



Microbial Performance of the **Klaran AKR UVC** **LED Reactor**

Summary of collected third party
microbial performance data

Providing validated microbial performance claims targeted to customer needs quickly differentiates water purifiers and appliances. Klaran works with independent labs and our customers to expand available product claims and data against a range of target organisms to best support product managers in selecting effective solutions that are precisely oriented to what their customers are seeking.

Product applications, regions, installation locations and other factors influence which organisms should be targeted for product claims. Specific end-product use cases will also inform on the needs for flow rate and log reduction and can be achieved by proper specification within reactor performance envelopes. The following summaries cover a range of possible organisms and performance envelopes of the Klaran AKR which can be achieved immediately, along with applicable US and EU regulations and guidelines advising on the organisms' allowable limits in drinking water uses.

In addition to the data cited here, customer tailored performance targets can also be achieved while working with Klaran Applications Engineering.

ORGANISM

Escherichia Coli (E. Coli)

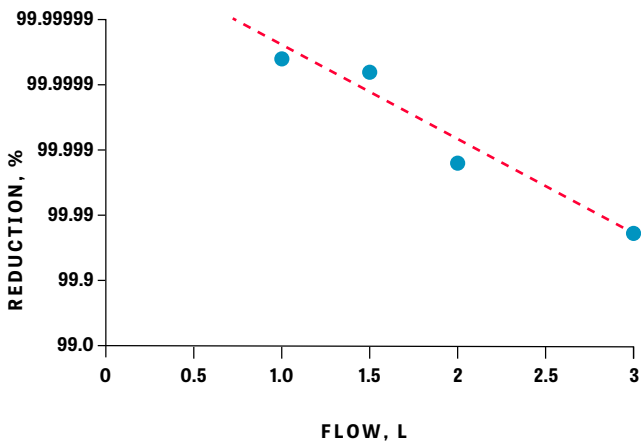
DESCRIPTION

E. Coli is a species of gram-negative bacteria which is used globally as a leading indicator for the potential presence of other pathogenic organisms, fecal contamination, inadequate water treatment, or distribution system contamination of water.

Certain strains of E. Coli can lead to mild to moderate intestinal infections in healthy individuals and may lead to severe or deadly infection in individuals with compromised immune systems.



KLARAN AKR UV LED REACTOR PERFORMANCE DATA AGAINST (E. COLI)



| Organism | Flow Rate (L/min) | Reduction (%) | Source |
|------------------|-------------------|---------------|---|
| Escherichia coli | 1.0 | 99.99994 | ● University of Colorado Boulder, Linden Research Group, 2018 |
| | 1.5 | 99.99992 | |
| | 2.0 | 99.99838 | |
| | 3.0 | 99.97116 | |

REGULATED IN WATER FOR HUMAN CONSUMPTION BY

- EU Drinking Water Directive
- US EPA Revised Total Coliform Rule – Safe Drinking Water Act
- Guideline: World Health Organization



Klaran AKR has been tested by the SGS. Please contact sales@klaran.com for the full SGS report.



ORGANISM

Legionella

DESCRIPTION

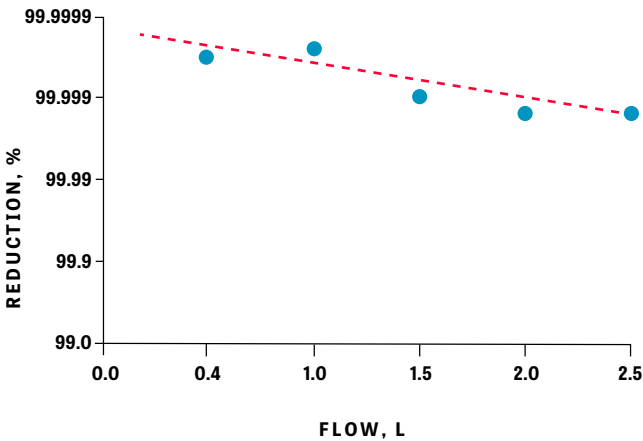
Legionella is a genus of gram-negative organisms that the World Health Organization considers the highest health burden of all waterborne pathogens in the European Union. Detection in water can be time consuming and remediation can be difficult due to Legionella's interaction with existing biofilms in distribution systems.

Exposure to Legionella can lead to Legionnaires' disease, a respiratory infection which can be deadly to older and immunocompromised populations.



KLARAN AKR UV LED REACTOR PERFORMANCE DATA AGAINST (LEGIONELLA)

REGULATED IN WATER FOR HUMAN CONSUMPTION BY



- Plenary Vote Approved for Revision of; EU Drinking Water Directive
- Guideline: World Health Organization

| Organism | Flow Rate (L/min) | Reduction (%) | Source |
|------------|-------------------|---------------|---|
| Legionella | 0.4 | > 99.9995 | ● University of Colorado Boulder, Linden Research Group, 2018 |
| | 1.0 | > 99.9996 | |
| | 1.5 | > 99.9990 | |
| | 2.0 | > 99.9980 | |
| | 2.5 | > 99.9980 | |



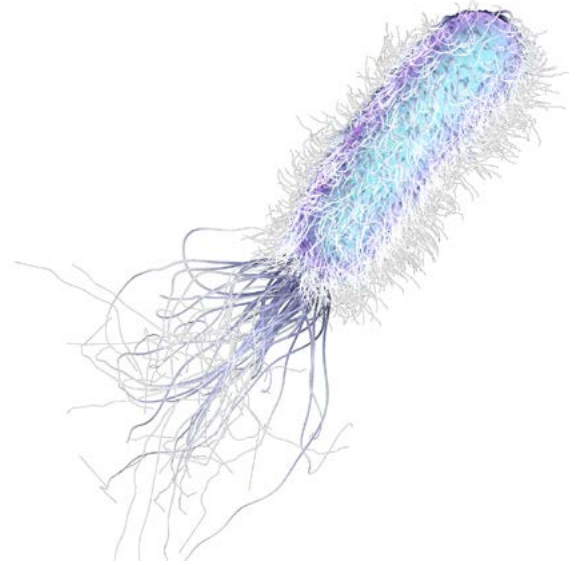
ORGANISM

Pseudomonas aeruginosa (SS40)

DESCRIPTION

Pseudomonas aeruginosa is a gram-negative organism found widely in the natural environment. It's presence in water is used as an indicator of potentially inadequate water treatment, the presence of other pathogenic organisms, and the presence of biofilms in distribution systems.

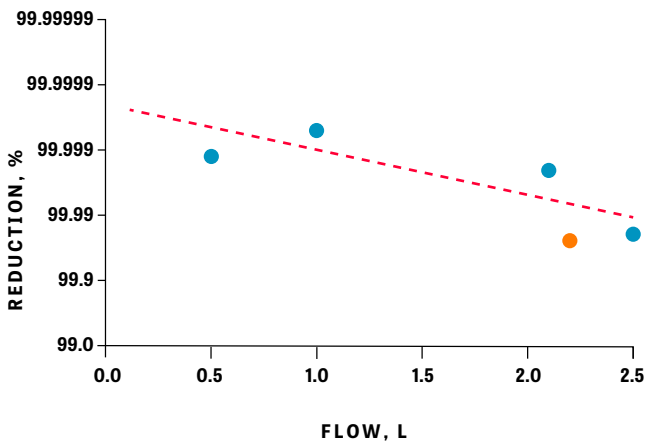
Exposure to Pseudomonas aeruginosa will not lead to illness for most healthy individuals but can lead to life threatening infections for immunocompromised populations.



KLARAN AKR UV LED REACTOR PERFORMANCE DATA AGAINST (PSEUDOMONAS)

REGULATED IN WATER FOR HUMAN CONSUMPTION BY

- Bottled Waters: EU Drinking Water Directive



| Organism | Flow Rate (L/min) | Reduction (%) | Source |
|-------------------------------|-------------------|---------------|---|
| Pseudomonas aeruginosa (SS40) | 0.5 | 99.99895 | ● University of Colorado Boulder, Linden Research Group, 2018 |
| | 1.0 | 99.99937 | |
| | 2.1 | 99.99743 | |
| | 2.2 | 99.95810 | |
| | 2.5 | 99.97958 | ● Independent Water Cooler OEM, 2018 |

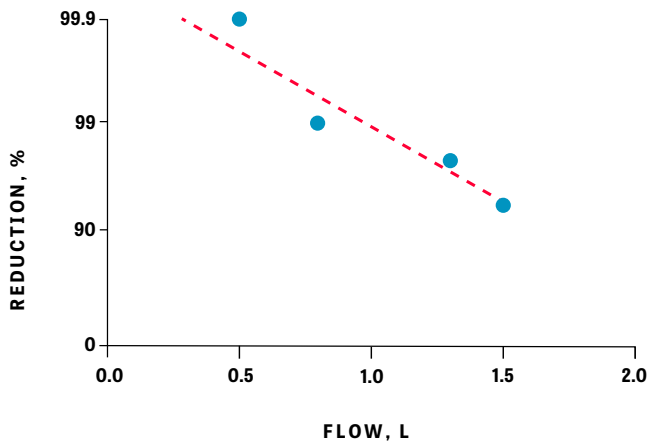
ORGANISM

Bacteriophage Q β (Q Beta)

DESCRIPTION

Q Beta is a bacteriophage, a virus hosted by E. coli. Q Beta is not considered a pathogenic organism to humans, but is valued for benchmarking performance of UV based disinfection systems. Its spectral sensitivity to certain wavelengths of UV light match closely to a broad range of other pathogenic organisms, allowing it to be used to benchmark performance of UV systems while accounting for potential differences in UV wavelength.

KLARAN AKR UV LED REACTOR PERFORMANCE DATA AGAINST (Q BETA)



REGULATED IN WATER FOR HUMAN CONSUMPTION BY

- Proposed as the new target organism in the draft revised NSF 55 protocol for testing UV system water disinfection performance.

| Organism | Flow Rate (L/min) | Reduction (%) | Source |
|----------------------------------|-------------------|---------------|---|
| Bacteriophage Q β (Q Beta) | 0.5 | 99.84151 | ● University of Colorado Boulder, Linden Research Group, 2018 |
| | 0.8 | 98.85184 | |
| | 1.3 | 95.73420 | |
| | 1.5 | 92.05671 | |
| | 2.4 | 63.69219 | |



KLARAN KEY APPLICATIONS



Water



Surface



Air

About Klaran

Klaran is dedicated to delivering products for true UVC LED-based disinfection. With a foundation in proprietary technology in aluminum nitride substrates, Klaran leverages multi-national design expertise in UVC LED-based disinfection systems to provide customers with dependable performance and delivery of POU water reactors and discrete UVC LEDs. In addition, Klaran partners with customers to guide them through the design process from conception to commercialization with engineering support services and customer training programs like Klaran University.

Learn more about Klaran today.
www.klaran.com