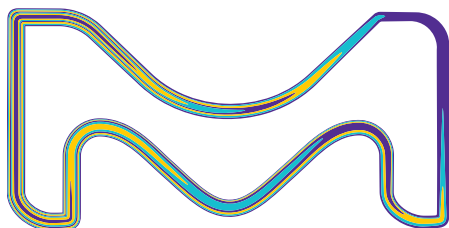


RiOs™ Essential 5, 8, 16, 24 Water Purification Systems

A reliable, user-friendly pure water solution



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

Milli-Q®
Lab Water Solutions

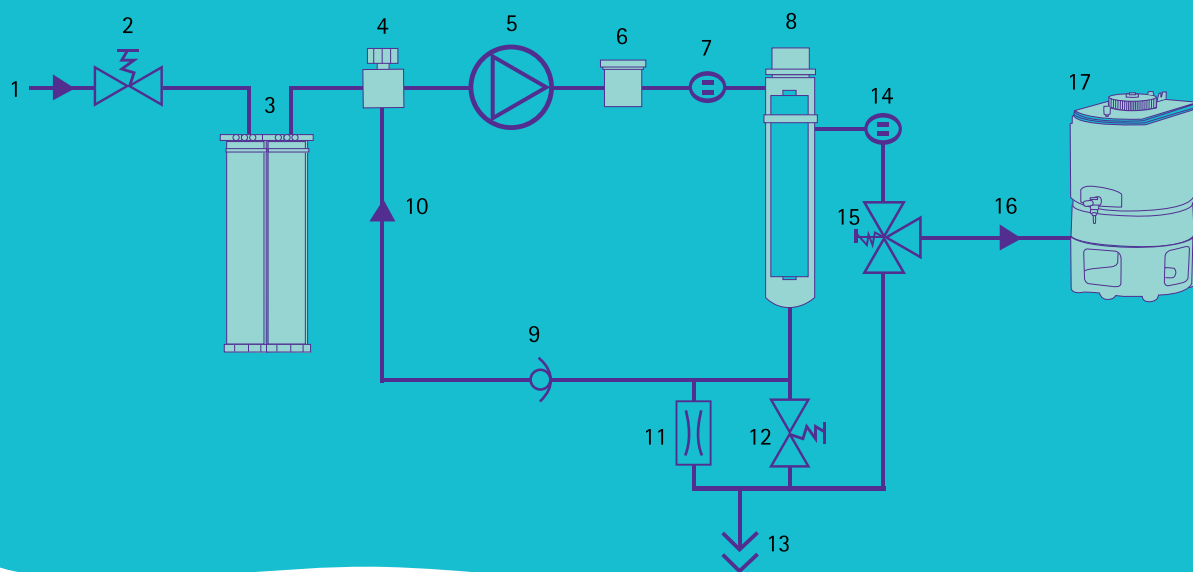
A reliable, user-friendly pure water solution

For Type 3 pure water needs, up to 480 L/day

| Your water purification needs | Our solution: The RiOs™ Essential range of water purification systems |
|---|--|
| Reliable, constant production of high-quality Type 3 pure water | Complementary water purification techniques, including pretreatment and high-performance reverse osmosis (RO) membranes , enable reliable production of Type 3 pure water. Temperature compensation ensures dependable, constant flow rates. |
| Full control over your water production facility | Essential water quality information is shown on the system display, including key water quality parameters measured by the system's monitoring equipment . RFID technology provides pack traceability . |
| User-friendly operation | Intuitive controls simplify system use, providing just the information required . System alert and alarm icons are shown on a color-coded backlit LCD display to clearly show message importance. Optional Millitrack® software provides data management, archiving and remote access capabilities. |
| A robust, low-maintenance system | Benefit from established RO technology and automatic RO self-maintenance functions . There is just one Progard® pretreatment pack to change on the system, and a new, ergonomic pack locking system lets users do this quickly and easily. |
| Easy installation | Systems have a small footprint , enabling convenient installation on or under the bench, or on a wall to make the best use of laboratory space. |
| Low running costs | The RO water recovery loop increases pretreatment pack lifetime, and also decreases water consumption by 50% or more compared to standard RO systems. |
| Confidence in your water purification system supplier | We are a partner you can count on. Our systems are manufactured in an ISO®-registered site , and Milli-Q® Service Plans offer a full range of support . |

RiOs™ Essential Systems Water Purification Pathway

- | | | |
|-------------------------------|---------------------------------|--------------------------------|
| 1. Feed Water | 7. Feed Water Conductivity Cell | 13. Reject |
| 2. Inlet Solenoid Valve | 8. RO Membrane | 14. Permeate Conductivity Cell |
| 3. Progard® Pretreatment Pack | 9. Check Valve | 15. Permeate Divert Valve |
| 4. Pressure Regulator | 10. Reject Water Recovery Loop | 16. Product Water |
| 5. Pump | 11. Capillary Tubing | 17. Reservoir |
| 6. Sanitization Port | 12. Flush Solenoid Valve | |



RiOs™ Essential systems

Reliable, constant production of high-quality Type 3 pure water

RiOs™ Essential water purification systems are ideal for the production of laboratory-grade water, which is particularly suitable for use in glassware rinsing, hydroponics, water baths, and as feed water for humidifiers, autoclaves, glassware washers, washing machines, and Milli-Q® ultrapure water systems.

By filtration through a Reverse Osmosis (RO) membrane, RiOs™ Essential systems ensure the

removal of all contaminants initially present in potable water. The semi-permeable RO membrane is protected from clogging by a Progard® pretreatment pack, which contains a combination of three purification media.

The water produced is always of optimal quality; each time the system is restarted, water is rejected until its quality meets the required expectations.

| Performances | RiOs™ Essential 5 | RiOs™ Essential 8 | RiOs™ Essential 16 | RiOs™ Essential 24 |
|---|-------------------|-------------------|--------------------|--------------------|
| Daily needs (L) | 30 to 100 | 80 to 160 | 160 to 320 | 240 to 480 |
| Product flow rate (L/h ± 15%) 7 °C < T < 35 °C | 5 | 8 | 16 | 24 |
| System recovery % | 32.1 | 32.1 | 43.1 | 39.0 |

The RiOs™ Essential system, step by step



The robust RiOs™ Essential systems have been developed to ensure reliable, constant production of high-quality Type 3 pure water. These robust systems incorporate complementary water purification techniques including pretreatment and high-performance RO membranes.

Pretreatment protects the system

In the RiOs™ Essential system water purification sequence, potable tap water is first treated with a Progard® pretreatment pack. This first purification step protects against:

- Particles and colloids (depth filter)
- Free chlorine and colloids (activated carbon)
- Hardness, via an anti-scaling agent that protects the RO membrane

Advanced reverse osmosis

Advanced RO is a particularly effective technique for obtaining good water purity, removing 95–99% of inorganic ions and 99% of all dissolved organic substances (MW > 200 Dalton), in addition to microorganisms and particles.

RiOs™ Essential systems incorporate two advanced features that provide major benefits for users:

- **Reduced water waste** is achieved by recycling part of the reject water to the RO membrane feed water stream, which decreases water consumption by 50% or more compared to standard RO systems.
- **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. Unlike these other systems, RiOs™ Essential systems benefit from temperature compensation, which ensures a dependable and constant flow rate. As temperature decreases, RiOs™ Essential system pump pressure increases to maintain a steady production rate, ensuring that pure water is always available when you need it, and enabling the system to adapt to a wide range of feed water types.

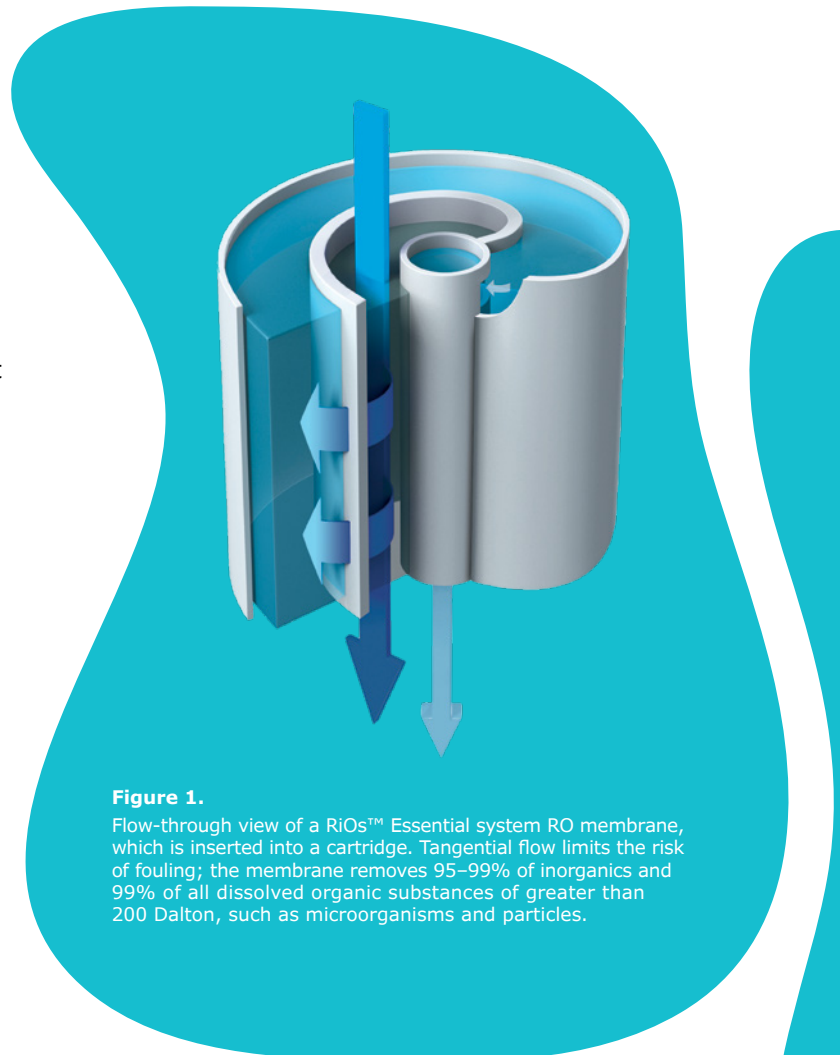


Figure 1. Flow-through view of a RiOs™ Essential system RO membrane, which is inserted into a cartridge. Tangential flow limits the risk of fouling; the membrane removes 95–99% of inorganics and 99% of all dissolved organic substances of greater than 200 Dalton, such as microorganisms and particles.

Full control over your water production facility

Essential water quality information is shown on the system's **easy-to-read backlit LCD display**, including the key water quality parameters that are measured by the system's monitoring equipment (product water resistivity/ conductivity compensated to 25 °C and tank level).

To enable optimized control of water quality and self-maintenance functions, RiOs™ Essential systems **check important relevant parameters**:

- Feed water pressure, feed water quality, feed water temperature
- RO pressure, RO water quality and RO membrane efficiency (% rejection of ions), RO water temperature

RFID technology provides further control by preventing insertion of an incorrect purification cartridge in the RiOs™ Essential system, and also by ensuring traceability of pack use and replacement.

When your RiOs™ Essential system will not be used for a long time, the **"Lab Closed"** function lets you maintain water quality by periodic automatic flushing and rinsing.



User-friendly operation

RiOs™ Essential systems have been designed for **easy, effortless operation**. Intuitive controls on the system cabinet simplify use, and provide essential details — you see just the information you need. When necessary, icons inform users of any actions that should be performed, such as routine maintenance reminders (i.e., changing the Progard® pack, sanitizing the system), or taking corrective measures in case of an alert or alarm.

To ensure optimal system operation, maintenance alerts or alarms are visually signaled by color changes of relevant icons and the backlit LCD screen.

- For example, 15 days before the purification pack should be replaced, the Progard® icon turns yellow. As the date for pack change approaches, the LCD screen switches from its normal blue background color to yellow.
- For more important warnings, the screen turns red to indicate an urgent action is required.
- When there has been no user interaction with the screen for 15 minutes, and there is no alert or alarm, the system's "ECO" mode screen saver is activated automatically.

For even greater flexibility, **optional Millitrack® software** is available for system users who would like to benefit from enhanced data management control, remote access capabilities and long-term electronic archiving provided by an interactive web interface.

Additional information on system operation and maintenance is provided by the Quick Reference Guide and User Manual stored on the water production unit.

A robust, low-maintenance system

RiOs™ Essential systems integrate **established advanced RO technology and automatic RO self-maintenance** functions. The systems are robust and require little maintenance, leaving you free to concentrate on your laboratory work. Clear instructions, alerts and alarms make it easy to keep your system in optimum condition.

There is just one Progard® purification pack to change — and the system's new **ergonomic pack locking system** makes this easier than ever to do. Just pull up on the locking handle to remove the exhausted pack,

position the replacement pack in the cabinet, and push down on the handle to lock the new pack in place — it's as simple as that! This is followed by an automatic 15-minute flush cycle, and your system is once again ready for use.

Automatic self-maintenance functions (e.g., flush mode, rinsing mode, sanitization cycle) keep the system's RO membrane in top operating condition, and ensure optimal water quality. System sanitization is recommended approximately four times a year, and takes just a few minutes to perform.

Easy installation

A complete range of RiOs™ Essential systems and specially designed storage reservoirs are available to meet the needs of laboratories requiring anywhere from 30 to 480 L of pure water per day. With their **small footprint**, RiOs™ Essential systems are designed to make the best use of laboratory space. Systems can be placed on or under the bench or wall-mounted, depending on your needs. Larger installations, based on the same principle, are also available for users with higher needs.

Select from a range of **high quality polyethylene reservoirs** (30–100 L) to match your water usage. For storage of larger volumes of water, 200 L and 350 L SDS (Storage & Distribution System) reservoirs are also available.



Low running costs

Budget-conscious users will also appreciate RiOs™ Essential systems for their low running costs:

- Only a **single Progard® pretreatment pack** is needed to remove particles, free chlorine and colloids from tap water.
- Compared to standard RO systems, the RiOs™ Essential system's **efficient RO-reject water recirculation loop** decreases tap water consumption by 50% or more, and also doubles the lifetime of the Progard® pack, as the recovered water has already been pretreated.
- The entire pretreatment sequence, as well as the self-maintenance functions and cleaning cycles for the RO membrane, ensure optimum final water quality. Consequently, the RO membrane lifetime is extended, which results in decreased running costs.

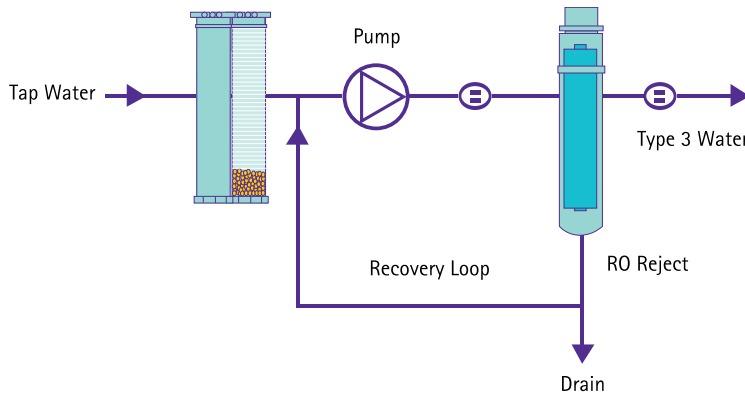


Figure 2. Advanced RO technology with high water recovery reduces water consumption by 50% or more. Some of the rejected water is recycled to the RO membrane feed downstream of the Progard® cartridge, making our RO systems best-in-class in terms of economical and environmental impacts.

Confidence in your water purification system supplier

As one of the top three R&D investors in the Life Science Tools industry and with more than 50 years of experience in water purification systems manufacturing, we are a partner you can count on.

RiOs™ Essential systems are manufactured in an ISO® 9001- and ISO® 14001-registered site*, and are certified for safety and electro-magnetic compatibility (CE, cUL, FCC).

Additionally, to optimize the performance and lifetime of your water purification system, we offer a complete portfolio of Milli-Q® Service Plans ranging from a single annual checkup to full system coverage.

* Certificates are available upon request.

Feed Water Requirements

| | |
|-----------------------------|-------------------|
| Water quality | Potable tap water |
| Temperature | 5-35 °C |
| Fouling index | < 12* |
| Free chlorine | < 3 ppm |
| Minimum feed water pressure | 1.0 bar |
| Maximum feed water pressure | 6.0 bar |

* If the Fouling Index is ≥ 12, additional pre-filtration is recommended.

RiOs™ Essential System Specifications

| Pure (Type 3) Product Water Quality | RiOs™ Essential Systems |
|-------------------------------------|-------------------------|
| Product flow rate ±15%, 7-35 °C | 5, 8, 16 or 24 L/h |
| Ionic content | Typical rejection > 95% |
| Organics & Particulates | Typical rejection > 99% |

System Information

| | |
|-----------------------------|--|
| Dimensions (H x W x D) | 470 x 268 x 339 mm (18.50 x 10.55 x 13.35 in.) |
| Net weight | 10.9-12.1 kg (23.9-26.7 lb) |
| Operating weight | 14.4-15.7 kg (31.7-34.5 lb) |
| Electrical feed voltage | 100-230 V ± 10% |
| Electrical feed frequency | 50-60 Hz |
| Tap (feed) water connection | 1/2" Gaz M |

Milli-Q®

Lab Water Solutions

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64293 Darmstadt, Germany

[MerckMillipore.com/labwater](https://www.MerckMillipore.com/labwater)

To place an order or receive technical assistance in Europe, please call Customer Service:

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Spain: 901 516 645 Option 1

Germany: 069 86798021

Switzerland: 0848 645 645

Italy: 848 845 645

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