POD® pure water remote dispenser: pure water where you need it

The E-POD® Elix® water point-of-delivery unit can be connected to an Elix® Advantage pure water system or Milli-Q® Integral pure and ultrapure water system to dispense pure water wherever it is needed in the lab.

Advantages of the E-POD® remote dispenser include:

- Improved bacterial water quality (less than 0.1 cfu/mL, with final filter)
- Versatility enabling use for multiple applications or users when a Millipak® or Biopak® polisher is fitted to the dispenser outlet

- Volumetric dispensing to save time
- Ergonomic design and ease of use
- Flexibility, with installation of up to three E-POD® units per system
- Information at a glance thanks to the color backlit screen on the dispenser base
- Space-saving small footprint



*E-POD® pure water remote dispenser*



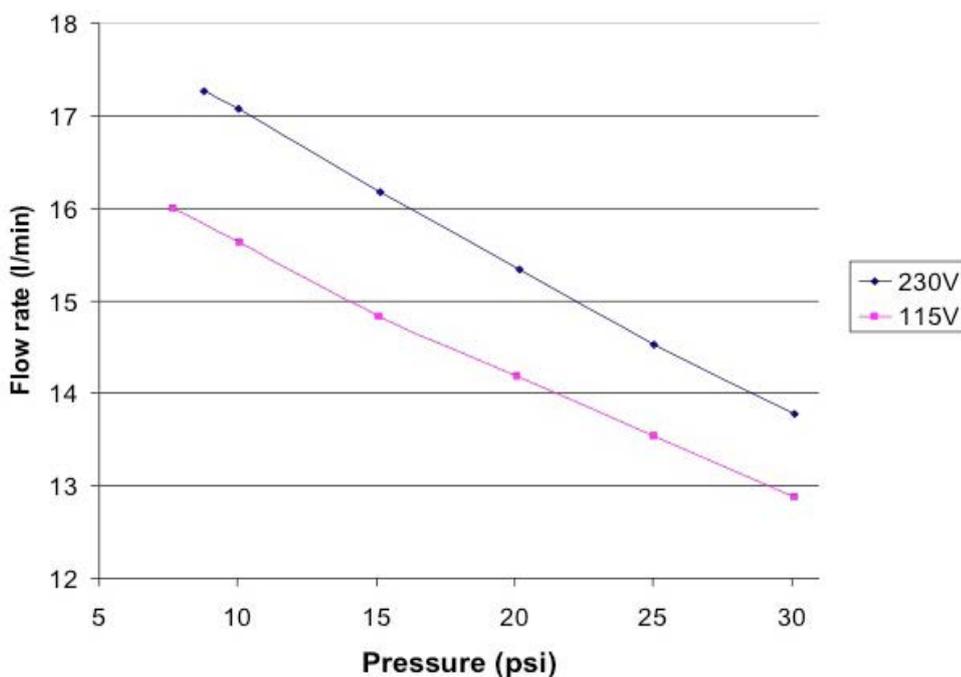
## Distribution pumps to meet increased demands

### Washer Distribution Kit

A key use of pure water is as feed to laboratory appliances such as glassware washers, autoclaves, sterilizers and weathering devices.

The Merck Millipore Washer Distribution Kit provides cost-effective and convenient distribution of pure water to common laboratory appliances, with flow rates between 12.5 – 13.5 L/min (at 2 bar or 30 psi, depending on voltage).

Installation of the small-footprint kit is fast, easy, and universal, with bench, underbench, or wall-mounted options. Users profit from a silent, automatic supply of pure water when required.



The graph shows characteristics of Merck Millipore distribution pumps. Pumps provide a long service lifetime and quiet operation.



Washer Distribution Kit

### Water sensor for control over feed water supply

If there is water on the floor, the water sensor enables shutdown of the feed water supply in order to prevent a lab flood.

### Lab Close Kit keeps your system in top condition when you're away

When your facility is closed for an extended time – such as vacation periods – the Lab Close Kit will avoid water purification system standstill during these long periods. The Lab Close Kit intelligently optimizes the consumption of water and electricity by your system, preventing the negative effects of nonuse, such as bacteria buildup. Your water purification system remains in top condition, ready for immediate use upon your return.

# Specifications & Ordering Information

## Specifications for Polyethylene Storage Tanks

There are several different storage tank sizes available in this range:

### 30-liter Storage Tank\*

Diameter	380 mm (14.82 in.)
Height	600 mm (23.4 in.)
Maximum Usable Capacity	25 L
Weight (full)	30 kg (66.14 lb)

### 60-liter Storage Tank

Diameter	380 mm (14.82 in.)
Height	840 mm (32.76 in.)
Maximum Usable Capacity	54 L
Weight (full)	59 kg (130.07 lb)

### 100-liter Storage Tank\*

Diameter	380 mm (14.82 in.)
Height	1255 mm (48.95 in.)
Maximum Usable Capacity	91 L
Weight (full)	98.5 kg (217.15 lb)

\* For 30-liter and 100-liter storage tanks, underbench models are also available.

## Ordering Information

Description	Catalogue No.
<b>Polyethylene Storage Tanks</b>	
30-liter PE tank	TANKPE030
30-liter PE underbench tank	TANKBI030
60-liter PE tank	TANKPE060
100-liter PE tank	TANKPE100
100-liter PE underbench tank	ZBITANK01

Description	Catalogue No.
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## Accessories

### Advanced Vent Filter

Advanced vent filter (for Elix® water purification systems)	TANKMPK01
Standard vent filter (for RiOs™ water purification systems)	TANKMPK02

### Automatic Sanitization Module

Milli-Q® Integral; Milli-Q® Direct, Elix® Advantage, and Elix® Reference water purification systems	TANKASMIN
ASM for RiOs™ / Elix® / AFS® Essential water purification systems	TANKASMES

### Air Gap Device

Air Gap Device	AIRGAP001
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### E-POD® Pure Water Remote Dispenser

E-POD® pure water dispenser	ZRXSP0D01
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### Washer Distribution Kit

Washer Distribution Kit (Left) 230 V	ZWDK5L100
Washer Distribution Kit (Left) 115 V	ZWDK6L100
Washer Distribution Kit (Right) 230 V	ZWDK5R100
Washer Distribution Kit (Right) 115 V	ZWDK6R100

### Water Sensor

Connection from the system	ZFWATDET4
Connection from the tap water source	ZFWATDET1 (120 V) or ZFWATDET2 (230 V)
Water sensor with cable	TANKLK002

### Lab Close Kit

Milli-Q® Integral; Elix® Advantage; Elix® Reference; and Milli-Q® Direct water purification systems	LABCLOSE1
RiOs™ / Elix® / AFS® Essential water purification systems	Included, setting to be activated



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**Use the above details to contact us if this literature doesn't answer all your questions.**

**Pricing on any accessories shown can be found by keying the part number into the search box on our website.**

The specifications listed in this brochure are subject to change by the manufacturer and therefore cannot be guaranteed to be correct. If there are aspects of the specification that must be guaranteed, please provide these to our sales team so that details can be confirmed.

