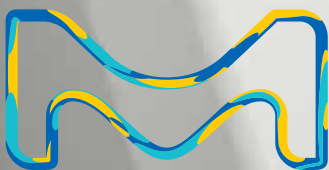


Milli-Q®
Lab Water

Milli-Q® HX 7000 Series High-Throughput Water Purification Systems

Connected, sustainable central pure water
solutions for up to 9000 L daily



The life science business of Merck operates as
MilliporeSigma in the U.S. and Canada.

MERCK

Milli-Q® HX 7000 series

A new range of high-throughput systems backed by decades of water purification expertise

Expertise to match today's changing laboratory environment

Laboratories around the world are evolving continually to keep pace with growing research requirements, new ways of sharing scientific information, the trend toward connectivity, and increasingly stringent environmental regulations. Adapting space and equipment to meet these new needs can be challenging for all involved.

As part of this process, your responsibilities may involve renovating or expanding existing labs — or planning, designing, and engineering entirely new facilities. In either case, you may need to specify water purification systems. That's where our expertise is key.

Merck has 50 years of experience in the water purification business. Our products are designed to improve the quality and reliability of results — from research laboratories to QA/QC laboratories in the pharmaceutical industry.

Based on our extensive knowledge of laboratory applications and equipment, pharmaceutical industry requirements, and water

purification technologies, we can help you select the appropriate water purification solution: a comprehensive total water purification package for a single laboratory, a suite of laboratories — or an entire laboratory building.

Our Milli-Q® HX 7000 water purification systems and SDS 500 (storage, protection and distribution systems) can be combined in compact and modular installations. One or more Milli-Q® HX 7000 systems can be provided in order to ensure the right water quality and quantity for each laboratory or department, and thus avoid very long distribution loops, which can encourage bacterial contamination.

Such installations are not only easier to maintain and sanitize, but also offer greater flexibility in the event that adjustments are required for future lab upgrades or configuration changes. There is also the added benefit of redundancy in case a system backup is ever required.

Point-of-use Milli-Q® IQ 7000 polishing systems can be added throughout the installation as needed, in order to meet ultrapure water quality needs for more sensitive applications.



A total water purification systems partnership

To meet a customer's specific requirements, we work closely with stakeholders throughout the different project stages. End-user scientists, architects, consultants, lab and facilities managers, as well as contractors and equipment suppliers all have their own criteria that must be evaluated before any decisions can be made.

We help establish key parameters for the installation, including water quality and quantity, industry standard requirements, and considerations for long-term laboratory use. We're your partner throughout the project.

A comprehensive solution to match your needs

Purified water is required for a wide range of applications within a laboratory facility. The water quality needed can range from general laboratory grade to ultrapure water matching the sensitivity of critical research and analytical techniques. In addition, the water quantity can vary from a few liters for a single end-user to several hundred or thousand liters per day for a laboratory facility.

Merck's Milli-Q® HX 7040/7080/7120/7150 range is designed for customers who require a few hundred liters to up to several thousand liters per day of analytical-grade water. Placed at the heart of a total pure water solution, an Milli-Q® HX 7000 high-throughput system and accompanying SDS 500 can be connected to additional components and accessories in order to build a comprehensive water purification system to match a customer's specific needs.



Merck is your partner of choice for total water purification systems — from conception and design, right through to engineering expertise and technical support services.

At the heart of your Total Pure Water solution

A total pure water solution consists of not just one system, but rather several integrated parts. At the heart of the solution, the Milli-Q® HX 7000 system serves as the nerve center for the entire water

purification chain, and provides total control of all functions, operating parameters and standard accessory components.

The Milli-Q® HX 7000 water purification system

The Milli-Q® HX 7000 system is the starting point for the installation. It functions as the makeup water system, using tap feed water purified by a combination of purification technologies to produce the required water quality in sufficient volume for use in all the laboratories.

An SDS 500 unit for storage, protection and distribution of pure water

- The SDS unit stores purified water from the Milli-Q® HX 7000 makeup system, helping to meet daily needs and cover peak periods of high demand from the labs. It is important to ensure that the Milli-Q® HX 7000 water production rate and the tanks are sized to meet the labs' daily and peak usage demands for purified water.
- The SDS unit also distributes and maintains top-quality pure water through the piping network at the correct flow rates and pressures. In-line UV lamps and integrated final 0.22 µm sterile filtration devices maintain/improve the quality of distributed water.

Point-of-use delivery and polishing

Throughout the piping distribution network, pure water can be used for a variety of purposes:

- Feed to instruments, clinical analyzers, dishwashers or autoclaves
- General glassware rinsing
- Buffer and media preparation
- Feed to high-throughput ultrapure water purification systems (Super-Q® systems) or point-of-use "polishing" systems, such as Milli-Q® IQ 7000 systems.



inside the Milli-Q® HX 7000



State-of-the-art complementary purification technologies

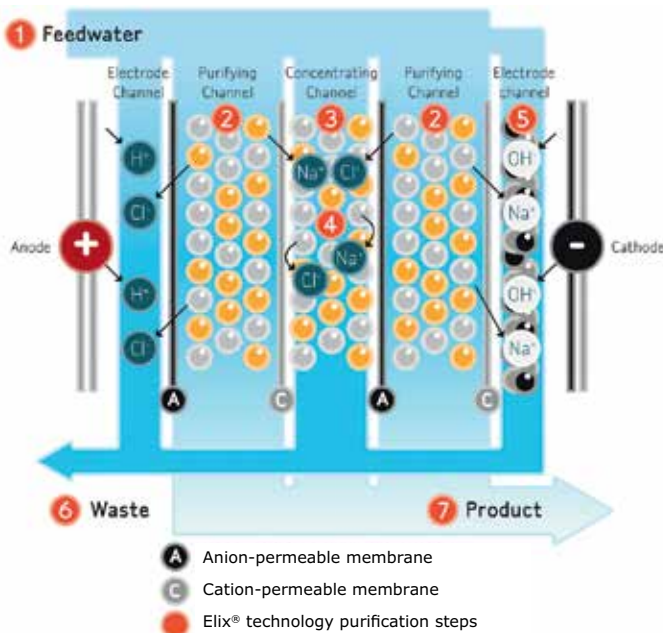
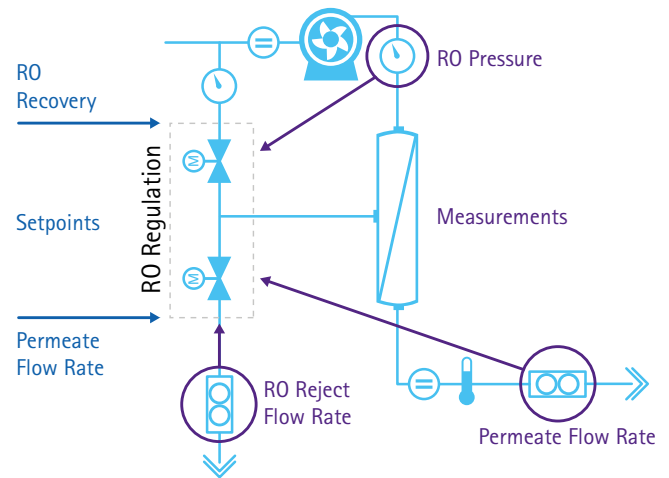
Progard® pretreatment packs combine several purification media to protect the Milli-Q® HX 7000 system by removing:

- Particles (0.5 µm filter)
- Free chlorine and colloids (activated carbon filter) from tap water

Other pretreatment such as backwashable carbon filters and ultrafiltration can be added depending on your feed water quality.

Advanced RO technology and Evolutive Reject Adjustment (ERA™)* technology decrease water consumption

- Advanced reverse osmosis removes 95-99% of ions and 99% of all dissolved organics (MW > 200 Dalton), microorganisms and particles.
- ERA™ technology uses an integrated calculator to optimize RO water recovery (between 45 and 75%) depending on feed water quality.
 - Production flow and water recovery rates remain constant regardless of feed water temperature.
 - No manual adjustment of valves is needed to maintain flow rate or protect RO cartridge lifetime.
 - Users save water, time and money.
 - Maintenance time is reduced, as well as the risk of human error.
 - System uptime is optimized and reliability increased.



The Elix® electrodeionization module ensures constant quality pure water, productivity and profitability

- Remaining ions are removed in the Elix® electrodeionization module, where ion-exchange resins are continuously regenerated by an electric field. No hazardous chemical regeneration or costly resin replacement is needed.
- There are no DI cartridges to change, which reduces maintenance time and ensures low and predictable running costs.
- Regardless of feed water quality (conductivity, CO₂ levels), or RO cartridge performance, both running costs and product water quality remain the same — there are no unexpected costs for users.
- Elix® patented technology does not require softeners; labs save space and maintenance time.

Merck's Elix® module: unique technology is based on anion- and cation-permeable membranes, high-quality ion-exchange resin, and activated carbon beads. Water produced by the Elix® module enters the tank with resistivity greater than 5 MΩ·cm @ 25 °C (typically up to 15 MΩ·cm @ 25 °C).

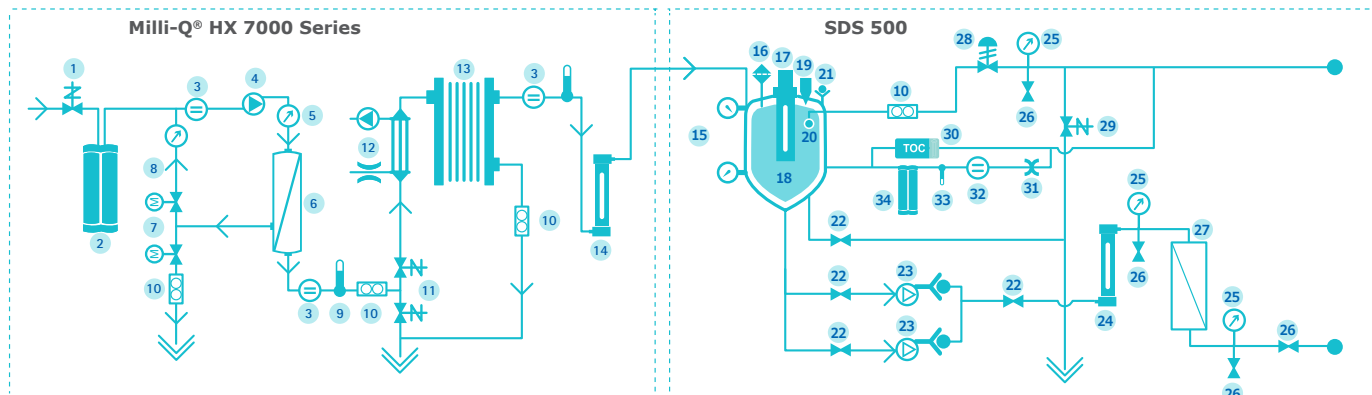
Ultraviolet (UV) lamp and final filtration for full bacterial control

- UV lamp sanitization occurs at three stages: during water production, storage in the SDS 500, and recirculation in the distribution loop. As a result, the water's bacterial count is reduced by a log reduction value of 4 (a bacterial count of 10,000 CFU/mL will be reduced to 1 CFU/mL irrespective of the system's nominal flow rate).
- A pharmaceutical grade Opticap® (0.22 μm) filter provides final filtration before water is delivered.
- Optimum-quality Elix® water can be used for bacteria-sensitive applications.

*Patent pending

Milli-Q® HX 7000 series

Water Purification Systems



- | | | |
|--|---|---|
| 1. Inlet valve | 13. Elix® module | 25. Pressure gauge |
| 2. Progard® pretreatment pack | 14. UV lamp (254 nm) | 26. Sampling valve |
| 3. Conductivity cell | 15. Tank level pressure sensors | 27. Opticap® filter (0.22 µm) |
| 4. RO pump | 16. Vent filter | 28. Back pressure regulator |
| 5. Pressure sensor | 17. Automatic Sanitation Module (ASM) (UV 254 nm; option instead of spray ball) | 29. Automatic loop rinsing valve |
| 6. RO cartridge | 18. Tank | 30. TOC monitor (option) |
| 7. Twin motorized valve - RO recirculation | 19. Overflow | 31. 4 LPM flow controller (option with Resistivity booster) |
| 8. RO circulation loop | 20. Spray ball | 32. Resistivity cell (option) |
| 9. Temperature sensor | 21. Check valve | 33. Temperature cell (option) |
| 10. Flow sensor | 22. Valve | 34. Resistivity booster (option) |
| 11. 3-way automatic rinsing valve | 23. Distribution pump(s) | |
| 12. Degassing unit (option) | 24. UV lamp (254 nm; option) | |



Full control of the installation and water quality parameters

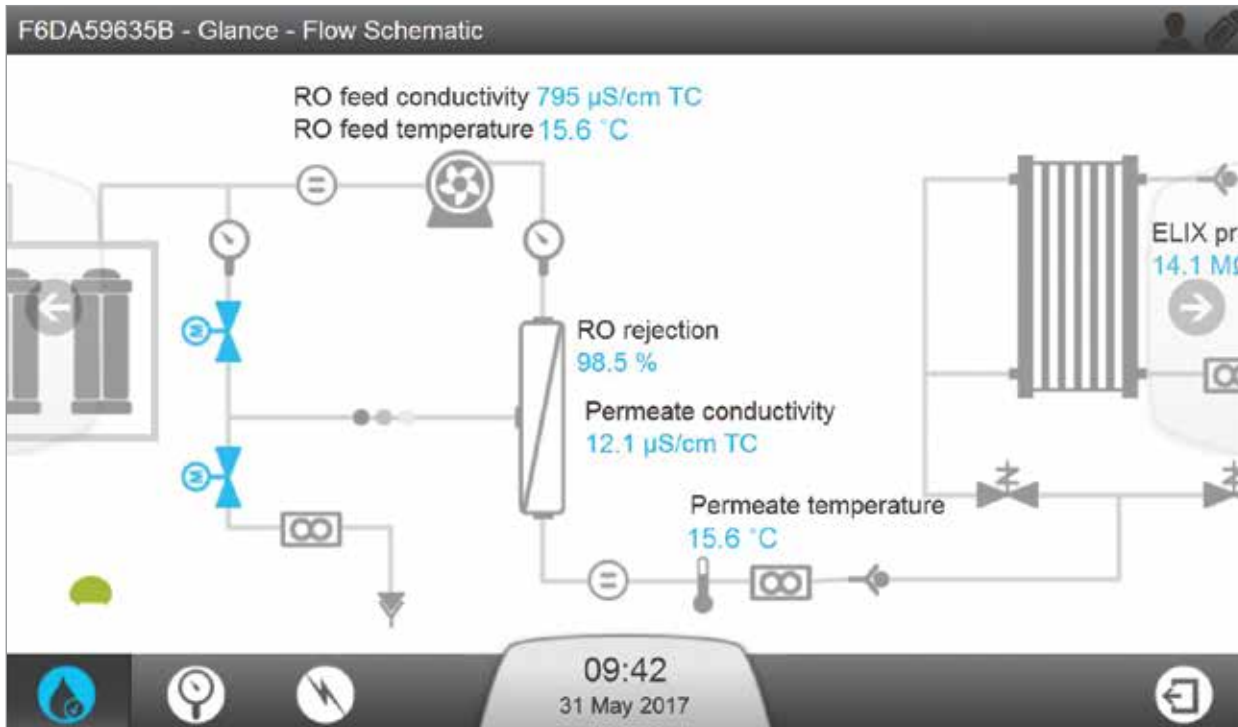
Milli-Q® HX 7000 systems drive and control all additional equipment needed in an installation, including:

- Single and duplex distribution pumps and their alarms
- Bactericidal UV lamp in the distribution loop*
- Automatic Sanitization Module (ASM)* on the SDS 500 unit
- Storage tank levels and alarms
- Vent and final filter consumable management
- TOC and resistivity monitoring in the distribution loop, depending on the configuration chosen
- Water detector to stop water production and distribution in case of a leak*
- Embedded web server technology compatible with LIMS and BMS via TCP/IP protocol; alarm outputs to LIMS/BMS for monitoring purposes

Following each purification step, the Milli-Q® HX 7000 system checks relevant parameters:

- Feed pressure, feed water quality
- RO pressure, RO water quality, RO membrane efficiency (% ion rejection)
- Elix® water: resistivity and temperature
- Water quality in the loop return (resistivity and/or TOC*) can also be checked by the system

* Available as an option



Compact SDS 500 storage unit protects water purity for efficient distribution

The SDS 500, with its state-of-the-art design, is the perfect companion for the Milli-Q® HX 7000 series of systems:

- Distribution flow up to 60 L/minute; single or duplex pump options
- Polyethylene tank with IR polypropylene piping
- Hermetically sealed lid with no overflow to drain prevents bacterial contamination
- Optional Automatic Sanitization Module (ASM) with integrated 254 nm UV lamp prevents bacterial and biofilm growth on tank inner surfaces
- Optional spray ball cleans the tank cover with high pressure
- Constant velocity in the loop limits biofilm buildup
- Cylindrical shape and conical bottom for full drainage
- Vent filter protects against airborne contaminants
- Differential pressure sensor for accurate level measurement
- Sanitary connection; sanitary sampling port located anywhere in the loop

superior communications interface, full connectivity and traceability

You can rely on the Milli-Q® HX 7000 system's superior connectivity to meet your current and future requirements.

All the details needed for daily operation of the Milli-Q® HX 7000 system are available at a glance. The system's large colored touchscreen allows users to navigate easily among several views that show data, including:

- Water production status
- Storage level
- Dispensing status
- Consumables exhaustion status
- Alarm and alert status

Information is displayed in a user-friendly, easy-to-read dashboard format.

System status zone

Large display shows water qualities and distribution process

Clear, visible status of all consumables



Notification zone for alerts and alarms

If a consumable change is required, the system will display a yellow, blinking alert 15 days in advance. Just touch the yellow alert to open a new screen...



... where a wizard will explain the maintenance procedure in easy, step-by-step instructions.





Traceability keeps your data always at hand

Water is a reagent whose quality must be documented for laboratories seeking accreditation (or reaccreditation) to the ISO® 15189: 2012 standard. Traceability of all system events, as well as electronic data archiving, facilitate compliance with worldwide regulatory guidelines and make the accreditation process easier.

Milli-Q® HX 7000 systems enable up to two years of data storage, which can be transferred via the network or USB key whenever needed. In addition, automatic electronic records are less time-consuming and less expensive to manage than their paper equivalents.

An ergonomic and patented pack locking system allows Progard® purification packs to be changed in seconds.

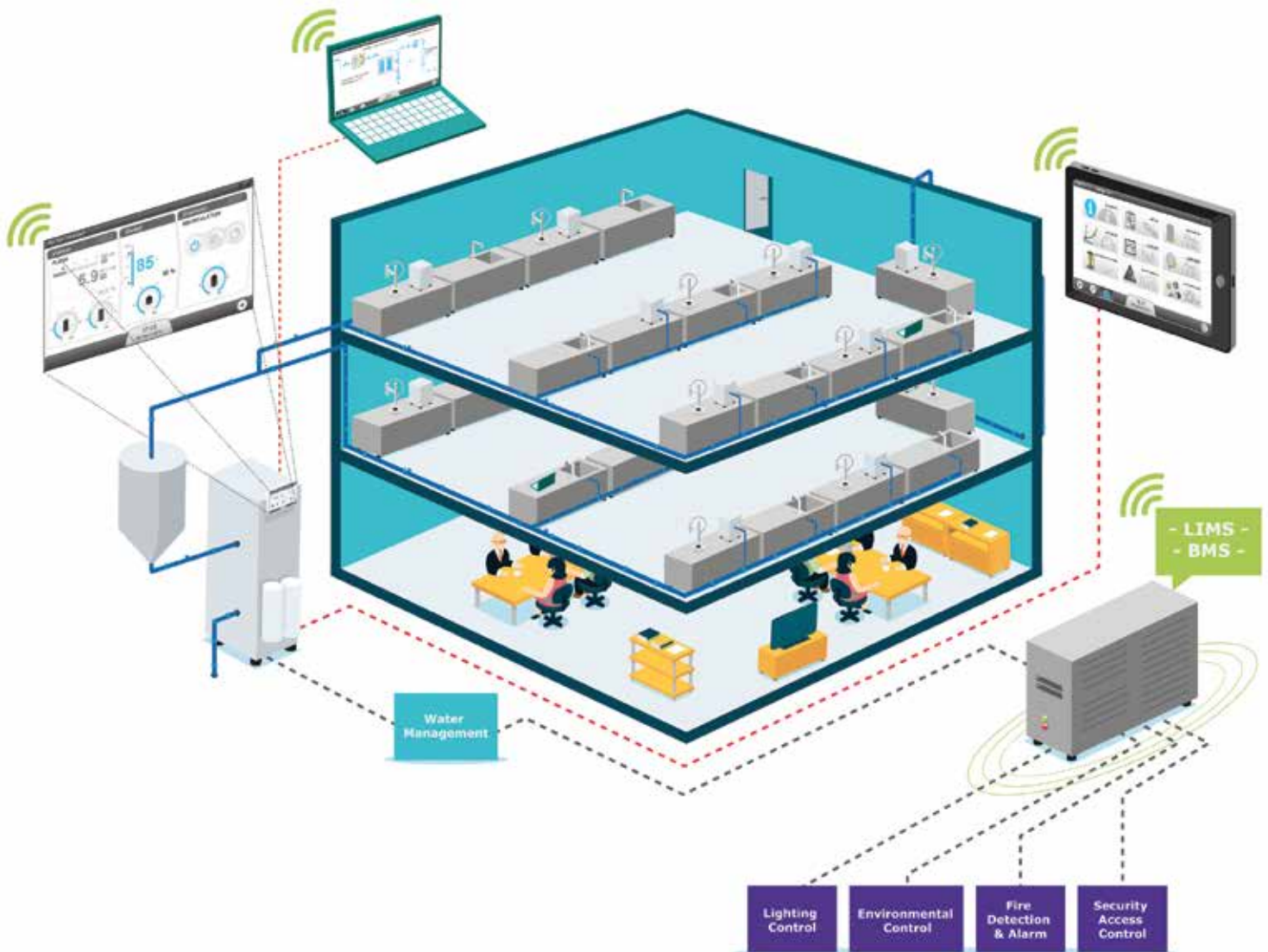


Connectivity provides flexible monitoring

Through the flexible system interface, users can view real-time web pages in order to monitor Milli-Q® HX 7000 system operations.

The system's full connectivity also offers authorized users remote monitoring 24/7 via a computer, tablet or smartphone. Up to three users can remotely access the system at the same time.

Risk management is provided through the Milli-Q® HX 7000 system's numerous adjustable set points, designed to trigger an alert or alarm in case of deviation. This proactive approach maximizes uptime for water purification and prevents breakdowns to ensure greater lab productivity.



The Milli-Q® HX 7000 water purification system can be controlled remotely by a PC or tablet device, and can be connected to a Laboratory Information Management System (LIMS) or Building Management System (BMS).

A sustainable solution, today and tomorrow

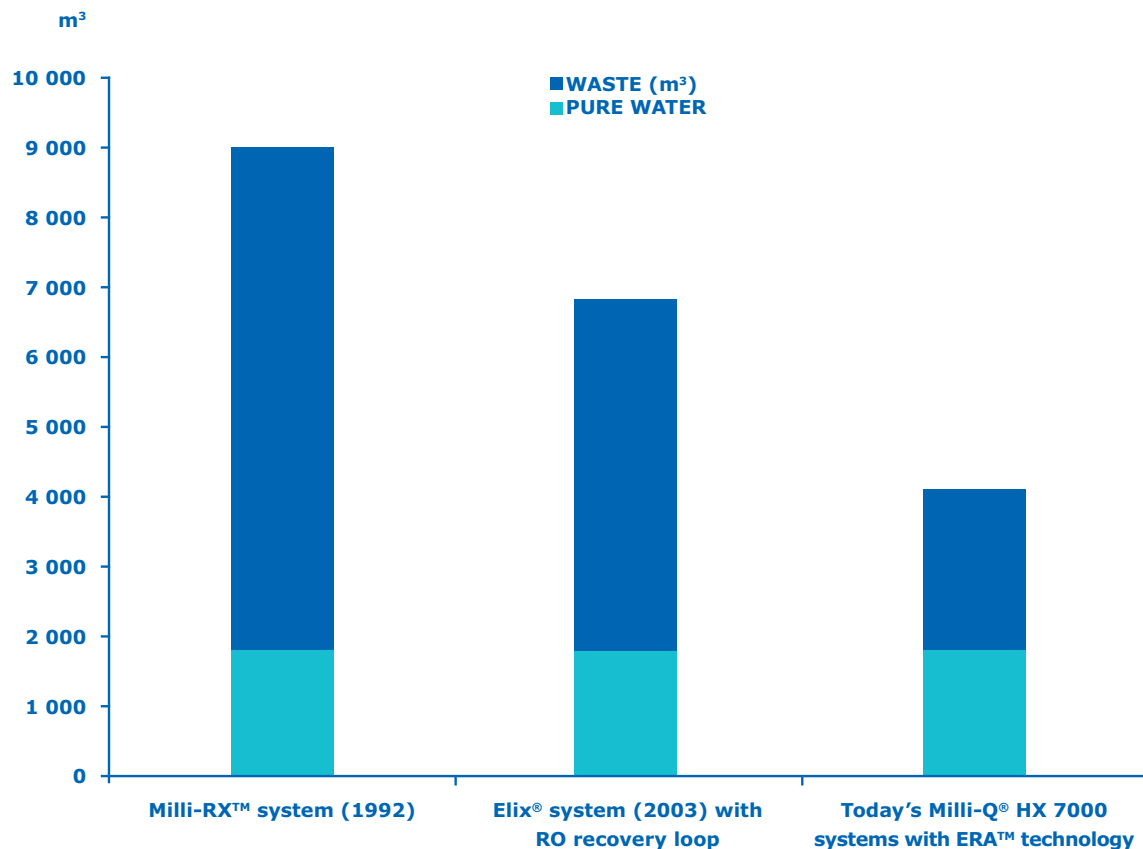
Merck is committed to environmental sustainability. Ongoing developments in Lab Water product stewardship underscore our determination not only to increase our own product sustainability, but also to help our customers move toward sustainable solutions themselves.

Our efforts include using optimized purification technologies that help decrease energy and water consumption, reducing packaging and documentation, and providing consumable recycling where possible.

The Milli-Q® HX 7000 series of systems incorporate patented Elix® technology, which provides constant-quality water without the need for resin cylinders, softeners, or conditioning systems. In addition, new

integrated ERA™ technology automatically optimizes water recovery based on feed water quality to decrease tap water usage — up to 50% compared to other high-throughput RO systems — reducing costs and helping protect valuable resources. The RO recovery loop also optimizes water consumption (between 45 to 75%) by recycling part of the water that has been rejected to the drain, thus further reducing water waste and also extending RO cartridge and Progard® pack lifetimes.

In a busy laboratory environment with a variety of equipment — often installed in a relatively small space — Milli-Q® HX 7000 systems also help reduce noise pollution with an operating noise level of less than 50 decibels (at a distance of one meter).



Over the last 25 years, Merck has dramatically reduced water purification system water consumption, enabling laboratories to save up to several thousand dollars per year on tap water expenses. The graph shows water

consumption and the split between purification system water and reject water for three Merck water purification systems over a seven-year period (production of 1000 L/day of pure water, 312 days per year).

Get unequalled quality of Milli-Q® services and support

Whether your project is a small laboratory renovation — or the design of a new laboratory building — it's critical to have full confidence in the expertise of your water purification supplier.

We're proud of our unequalled service offering, which allows us to pass along outstanding benefits to our Milli-Q® HX 7000 system users. Before installation, a certified Field Service Engineer will analyze the laboratory's feed water quality. Then during the installation procedure, the measured feed water parameters are programmed into Milli-Q® HX 7000 system memory, making it possible to optimize water recovery and maximize system performance.

Throughout the system's lifetime, we offer Milli-Q® service plans* that can be tailored to meet specific customer needs. Options range from a single annual preventive maintenance visit with replacement of aging parts, to full system coverage, including qualification, calibration, and verification services.

Count on us to support your project with state-of-the-art technologies and manufacturing excellence, wherever you are.

Final User / Laboratory

Architect, Engineer, Design & Facility Needs



- Configuration options based on the user's environment and specific needs (central or individual water purification solution with additional point-of-use systems)
- Selection of the optimal systems
- Support for loop design based on our 50 years of experience
- Design Qualification of the complete solution
- System installation
- Support for the loop sub-contractor

* Subject to subscription



Specific to pharmacopeia and accredited labs

Our stringent Quality system, product development process and manufacturing procedures ensure that our products are robust and reliable. Milli-Q® HX 7000 systems are manufactured in an ISO® 9001- and ISO® 14001-registered site. Additionally, to ensure efficiency and safe operation, systems are

IEC-certified (CE, cULus, FCC, EAC). Furthermore, to reduce environmental impact, all Milli-Q® HX 7000 systems follow European Restriction of Hazardous Substances (RoHS) and Waste Electrical and Electronic Equipment (WEEE) directives.

Needs



Full Solution Qualification



- Installation Q
- Operational Q
- Maintenance Procedure
- Calibration
- Verification

Training

- Users
- Maintenance Department
- Quality controller & assurance expert



Lifetime Services

- Milli-Q® Service Plans*
- Technical support hotline
- Maintenance Protocol
- Traceability



Technical Appendix

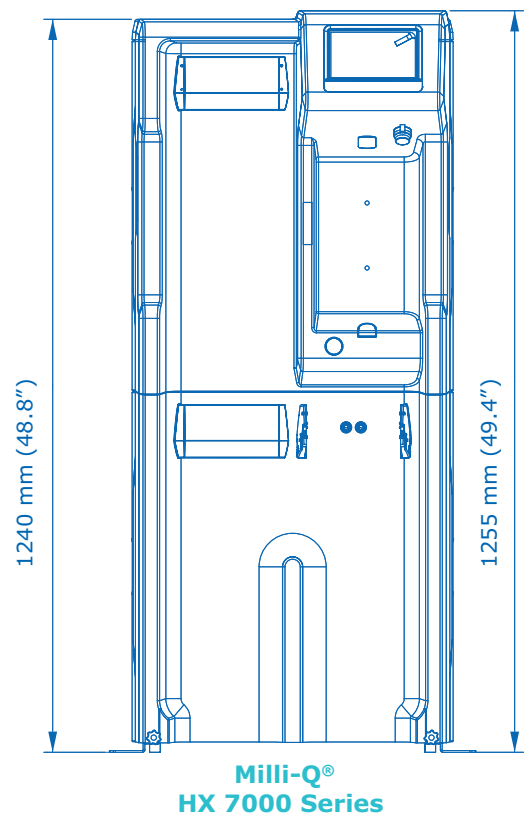
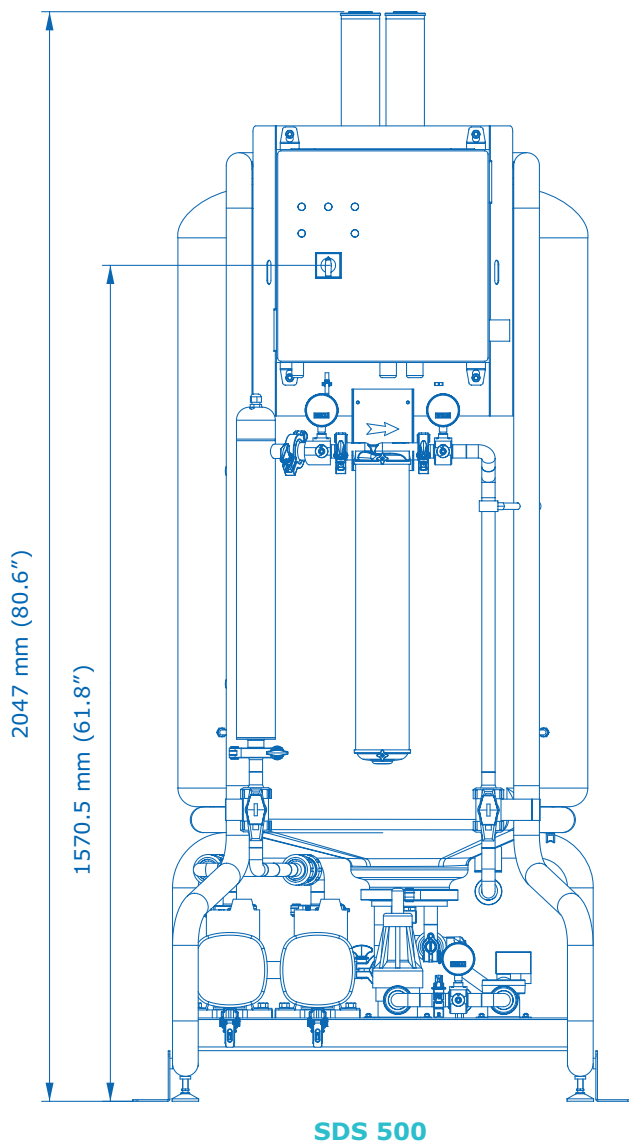


Milli-Q® HX 7000 series system paired with the SDS 500

Milli-Q® HX 7000 series

Type 2 Water Purification Systems

System Dimensions



Milli-Q® HX 7000 series

Type 2 Water Purification Systems

Feed Water Requirements

| Parameter | Value or Range |
|--|--------------------------|
| Pressure | 2 – 6 bar |
| Flow rate | > 10 L/min at 2 bar |
| Feed water type | Potable water |
| Temperature | 5 – 35 °C |
| Conductivity | 10 – 2000 µS/cm at 25 °C |
| pH | 4 – 10 |
| Hardness (as CaCO ₃) | < 300 ppm |
| Silica concentration | < 30 ppm |
| Carbon dioxide concentration (CO ₂) | < 30 ppm |
| Langelier Saturation Index (LSI) | < 0.3 |
| Fouling Index (FI _s) or Silt Density Index (SDI) | ≤ 7(*) |
| Total Organic Carbon (TOC) | < 1 ppm |
| Free chlorine for Milli-Q® HX 7040 LC, 7080 LC, 7120, 7150 systems | < 1.5 ppm |
| Free chlorine for Milli-Q® HX 7040 HC, 7080 HC systems | < 1.5 ppm – 3 ppm |

* < 12 when the optional UF pretreatment is installed.

Milli-Q® HX 7000 Series Performance

| Parameter | Value or Range |
|----------------------------|---|
| Resistivity | > 5 MΩ.cm @ 25 °C (10-15 MΩ.cm @ 25 °C typically) |
| Conductivity | < 0.2 µS/cm @ 25 °C |
| Total Organic Carbon (TOC) | Typically < 30 ppb |
| Microorganisms | < 10 CFU/mL |
| Dissolved silica | < 3 ppb (rejection >99.9%) |

Electrical Specifications

| System Type | Voltage / Frequency | Power Consumption (VA) |
|-----------------------|-----------------------|------------------------|
| Milli-Q® HX 7040/7080 | 220-240 VAC, 50/60 Hz | 750 |
| | 120 VAC, 60 Hz | 775 |
| | 100 VAC, 50/60 Hz | |
| Milli-Q® HX 7120/7150 | 220-240 VAC, 50/60 Hz | 870 |
| | 120 VAC, 60 Hz | 900 |
| | 100 VAC, 50/60 Hz | |

General Specifications

| | |
|------------------------|---|
| Noise level | < 50 dB at 1 meter |
| Communication protocol | TCP/IP/CGI, embedded web server and HTML 5 embedded website* |
| Communication ports | Ethernet, USB 2.0 |
| Languages | English, French, Spanish, Portuguese, Italian, German, Russian, Chinese, Japanese |

* No additional software needed for remote control.

Dimensions and Weights

| | Milli-Q® HX 7040 | Milli-Q® HX 7080 | Milli-Q® HX 7120 | Milli-Q® HX 7150 |
|----------------------------------|--|------------------|------------------|------------------|
| Dimensions (H x W x D) footprint | 1 240 x 543 x 542 mm (48.8 x 21.4 x 21.3 in) | | | |
| Shipping weight | 97 kg (213 lb) | 105 kg (231 lb) | 113 kg (249 lb) | 124 kg (273 lb) |
| Dry weight | 78 kg (172 lb) | 86 kg (190 lb) | 94 kg (208 lb) | 105 kg (232 lb) |

SDS 500

Storage, Protection & Distribution System

SDS 500 Specifications

| | |
|----------------------------|--|
| Tank volume | 500 L (132 Gallons) |
| Usable water volume | 400 L (105 Gallons), <i>an additional volume of 100 L is reserved for low and high level security</i> |
| Weight (filled with water) | 660 kg (1455 lb) |
| Weight (empty) | Up to 140 kg (308 lb) |
| Dimensions H x W x D | 2047 x 790 x 1082 mm (80.6 x 31.1 x 42.6 in) |
| Floor space required | 0.85 m ² (9.15 ft ²) |
| Noise level | E.g. 45.5 dB @ 1m (BPR = 1.5b / flow rate 20 L/min) E.g. 54.7 dB @ 1m (BPR = 4b / flow rate 40 L/min) |

Pump Performances (Variable speed pumps)

| Voltage / Frequency | Pump Performances |
|---------------------|---------------------------------|
| 220-240 V, 50/60 Hz | Nominal: 16-40 LPM @ 1-4 bar |
| 110-127 V, 50/60 Hz | 4-9 GPM @ 14-58 psi |
| 200 V, 50/60 Hz | Nominal: 16-40 LPM @ 1-3.5 bar* |
| 100 V, 50/60 Hz | 4-9 GPM @ 14-50 psi* |

* At 90V, performance is reduced to 16-40 LPM @ 1-3 bar (4-9 GPM @ 14-43 psi).

Electrical Specifications

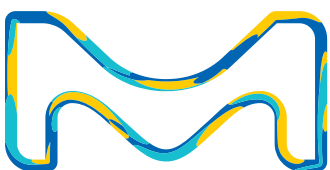
| Voltage / Frequency | Maximum Power Consumption | Maximum Intensity |
|---------------------|---------------------------|-------------------|
| 220-240 V, 50/60 Hz | 2100 VA | < 9A |
| 100-127 V, 50/60 Hz | 2000 VA (120 V) | < 16A |
| | 2000 VA (100 V) | < 20A |

Materials

| | |
|------------------------|--|
| Tank | Medium density polyethylene (MDPE) |
| Frame | Epoxy painted passivated steel |
| Valves and fittings | Polypropylene, polyamides, EPDM |
| Piping | Beta Polypropylene Homopolymer (Beta PP-H) |
| Pump wetted parts | 316 SST and tungsten carbide / carbon and EPDM seals |
| BPR wetted parts | Polypropylene, EPDM, PTFE |
| Pressure gauge | Inox 316 L |
| Other mechanical parts | Polyethylene terephthalate (PETP) |

Plumbing Connections

| | |
|--------------------------|--------------------|
| Pure water inlet to tank | 3/4" Sanitary TC |
| Tank drain | 1 1/2" Sanitary TC |
| Tank loop inlet/return | 1 1/2" Sanitary TC |



For more information on the Milli-Q® HX 7000 series of systems,
including options and accessories, please visit our website:
merckmillipore.com/labwater