PearlAqua Deca™

UV-C LED Water Disinfection System Operations Manual

threeUV
UV-C infection prevention

Introduction

Congratulations on purchasing the most advanced product available for protecting your water supply against disease causing pathogens. PearlAqua Deca is a UV-C LED water disinfection platform designed for Point-of-Entry applications. This system provides whole house disinfection without the use of harmful chemicals or materials, such as mercury vapor lamps.

First UV LED PoE System

PearlAqua Deca offers the first whole home UV LED disinfection system, offering greater than 99.99% pathogen reduction without the use of harmful materials.

Peace of Mind at Home

With UV Intensity monitoring as standard, instant on/off disinfection for intermittent flows, and reduced hot water shot, the PearlAqua Deca provides advanced UV treatment for the water in your home.

Low Cost of Ownership

Efficient UV LED technology cuts your electric consumption. Designed for intermittent flows, PearlAqua Deca only uses power when water is flowing, drastically reducing the energy needed.

Low Maintenance

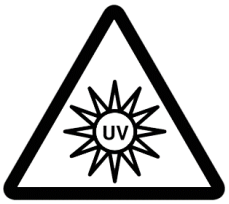
The PearlAqua Deca features a 5-year lamp replacement interval, reduced mineral fouling, and no handling of fragile lamps or sleeves making it the lowest maintenance option on the market.

Table of Contents

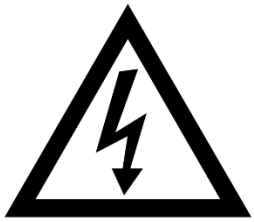
1. Safety & Regulatory

a. Overview/Best Practices

This device produces harmful ultraviolet (UV) radiation. Direct contact when powered could damage the eyes and/or skin. Do not look directly into inlet or outlet ports without the use of UV resistant safety glasses.



UV exposure risk if used improperly



Electrical shock possible

The unit should only be operated according to the guidelines described herein

- Always disconnect power from the unit before performing any type of maintenance or servicing
- Do not operate product without first connecting water supply and allowing water to flow through
- Operate within the Absolute Maximum Ratings described in Section 2
- Do not exceed pressure rating shown on product safety label
- Do not use the unit if there is any sign of damage
- Do not install the unit in an area subject to full sunlight
- Keep children away from device
- Always comply with local plumbing and electrical codes
- No user serviceable parts
- FCC: Exempt under 15.103(c) and/or 15.103(d)
- ISED: Exempt under ICES 3 and 5 categorization
- CE: Exempt from Low-Voltage-Directive, EMC exempt

b. Safety Label

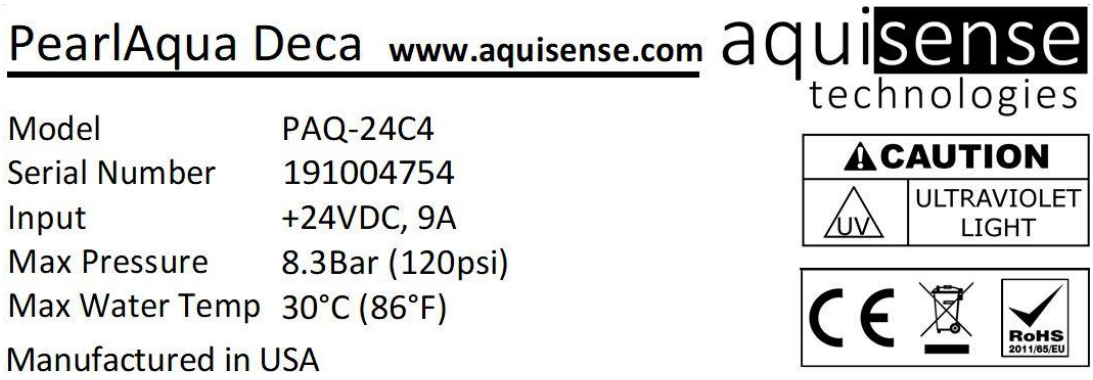


Figure 1-1: Typical PearlAqua Deca safety label

A safety label is affixed to each PearlAqua Deca unit. The label identifies several maximum thresholds for the product. For more details on each model and recommended operating specifications for your Deca unit, please see Section 2 (Detailed Specifications and Advanced Operation).

c. Water Chemistry

UV disinfection can be affected by water quality conditions. The PearlAqua Deca is designed to ideally disinfect drinking water with the specifications shown in Table 1-1. **Prefilter strongly recommended to remove any fine particulates not visible to the naked eye. Failure to adhere to these specifications may reduce disinfection performance.**

Table 1-1: Water quality specifications for optimal disinfection performance

Parameter	Description	Limits	Unit
UV-Transmittance* (UV-T)	Measure of how well UV light can travel through a fluid. Defined as the ratio of UV light intensity after passing through a liquid sample to the UV light intensity at the light source.	≥90	%
Particulate Size**	Dirt, dust, rust, sediment, and other solid particles	≤10	micron (µm)
Hardness***	Lime scale	7/120	gpg/ppm (mg/L)
Iron***	Rust stains	0.3	ppm (mg/L)

*Minimum recommended UVT is 90%. Water with lower UVT levels can still be treated effectively but maximum water flow should be restricted accordingly **Prefilter strongly recommended.
*** Water softener or other pretreatment may be required.

Figure 1-2: Lamp Relative Power and Water UV-T

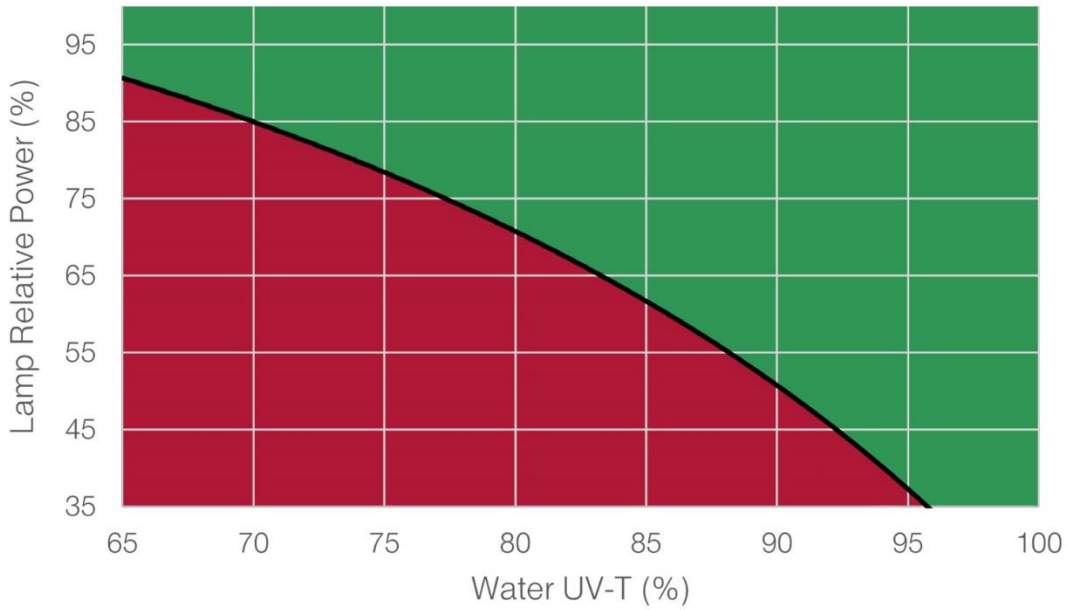


Figure 1-2 indicates the conditions under which a low UV intensity alarm will be triggered. At this point the system status indicators will show a flashing red and a solid yellow (see Section 4 - Troubleshooting). As described in Table 1-1 of the manual, it is important that the UV transmission (UVT) of the water is adequately high. Low values risk triggering a low UV alarm before the lamps are due for replacement as shown in the diagram (EOL threshold). In the event of a low UV alarm, refer to the Troubleshooting Section and Table 4-1 for corrective actions

d. Summary of Regulatory Compliance

Table 1-2: Relevant regulations, guidelines, and certifications

Regulation/Guideline	Status
NSF/ANSI 55:2019	Pending
CE (2014/30/EU; 2011/65/EC; 2001/95/EC)	Compliant
RoHS 3 (Directive 2011/65/EU)	Compliant
REACH (EC No.1907/2006)	Compliant
ISO 9001:2015	Certified
IEC 60335-1:2010	Tested as Compliant
WaterMark (AS/NZS 3497 Cert No. 40254)	Pending
WRAS	Pending

*Certificates available upon request, as applicable

2. Absolute Maximum Ratings

Do not exceed the following values when using your PearlAqua Deca device. Improper usage outside of these values may result in injury or damage to the PearlAqua Deca unit. Warranty may also be voided if these conditions are not followed.

Specification	Min	Max	Unit
Operating Pressure	-	8.3 (120)	Bar (psi)
Water Temperature (while unit is powered)	1 (33)	30 (86)	C (F)
Ambient Air Temperature (while unit is powered)	0 (32)	45 (113)	C (F)
Flow Rate (while unit is powered)	-	45 (12)	LPM (GPM)
Input Voltage for 24V devices	100	240	V AC

Table 2-1: Maximum Ratings for PearlAqua Deca

3. Basic Installation

General Practices

- Please read all instructions before use.
- Remove the PearlAqua Deca from its packaging; ensure contents of the package are complete.
- Do not power the PearlAqua Deca without water connected and initial flushing
- For installation, consider ease of access, maximum length and minimum bend radii of piping, electrical connections, and air circulation when selecting the installation location.
- Do a quick test fit of the unit before beginning any installation
- Use appropriate connection fittings compatible with the plumbing pipework and Deca inlet/outlet ports.
- Installation by plumbing professional recommended

a. Product Parts, Dimensions, and Specifications

Figure 3-1: Anatomy of PearlAqua Deca unit

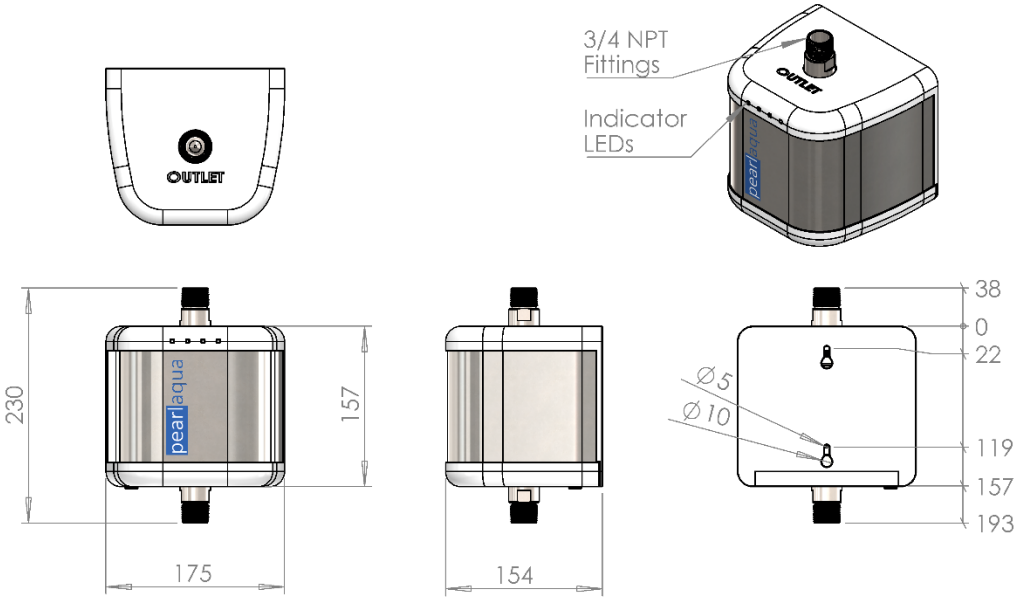


Figure 3-2: Dimensions of PearlAqua Deca

Specifications			
Model Name			24C4
UV Dose (mJ/cm^2) @98% UV-T	16	Max Flow [lpm (gpm)]	45 (12.0)
	30		25 (6.5)
	40		19 (4.5)
Headloss at Max Flow	[bar (psi)]		0.3 (4.5)
Inlet/Outlet Water Connection			¾" MNPT
Weight (dry)	[kg (lbs)]		4.2 (9.3)
Max Operating Pressure	[bar (psi)]		8.3 (120)
Environmental Protection			IP65
Lamp Replacement Interval			60 months @ 2.5 hours/day [5,000 hours]
Max Ambient Temp	[C(F)]		45 (113)
Water Temperature	[C(F)]		0-30 (32-86)
Input Voltage	[V DC]		24 [110/240 AC power supply included
Input Power [flow variable]	[W]		180 (max)
Power Draw (with Water Flowing)	[A]		6.3 @24VDC (1.4 @110V; 0.7 @220V) Typical wattage equivalent = 160W
Power Draw (Standby [no water use])	[mA]		5 @ 24VDC (1.2 @ 110V; 0.6 @ 220V) Typical wattage equivalent = 130mW

Specifications provided as a guide. Specifications subject to change.

Unit designed to be used on domestic cold water supply only.

Table 3-1: Specifications for PearlAqua Deca

b. Plumbing Installation

Figure 3-3: Typical diagram of PearlAqua Deca installation

1. PearlAqua Deca
2. Prefilter (recommended)
3. Electrical outlet (ideally above PearlAqua Deca allowing for a drip loop)
4. Water softener (where installed)
5. **When powering unit for the first time, wait 10 seconds before running water. This allows the unit to initialize and establish the "no flow" setting.**

WARNING

- Installation by plumbing professional recommended
- Install in accordance with local plumbing and electrical regulations.
- This product contains an ultraviolet (UV) light source. Please use caution; see Section 1.
- Do not use if there is any sign of damage to the unit.
- Do not exceed maximum flow and pressure allowed through the unit. Please refer to Section 2 for details.

c. Connection of Water Lines

Ensure that the PearlAqua Deca unit is installed vertically with the incoming water supply connected to the inlet (bottom) port and the post Deca pipework connected to the outlet (top) port. Please contact AquiSense if more information is needed.

To connect your unit to plumbing:

1. Do a quick test fit of the unit before beginning any pipework modifications. Remember to measure twice, cut once.

2. Mount the Deca unit securely – for example, directly to a wall stud or by using appropriate wall anchors

3. Connect water lines to the inlet and outlet of the Deca. Copper, PEX, or stainless steel should be used. Use suitable ¾" connection fittings.

4. Flush water through system by fully opening a tap. Check for leaks. Do not apply power until this has been done.

d. Electrical Installation and Power Application

Power Supply

Your Deca system is supplied with a 24VDC adaptor which plugs into a regular 110V or 230V outlet. It is recommended to use a dedicated, GFCI (ELCB) outlet.

Do not power the system without water in the unit.

4. Troubleshooting

a. Indicator Light Identification

Number	Color	Indicator
1	Blue	UV-C LED Status
2	Red	UV-C LED Error
3	Yellow	Overheating
4	Green	Power On

BLUE	GREEN
Off = UV-C LEDs are off	Off = no power to unit
Solid = UV-C LEDs are on	Solid = power on

RED	YELLOW	ALARM CONDITION
Off	Off	No errors
Off	Blink	Unit o/temp
Blink	Blink	Approaching EOL (lamp replacement)
Blink	Solid	50% intensity (critically low UV)
Solid	Blink	EOL (replace lamps)
Solid	Solid	Critical failure

a. Other Issues, Causes, and Solutions

Issue	Possible Cause	Possible Solution(s)
Unit does not power on	Unsecure power connections or unstable power supply	Check outlet power and connections

Blinking yellow indicator	Unit is overheating	Do not operate unit without water in system. Run water for 30 seconds. Check water temperature.
Low UV intensity (blinking red indicator; solid yellow indicator)	Low UV transmission	1. Check UVT of water, install pre-treatment as necessary. 2. Possible lamp replacement needed
Unit is leaking	Unsecure plumbing connections	Verify connections are secure
	Improper connector sizing	Ensure connector size matches your unit's plumbing Inlet/Outlet
Failed microbiological test	Low UV-Transmittance or other water quality issue	See Section 1c on Water Chemistry specifications. Add pre-treatment steps as required.
	Bacteria from other portion of water system after UV i.e. pipework, connectors	Use new, clean pipework and connections. Disinfect waterlines.
	Air bubbles trapped in unit	See Figure 3-1 on recommended orientation. Adjust orientation, flow, and system as applicable.
	High flow rate	Refer to the Disinfection Performance specifications for your model.
	Lamp has reached end of life	Contact dealer for replacement

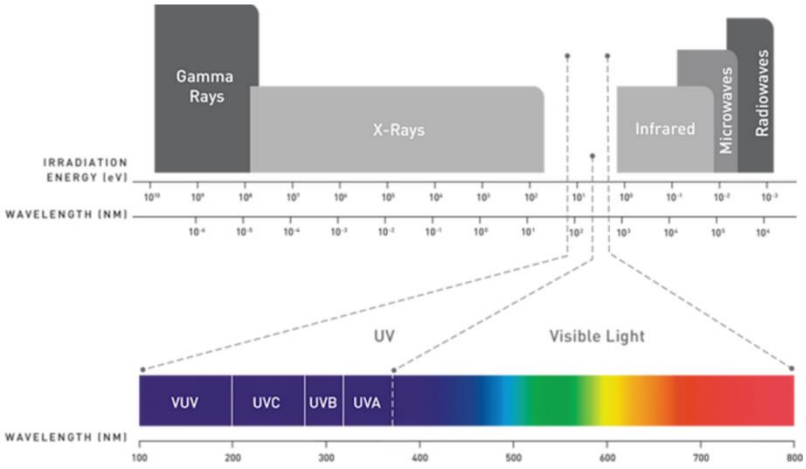
If issues continue after careful review of this O&M manual and troubleshooting, contact AquiSense for assistance.

Table 4-1: Troubleshooting, Potential issues, and Solutions

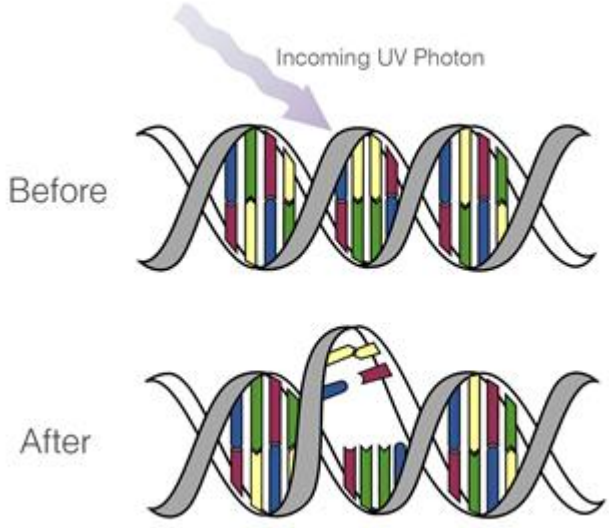
5. Theory

UV-C Water Disinfection

Ultraviolet (UV) water disinfection technology has become an increasingly popular tool in water treatment over the past three decades, due in part to its ability to provide treatment without the use of harmful chemicals. UV represents wavelengths that fall between visible light and x-ray on the electromagnetic spectrum.



The UV range can be further divided into UV-A, UV-B, UV-C, and Vacuum-UV. The UV-C portion represents wavelengths from 200 nm - 280 nm, which is the wavelength range used in our LED disinfection products. UV-C photons penetrate cells and damage the nucleic acid, rendering them incapable of reproduction, or microbiologically inactive.



UV-C LEDs

A light-emitting diode (LED) is a semiconductor light source. It is a p–n junction diode, which emits light (or photons) when activated. The PearlAqua Deca utilizes small, state-of-the-art, UV-C LEDs, which emit photons in the UV range, to provide pathogen reduction without the use of harmful chemicals or heavy metals. Use of LEDs allows the PearlAqua Deca to achieve full intensity power upon start-up, withstand unlimited power cycles without impacting device life, and eliminate expensive disposal processes.

6. Warranty

General Statement of Warranty

The warranty period is 24 months from date of warranty registration, covering all failures due to material and product assembly. The owner must register the product at ast1.aquisense.com/registration for the warranty to be in place.

This warranty shall not apply to any failure or defect which results from the Equipment not being operated and maintained in strict accordance with instructions specified in the AquiSense Operations manual or defect which results from mishandling, misuse, neglect, improper storage, improper operation of the Equipment with other equipment furnished by the Owner or by other third parties or from defects in designs or specifications furnished by, or on behalf of, the Owner by a person other than AquiSense. In addition, this warranty shall not apply to Equipment that has been altered or repaired by anyone except AquiSense, their Authorized representative, or personnel acting under specific instructions from AquiSense.

The Owner must notify their dealer within 5 days of the date of any Equipment failure. This notification shall include a description of the problem, details of the product name (e.g. PearlAqua Deca), model number (e.g. 24C4) and serial number - all found on the product label.

The Owner will fully cooperate with their dealer in attempting to diagnose and resolve the problem by way of telephone/web support. If the problem can be diagnosed by telephone/web support and a replacement unit is required, the dealer, in conjunction with AquiSense will either, at AquiSense expense, ship a repaired, reworked, or new part to the Owner. If the problem is not attributable to a breach of this warranty, the dealer or AquiSense reserves the right to invoice the Owner for this service.

This warranty is in lieu of all other warranties whether written, oral, implied, or statutory. Without limitation, no warranty of merchantability or fitness for a particular purpose shall apply to the Equipment.

Operating Hours

Unlike mercury vapour UV-C lamps, the lifetime of UV-C LEDs is not affected by on/off cycles. However, like all light sources, LEDs are subject to aging over time. AquiSense Technologies have engineered an integrated UV-C LED lamp module that contains: power regulation, temperature management, temperature monitoring, and intensity monitoring. When operated in accordance with AquiSense instructions, it is expected that the LED lamp module lifetime will be up to 10,000 hours depending on configuration.

Premature LED lamp module Failure

In the case of failure, the following refund/replacement applies:

- Up to 6 months use: Full Replacement
- Over 6 months use: Proportionate (Pro-rata) credit

Limitations of Warranty

This warranty:

- Relates only to faults in material and assembly. It does not cover any form of breakage from mishandling or mis-operation
- Applies where operating conditions are kept in accordance with AquiSense instructions
- Is limited to 24 months after the date of delivery
- Excludes transport costs for the return of parts
- AquiSense will not be responsible for any damages, consequential or otherwise

Return of Product

In all warranty cases, contact your dealer with details of the product name (e.g. PearlAqua Deca), model number (e.g. PAQ-12C4-350…) and serial number - all found on the product's cable. In case of difficulty, contact info@aquisense.com

Disposal of Product

As part of our commitment to the environment, all used or failed product returned to AquiSense facilities through your dealer will be properly recycled at no charge.