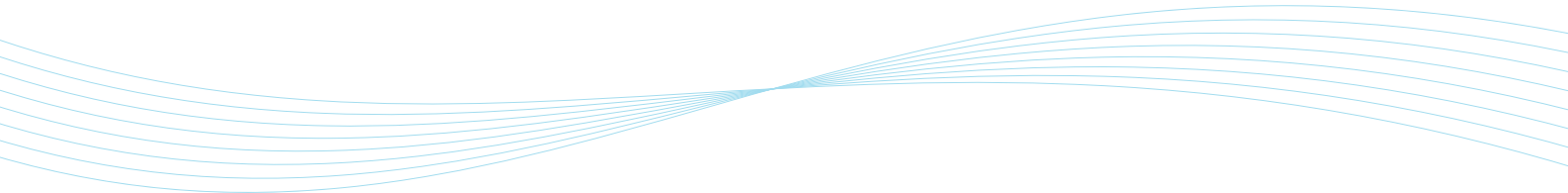
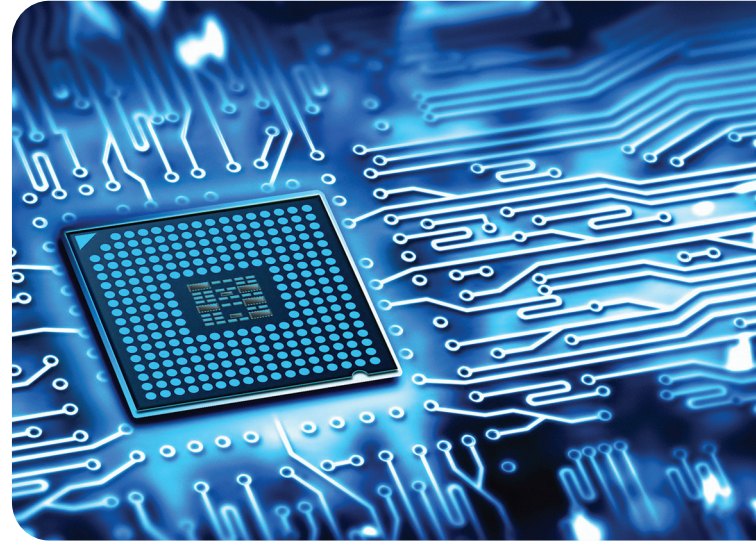




**eVOQUA**  
WATER TECHNOLOGIES

ULTRAPURE  
WATER FOR  
MICROELECTRONICS

**LEADING WATER SOLUTIONS  
FOR THE RAPIDLY  
CHANGING SEMICONDUCTOR  
INDUSTRY**



## ABOUT US

Water fuels and enriches everything, from daily life to industry and manufacturing. But it is a finite resource. To harness the power of water, we need solutions to manage and maintain it.

At Evoqua, we believe that innovation and technology can help us use and preserve this resource, now and in the future.

We are a global leader in identifying emerging water concerns. Our world-class expertise and growing portfolio of products have established Evoqua as the trusted advisor to industrial, municipal and recreational customers worldwide.

Evoqua, and our brands, have over a 100-year heritage of innovation, and every day, millions of people and thousands of companies rely on us as their trusted advisors to help them meet their water needs.

## Advanced Solutions for Ultrapure Water in Microelectronics

Ultrapure water is a vital component in microelectronics manufacturing. There's no margin for error when it comes to getting the quality of water right to meet the rigorous specifications that mean manufacturing output levels will be met.

To guarantee the quality of ultrapure water requires a combination of innovative, highly effective treatment technologies that address the three steps of an ultrapure water system: makeup, primary and polishing systems.

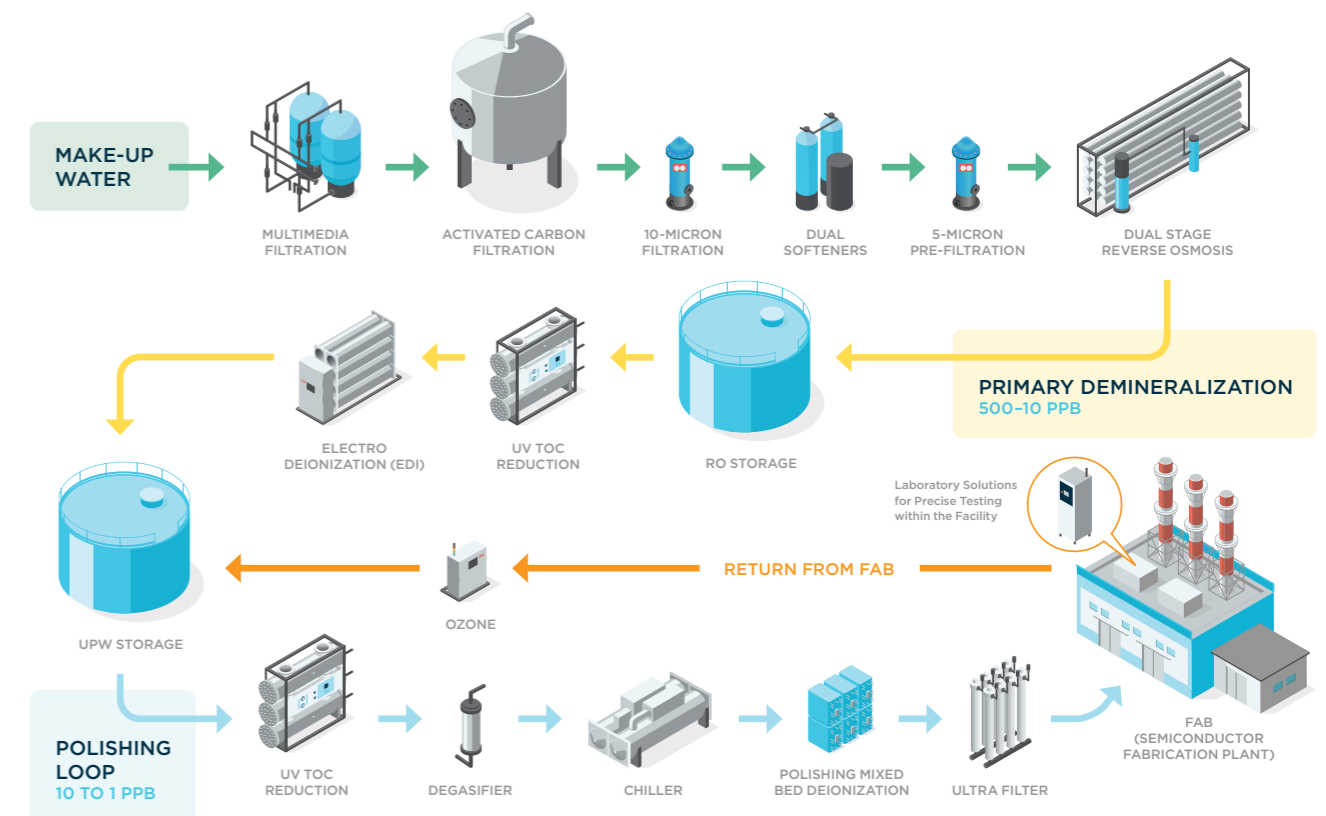
Evoqua has been designing, manufacturing, and delivering industry-leading water treatment solutions to the microelectronics industry for decades. Our proven and trusted technology is backed up by our ongoing global consultancy, service, and support.

Today, with productivity critical, our superior technology solutions also support manufacturers with improving plant reliability, sustainability, reducing downtime and lowering the total cost of operation.



### HOW EVOQUA CAN HELP

- Guarantee ultrapure water quality
- Improve system reliability
- Reduce downtime
- Minimise ongoing maintenance
- Provide ongoing service and support



## Filtration Systems

### ELECTRODEIONISATION (EDI)

Electrodeionisation is a superior form of deionisation technology to remove weakly charged or ionised compounds from feedwater. EDI is a vital component in the ultrapure water generation process, delivering consistent water quality to avoid the risk of product contamination, helping microelectronics manufacturers to meet production and profit targets.

EDI is an energy efficient, chemical free process which takes place once total organic carbon (TOC) has been removed from the water via Evoqua's specialist ultraviolet technology. What really sets EDI apart from traditional technologies is the huge safety benefits it delivers for plants, as there's no requirement for the handling or storage of hazardous chemicals.

### WHAT IS ELECTRODEIONISATION AND HOW DOES IT WORK?

EDI works by combining resin, electricity, and ion exchange membranes to remove ionised or ionisable impurities, such as carbon dioxide, boron, and silica. By integrating these components, EDI eliminates the requirement for a separate ion exchange tank or the reliance on single-use resin.

Furthermore, as the EDI process does not involve regeneration or chemical usage, water consumption is lowered, and waste reduced. EDI therefore delivers low maintenance requirements, reduced operational costs and improved sustainability credentials, as well as supply chain resilience.

### EVOQUA RANGE

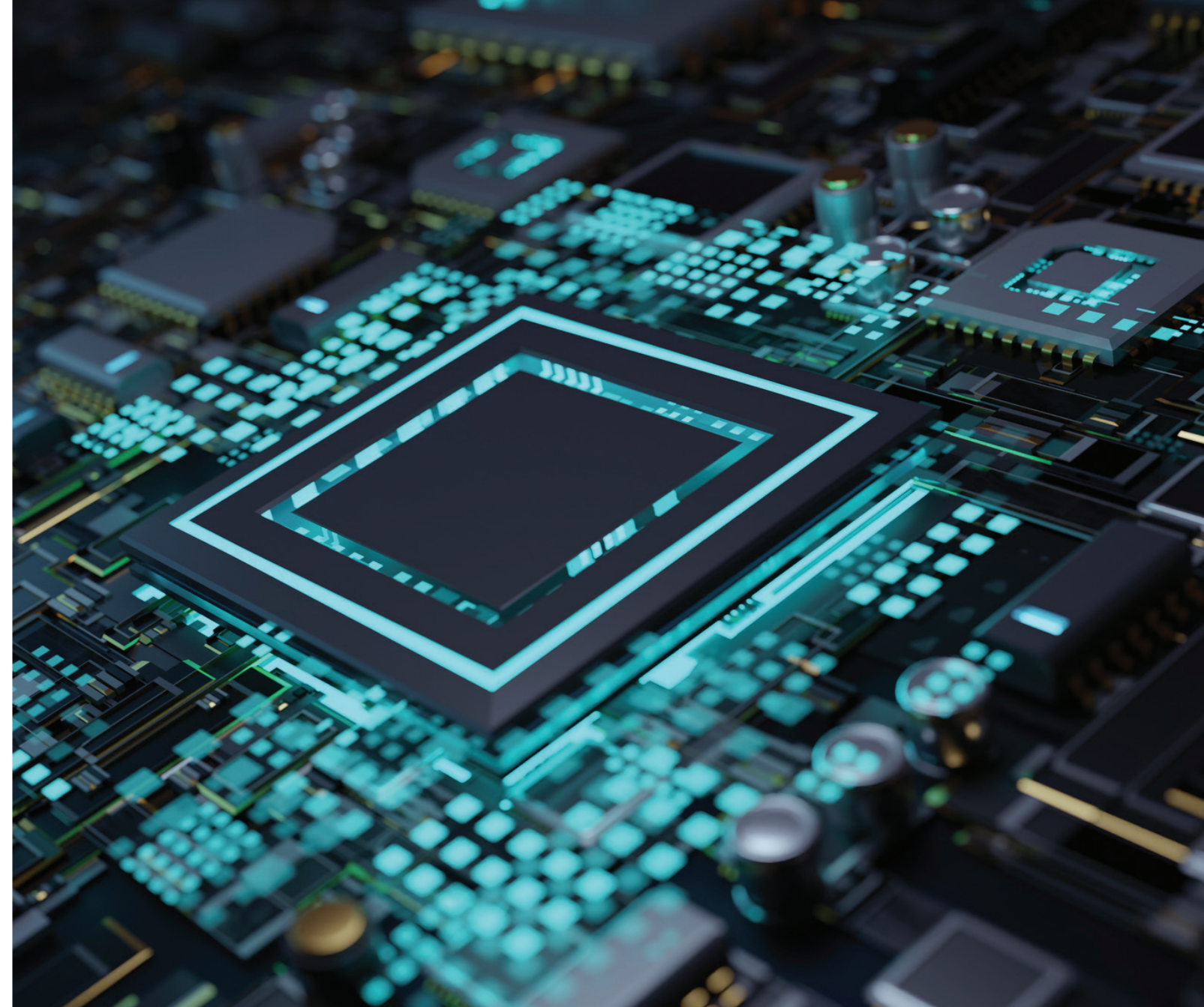
Evoqua is one of the pioneers of a transformative process of continuous electrodeionisation using its innovative Ionpure® system. We have one of the most complete and superior ranges of products on the market for a continuous supply of ultrapure water.

We provide a range of models to suit different applications, including:

- Ionpure VNX E system
- Ionpure VNX EX system
- Ionpure VNX Ultra system: our latest model for highly effective boron removal



VNX MODULE



### ADVANTAGES OF UTILISING IONPURE® CEDI PRODUCTS

- Superior deionisation for ultrapure water generation
- A continuous supply of ultrapure water
- Significantly lower OPEX
- Improved safety as chemical free
- Reduced maintenance requirements
- No regeneration waste

The exceptional boron removal capability of the VNX results in extended longevity for post-treatment boron selective resin, leading to impressive cost savings of \$20-40K per module over a 7-year lifespan.

# UV Systems

## UV FOR TOC REDUCTION

UV technology plays a critical role in the generation of ultrapure water. It efficiently and effectively breaks down total organic carbon (TOC) from process water. If left untreated, TOC can leave damaging and costly deposits on components, negatively impacting profits for microelectronics manufacturers.

TOC is present in all untreated water and therefore throughout a plant's water system. Without treatment, TOC acts as a nutrient for microorganisms. Even small increases in TOC can result in large increases in bacteria by providing the nutrients for the creation of biofilms and subsequent shedding of bacteria and organics from pipe system walls.



VT TOC RANGE

## WHAT IS UV AND HOW DOES IT WORK?

Ultraviolet (UV) radiation technology works by applying light in wavelengths that damage and destroy the DNA of biological organisms. A UV system uses energy-efficient UV light, so the process is chemical-free and therefore doesn't leave any residual disinfectant in the water.

The effectiveness of a TOC system for the generation of ultrapure water is dependent on the output of the UV lamps. UV radiation at 254nm wavelength is required to destroy microbial contaminants or inactivate microbial reproduction, and at 185nm wavelength it breaks down TOC

by photolysis. At this wavelength, the increased energy and adsorption sensitivity of oxidizable organic compounds leads to formation of hydroxyl free radicals in varying degrees of photochemical excitement. They can break various chemical bonds of organics, which in turn produce chain reactions, oxidizing most organics into carbon dioxide and water.

## EVOQUA UV RANGE

The superior VT TOC Range of ATG™ UV Generators is specifically designed for TOC reduction applications in ultrapure water processes, with a high UV output of 185nm. The lamps are constructed using the finest-grade materials to deliver high performance, longevity, and sustainability.

## ADVANTAGES OF UV

- Highly effective TOC reduction for superior ultrapure water
- Industry-leading lamp performance of 185nm with 16,000 hours of life
- Easily integrated and configurable to meet customer requirements
- Simple maintenance to reduce OPEX and increase productivity
- Enhanced and variable power control for energy management

Evoqua UV disinfection generator systems undergo third-party validation testing in accordance with the UVDGM (USEPA, 2006). Validated products are tested to confirm a minimum inactivation equivalent of 3 log (99.9%) for microorganisms in accordance with NSF/ANSI 50 and the UVDGM. Performance is not claimed nor implied for any product not yet validated; unvalidated products use single point summation calculations to provide delivered dose recommendations. Performance limitations depend on feed conditions, overall installed system design, and operation and maintenance processes; please refer to Operations Manuals. For more information: [Contactus@evoqua.com](mailto:Contactus@evoqua.com)



Silanna Semiconductor was able to enhance their UPW production and reach their environmental goals by installing a customised multi-stage solution that would produce UPW from readily available municipal town water. The equipment supplied included Evoqua's Ionpure® CEDI™ system and ATG™ UV VT TOC reduction system. The process design exceeded stringent water quality requirements, reduced their maintenance and also demonstrated a commitment to sustainability by optimising water efficiency and reducing chemical consumption.

# 70%

Evoqua helped Silanna Semiconductor achieve its environmental goals by reaching the project's water efficiency requirement of converting 70% of town water to Type E-1 UPW.

# 2.1 ppb

The bespoke system delivers a recorded TOC level of 2.1 ppb and resistivity greater than 18.1 MΩ.cm for the UPW.



**ADVANTAGES OF UTILISING LAB WATER SYSTEMS**

- Consistent supply of high quality water
- Reliable performance
- Energy efficiency
- Lower maintenance costs and requirements
- Option to run a centralised distribution system

sustainable methods is through the latest reverse osmosis (RO) technology. It can remove up to 99.9% of contaminants without the use of chemicals. When combined with continuous electrodeionisation (CEDI), it results in extremely high purity water and operational efficiency. The water quality achievable is as low as 0.055µS/cm at 15°C for flow rates up to 1000 l/h.

Industry leading dispensing systems, such as the Ultra Clear™ TP ED series, enable precise volume-controlled dispensing of ultrapure water, up to 2 l/m. Each system delivers water quality with a resistivity of 18.2 MΩ-cm and a TOC level between 1-3 ppb, and can produce ultrapure water with endotoxin levels of < 0.001 EU/ml.

**EVOQUA RANGE**

Our technology is at the forefront of high purity water production. The Protegra CS® Pro RO EDI system uses our high-performance Ionpure® CEDI cell technology for increased water quality, efficiency, and sustainability. For highly accurate water distribution, the Ultra Clear TP ED ultrapure water systems have an advanced electronic dispenser.

We provide a range of models to suit different applications, including:

- Protegra CS® Pro RO EDI systems for flows from 125 to 1000 l/h
- Ultra Clear™ TP ED systems

**High Purity Water Systems**

**LAB WATER SYSTEMS FOR PURIFIED WATER**

For a consistent output of high purity water at high volumes for microelectronics production, getting the right technology in place is vital. Access to a reliable source of high purity water is an essential component in the manufacturing process. But as well as guaranteeing quality, any technology solution needs to deliver cost and operational benefits to meet strict industry demands.

To reach the right water quality and output levels, systems need to be configurable to meet each facility's unique needs and work alone or as part of a centralised distribution system for optimum efficiency.

**EVOQUA HIGH-PURITY WATER SYSTEMS**

Our lab water treatment systems are transforming the way high purity water is produced. One of the most reliable and



PROTEGRA CS® PRO RO EDI SYSTEM

**Ozone Systems**

**OZONE FOR UPW PRE-TREATMENT, STORAGE AND DISTRIBUTION SYSTEMS**

Evoqua's Pacific Ozone® Series of ozone generators provide residual-free disinfection, oxidation, and sanitisation for the pre-treatment area of a water system, as well as for sanitising processes and re-circulating systems in Microelectronics manufacturing. UPW storage, piping and distribution systems play a critical role in transporting the water to the points of use at the required flow and pressure, which is why Ozone is a critical and efficient step to maintain the high purity levels required.

Evoqua's Pacific Ozone Systems use innovative floating plate technology which allows the powerful, compact production of ozone. In addition, the systems are air-cooled which results in less maintenance, lower power consumption, and ease of installation.



PGS SERIES PACKAGED OZONE GENERATOR SYSTEM

**ADVANTAGES OF OZONE**

- Prevents microbial contamination
- Eliminates microbial survival even in low nutrient environments
- Generated on-site, on-demand, with no handling of chemicals or heat
- Less down time with fast change-over and less out-of-spec conditions
- Safe and controlled operation with feedback controls and reporting for automation

## Other Microelectronics Applications

### FOR EVOQUA WATER TREATMENT SYSTEMS

#### COOLING TOWER TREATMENT

Evoqua offers a complete portfolio of advanced water treatment packages applicable for open-loop, closed-loop and generic cooling systems. Our leading disinfection and filtration solutions increase the overall efficiency of cooling systems, resulting in reduced consumption of water, energy and chemicals, helping facilities to maximise productivity and save costs.

#### METAL PLATING

Evoqua's Magneto Special Anodes produce and supply high-quality titanium-based anodes with active precious metal coatings to close the electrical loop associated with metal plating applications. They ensure a long lifespan, stable geometry, superior strength and the best possible performance to keep your operations moving.

#### WATER REUSE

Evoqua offers a range of filtration, reverse osmosis and UV systems used in water reuse systems. The correct strategy for your facility can be determined based on concentration levels of impurities and water reuse goals.

#### UTILITY FEEDWATER TREATMENT

Treating utility water is crucial for manufacturing facilities to maintain water quality for efficient operation. Source water can contain contaminants which can cause issues such as scaling and corrosion in boilers and cooling towers. From filtration for particulate removal, disinfection or pretreatment, our broad portfolio ensures we have the right solution to fit your facility's specific needs.



## Driving Sustainability

### OUR COMMITMENT TO TODAY AND TOMORROW

Evoqua is committed to helping the world be more sustainable through our solutions and in our operations. Sustainability is a core value at Evoqua that is driven by our culture and comes to life in our work:

- We transform water for our customers, communities, and the planet.
- We embrace inclusion and diversity as primary catalysts for innovation.
- We are stewards of environmental health through our actions and conduct

Our offerings are aligned with the United Nations Sustainable Development Goals (UNSDGs), allowing us to help our customers create a more sustainable future.

## Service

Evoqua Water Technologies is one of the world's leading providers for water treatment equipment and service. We offer industrial customers and communities sustainable solutions for highly efficient water usage and supply.

Service is a key issue for the satisfaction of our customers. Aftermarket services offers unique, product-related service and support across a product's entire lifecycle.

To protect your investment in our premium quality equipment, we deliver unrivalled after-sales service packages—including technical support, training, on-site service, troubleshooting and spare parts—provided by a worldwide network of factory trained and dedicated professionals.

### EVOQUA SERVICE

**Service Contracts**—Recurring scheduled services with a defined scope of work for operations, or maintenance of a customer's water treatment systems.

**Field Services**—One time event services covering a broad range of activities; equipment repairs, warranty services, new equipment startups, unscheduled maintenance and safety audits.

**Spare Parts/Repairs**—Evoqua provides both proprietary spare parts, consumable items and comprehensive repair services for clients.

**Technical Support**—Evoqua can quickly support you in all technical queries during the complete product life cycle.

**Training**—Evoqua offers training directly from the manufacturer and therefore first hand know-how. The courses comprise the entire disinfection range.

**TRANSFORMING**  
**WATER**  
— **ENRICHING** —  
**LIFE**



**evoqua**  
WATER TECHNOLOGIES

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Disinfection efficacy and microbial control will vary based on the facility and influent water quality, ambient conditions, the specific treatment products incorporated and system design, operating conditions, and maintenance practices. Contact Evoqua for more details

The information provided in this literature contains merely general descriptions or characteristics of performance which in actual case of use do not always apply as described or which may change as a result of further development of the products. An obligation to provide the respective characteristics shall only exist if expressly agreed in the terms and of the contract.

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