



MILLIPORE

RiOs™ Water Purification system

The Standard for Laboratory-Grade Water



ADVANCING LIFE SCIENCE TOGETHER™
Research. Development. Production.

THE LABORATORY-GRADE WATER SOLUTION

RiOs water purification systems are ideal for the production of laboratory-grade water, which is particularly suitable for glassware rinsing, feed water for humidifiers, autoclaves, washing machines and Milli-Q® ultrapure water systems.

RiOs 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 allows total control over the water produced at a low operating cost. Bench-operated, wall-mounted or bench-integrated, RiOs systems are designed to fit your space requirements.

A complete range of RiOs systems and specially designed storage reservoirs are available to meet the needs of laboratories requiring anywhere from 10 to 300 liters of pure water per day. Larger systems, based on the same principle, are also available for users with needs of up to 5000 liters per day.



BENEFITS THAT COUNT

High performance RO systems

By filtration through a Reverse Osmosis (RO) membrane, RiOs systems ensure the removal of all contaminants initially present in potable water (as shown in the table). The semi-permeable RO membrane is protected from clogging by using a pretreatment pack that contains a combination of complementary technologies. The water produced in the reservoir is always of optimal quality; each time the system is restarted, water is rejected until its quality meets the required expectations.

Contaminant	Rejection*	Passage*
Ions	94-99%	1-6%
Organics	≥ 99%	≤ 1%
Particles	≥ 99%	≤ 1%
Microorganisms	≥ 99%	≤ 1%

* Typical Values

Facilitating work

- Pure water is always available and no longer depends on the temperature of the feed water. RiOs systems provide water with a constant flow rate.
- A unique and easy-to-install prefiltration pack unit (plug-and-use concept) includes three types of purification media.
- The reverse osmosis membrane is self-maintaining due to the automatic flushing cycles.
- System functions are easily accessible by a user-friendly keypad. The information is displayed in the chosen language on an easy-to-read alphanumeric backlit display. The screen angle can be adjusted.

Reduced operating costs

- Advanced reverse osmosis technology reduces water consumption by more than 50 % due to the high recovery loop, and doubles the lifetime of the pretreatment pack as the recovered water has already been pretreated.
- Replacement of the pretreatment pack is calculated based upon the actual amount of water pretreated.
- The entire pretreatment sequence results in a long life expectancy for the RO membrane, thus decreasing running costs.

RiOs systems are designed to always keep pace with possible changes in laboratory requirements. All systems can be upgraded to a higher flow rate. In addition, by adding an Elix® module, a RiOs system can be changed to an Elix system, providing the laboratory with analytical-grade water.

THE RIOS SYSTEM STEP BY STEP



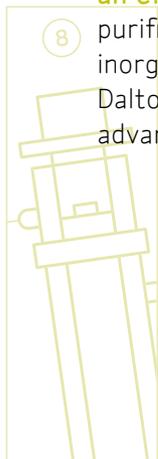
3 Pretreatment

to protect the system. The first purification step using the Progard® pretreatment pack removes:

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

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

8 Advanced Reverse Osmosis



an effective technique to obtain good water purity. In the second purification step, reverse osmosis technology removes 94-99 % of inorganic ions and 99 % of all dissolved organic substances (MW>100 Dalton) in addition to microorganisms and particles. Two built-in advanced features result in major benefits:

- High water recovery is achieved by recycling part of the reject water to the RO membrane feed water 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 RiOs systems, as the temperature decreases, pump pressure increases to maintain a steady product flow rate.

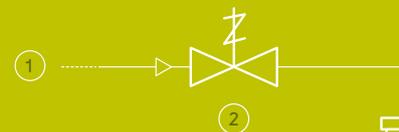


16 Ultraviolet Lamp*

for very low bacteria levels. For all applications where bacterial contamination is a significant factor, RiOs systems can be equipped with a UV module. During the last purification 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 RiOs system produces optimum water quality for applications sensitive to bacteria.

* optional

Flow schematic

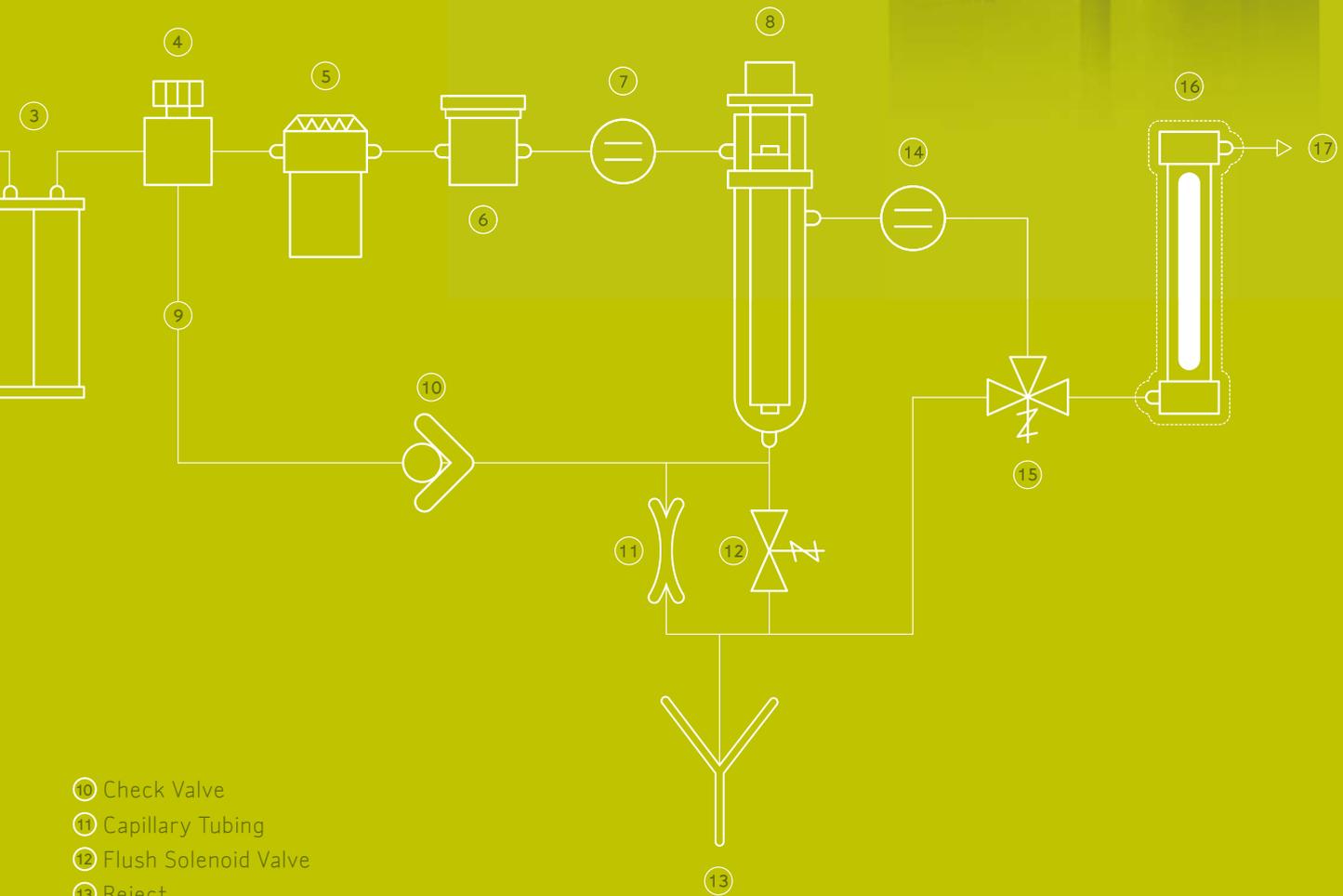


- ① Feed water
- ② Inlet Solenoid Valve
- ③ Progard Pack
- ④ Pressure Regulator
- ⑤ Pump
- ⑥ Sanitization Port
- ⑦ Feed water Conductivity Cell
- ⑧ RO Cartridge
- ⑨ Reject Water Recovery Loop

Optimized control of water quality

After each purification step, relevant parameters are checked.

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



- ⑩ Check Valve
- ⑪ Capillary Tubing
- ⑫ Flush Solenoid Valve
- ⑬ Reject
- ⑭ Permeate Conductivity Cell
- ⑮ Permeate Divert Valve
- ⑯ UV Lamp (optional)
- ⑰ Product Water

RELIABLE WATER QUALITY

RiOs systems are easy to operate - just turn the system on for automatic water production and monitoring of water quality. All system functions are easily viewed on the built-in backlit display. All RiOs systems are manufactured in an ISO® 9001 v. 2000 and ISO 14001 certified manufacturing site.

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 water quality, and are completely visible to the user on the display:
 - Automatic flush mode - cleans the RO membrane surface with a high water flow
 - 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 feed water quality)

RiOs systems are adapted to GLP requirements

GLP (Good Laboratory Practices) requires the recording and storage of laboratory data to ensure traceability. Historical data stored in the system memory can be displayed or printed out. The RiOs system built-in real-time clock guarantees complete traceability, with the date and time appearing on all reports delivered by the system. RiOs systems are developed for ease-of-use in a validated laboratory environment. Our qualification program provides the necessary workbooks and certificates, and is thoroughly supported by Millipore's certified Field Service Support Engineers.



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PRES:4.3bar 70%
START AUTOCLEAN
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PRES:4.3bar 70%
PERMEATE: 4.0µS
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Examples of messages from the RiOs system:

- Conductivity of feed water (compensated to 25 °C)
- Conductivity of reverse osmosis permeate (compensated to 25 °C)
- Percentage of ions rejected by the reverse osmosis membrane (%)
- Water temperature
- Change Pack
- Progard Pack not in place
- Feed water pressure too low

TOTAL WATER SOLUTIONS

Millipore not only supplies the laboratory with laboratory-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. 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 CO₂ 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

From pure water to ultrapure water

For more sensitive applications, the addition of a Milli-Q ultrapure water system - fed with RiOs system water - guarantees optimum Type I, reagent-grade water quality. Additional information about our range of ultrapure water systems 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.



Specifications

Performances	RiOs 5	RiOs 8	RiOs 16
Daily Needs	30 to 100 liters	80 to 160 liters	160 to 320 liters
Product flow rate 7 °C < T < 30 °C	5 l/h ± 15 %	8 l/h ± 15 %	16 l/h ± 15 %
Water recovery	25 %	28 %	38 %

General system characteristics

Dimensions	457 x 255 x 315 (mm) (height x width x depth) (18" x 10" x 12.4")
Operating weight	RiOs 5: 14 kg (31 lb) RiOs 8: 14 kg (31 lb) RiOs 16: 15 kg (33 lb)
Electrical requirements	120 V/230 V - 50/60 Hz
Electrical consumption	RiOs 5, 8 & 16: 70 W maximum

Feed water requirements

Water quality	Potable tap water
Temperature	2 to 35 °C
Fouling index	Progard 1: < 5 Progard 2: < 12*
Free chlorine	Progard 1: < 1 ppm Progard 2: < 3 ppm
Minimum feed water pressure	RiOs 5, 8, 16: 1.0 bar (15 psi)
Maximum feed water pressure	6.0 bar (90 psi)

* If the Fouling index is > 12, additional pre-filtration is recommended.

Monitoring standards

Cell Constant of Measuring Cells	
Feed water conductivity	0.35 cm ⁻¹
Permeate conductivity	0.35 cm ⁻¹

Additional Standard	
Product water temperature	0.1 °C
measurement resolution	
Electronic connection	RS232 out port

Millipore offers more innovative technologies and stronger application support to streamline processes and provide consistently reliable results. Our Lab Water experts take the time to evaluate the needs of individual labs and particular applications in order to recommend a system that balances water quality with volume and distribution requirements, removing water quality concerns so customers can focus on their research.



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