

NovoLabsTM
Supercritical UVTM
**Disinfection
Systems**



NovoLabsTM
Supercritical UVTM

Is ultraviolet disinfection a treatment option for me?

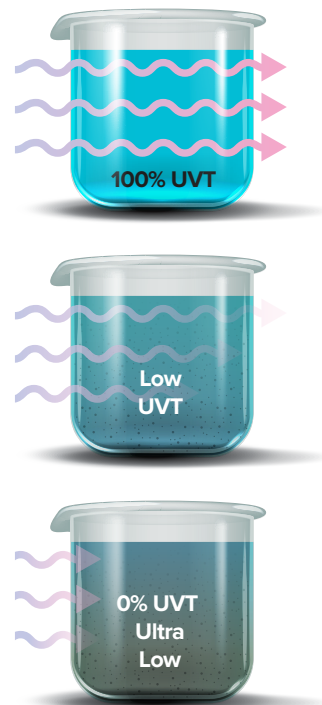
As our world changes and our water resources become increasingly challenged, the need for cost-effective and sustainable treatment solutions has never been so important. Ultraviolet disinfection is one of the most commonly used technologies for the cost-effective treatment of drinking water, process liquids and wastewaters.

Modern ultraviolet disinfection systems use lamps that emit a specific range of ultraviolet light that is highly effective in disrupting the RNA and DNA structures of bacteria, viruses and protozoa – resulting in rapid deactivation and disinfection.

A major challenge for ultraviolet treatment however is low clarity liquids. Whilst ultraviolet treatment has been excellent for drinking waters and higher clarity wastewater, legacy ultraviolet treatment products are much less effective in treating low clarity liquids i.e., process and waste waters with low ultraviolet light transmittance ("low UVT"). Until now, ultraviolet treatment has generally not been regarded as viable for liquids with UVT's below ~30% for the very simple reason that ultraviolet light struggles to transmit adequately through such liquids.

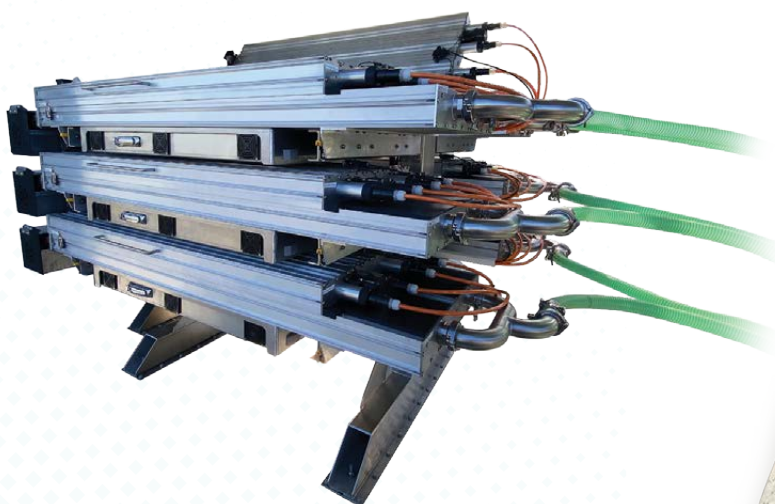
NovoLabs™ Supercritical UV™ disinfection system is a world-first solution for treating liquids with UVT as low as <1% in a single pass!

% ultraviolet transmittance through liquids

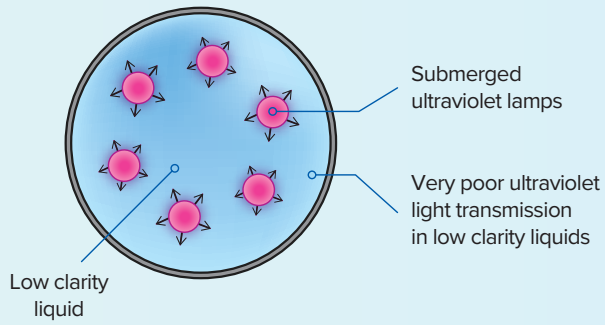


NovoLabs™ Supercritical UV™ disinfection system can address treatment challenges and significantly reduce treatment costs for low clarity/low UVT process liquids and wastewaters

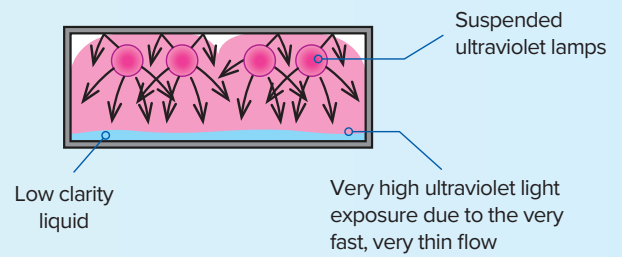
Developed at Massey University in New Zealand, the *NovoLabs™ Supercritical UV™* disinfection system is a breakthrough in ultraviolet disinfection technology for the effective treatment of process liquids and wastewaters.



Legacy submerged lamp ultraviolet disinfection system



NovoLabs™ Supercritical UV™ disinfection system



Ultraviolet light drops off at an exponential rate in liquid and gets worse as UVT decreases.

In contrast with legacy ultraviolet systems that employ lamps submersed in the liquid flow, *NovoLabs™* disinfection system ejects a very fast, very thin flow of liquid that is irradiated from above providing unparalleled ultraviolet dose exposure across the liquid depth. In addition to the thin gauge of fast-moving liquid, the flow hydraulics are highly turbulent ensuring a high level of dosing with ultraviolet light throughout the liquid and avoiding areas of low light intensity where the treatment dose is low.



Reduce or eliminate chemical and biological treatment costs

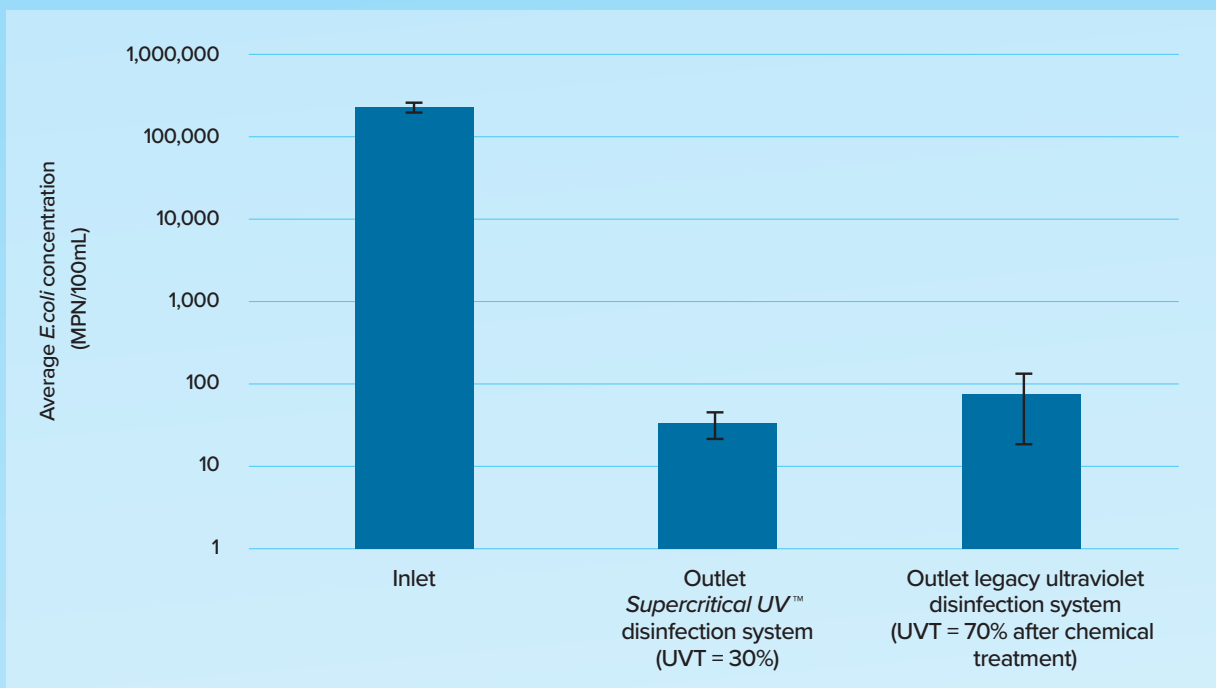
***NovoLabs™ Supercritical UV™* disinfection system can save operational costs and reduce greenhouse gas emissions.**

Oftentimes, particularly where there is wastewater from industry or a municipal plant which has a significant component of trade waste, it is necessary for treatment operators to upgrade the clarity of their effluent before legacy ultraviolet disinfection treatment can be effectively applied. This can require large increases in capital and operational costs.

Through its unique design, the *NovoLabs™ Supercritical UV™* disinfection system can treat liquids normally considered unviable for ultraviolet treatment. This can significantly reduce land and capital costs required to upgrade or build new biological systems and/or the very high operating costs associated with chemical dosing resulting from the chemical supply and the chemical sludge disposal.

Case Study: Providing Savings & Sustainability

At a New Zealand municipal wastewater treatment facility that receives a high proportion of trade waste from local industries, operators spend ~\$0.6million per year on chemicals to increase the clarity of wastewater. When they irrigate to land, the only reason this chemical dosing is required is to enable their legacy ultraviolet treatment system to be able to cope with their low UVT. *NovoLabs™ Supercritical UV™* disinfection system tested on this site was proven to easily meet the consent conditions and achieve a greater reduction in *E. coli* than the legacy system, **without** the need for any chemical treatment.



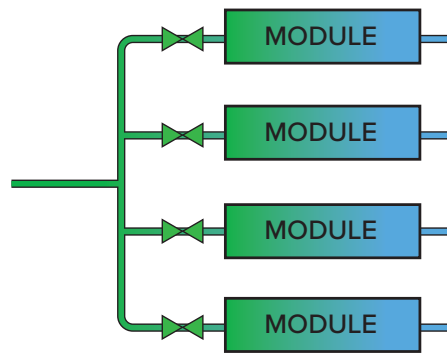
*Treatment comparison between the *NovoLabs™ Supercritical UV™* disinfection system (with no chemical dosing) and a legacy channel ultraviolet system with prior chemical dosing*

The Council's project engineer stated that *NovoLabs™* containerised *NovoLabs™ Supercritical UV™* disinfection system would save approximately \$1600/day when irrigating and provide them with a much more holistic and sustainable solution in line with the aspirations of local iwi. By eliminating the import of chemicals from outside the area and the production of a chemical sludge that then needs to be disposed of to landfill, the *NovoLabs™ Supercritical UV™* disinfection system would enable valuable nutrients such as phosphate to be recycled to the land instead of being locked up in the chemical sludge and forever wasted.

Eliminating chemical use saves operational costs, allows valuable nutrients to be recycled to the land, and reduces greenhouse gas emissions that are equivalent to the entire council fleet being electrified.

Peace of mind with parallel processing

- Because *NovoLabs™* modules operate in parallel, any individual module can be safely deactivated and accessed for inspection or service while maintaining full flow throughout the rest of the system.
- *NovoLabs™* smart system continually monitors flow rates and system status and will auto-divert flow to another module in the event of a lamp outage – ensuring performance protection day and night.



Operator safety and ease of maintenance – NO DRIP, NO MESS

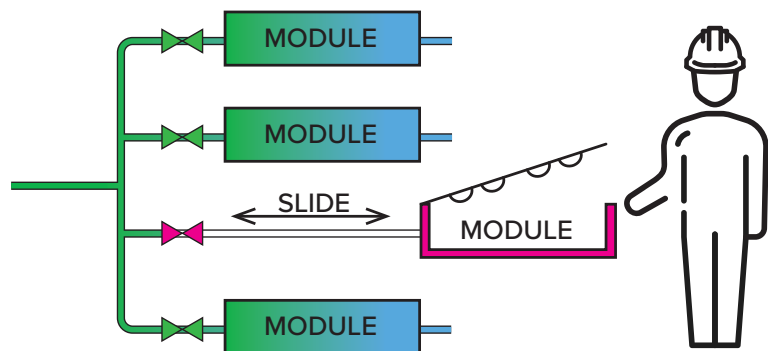
Working with liquids containing concentrated pathogens is not only unpleasant, but it can present health and safety risks for staff.

NovoLabs™ modules are mounted on a pull-out slider system with a flip-up lid making access for inspection or lamp-change quick, clean, safe and effortless. No messy disconnections are required.

Unlike legacy systems that require the extraction of submersed lamps/sleeves from unpleasant liquids for maintenance, *NovoLabs™* lamps are safely located in the lid above the liquid channel and have zero contact with the liquids.

Multiple safeguards allow operator access to the lamps and the liquid flow channels without exposure to ultraviolet radiation. Module/lamp status LED indicator enables a convenient, quick check of “module” status.

Slide out and flip up the lid for access within seconds!



The NovoLabs™ Supercritical UV™ system explained

The NovoLabs™ Supercritical UV™ disinfection system not only brings a breakthrough in the effective treatment of a wide range of liquids, but also delivers huge advantages in operational functionality and safety.

Modular Design for Easy Scalability

- NovoLabs™ Supercritical UV™ disinfection systems utilise a series of treatment modules that run in parallel. Each module has its own control unit to monitor and manage flow and optimise lamp temperature.
- The modular design allows for the easy addition of extra modules to increase capacity as circumstances require.
- Standard configurations are 1 to 10 modules in a rack, and these can be configured to best suit your facility's layout.
- Containerisation: Whilst NovoLabs™ can install a Supercritical UV™ disinfection system in to existing spaces within your facility, NovoLabs™ also offers “Plug and Play” containerised solutions with quality lighting, additional power points and aluminium treadplate flooring that allow for quick installation and easy relocation if required.



Powered to match your requirements

- *NovoLabs™ Supercritical UV™* disinfection systems employ the highest quality, long-life, low pressure amalgam ultraviolet lamps that output an optimal spectrum of germicidal light. Each module is fitted with the number of lamps needed to provide the required output for your application.

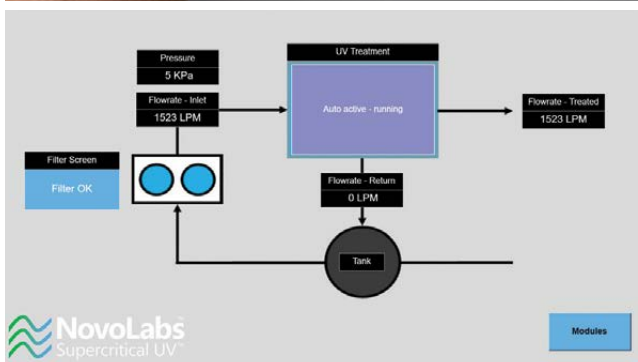
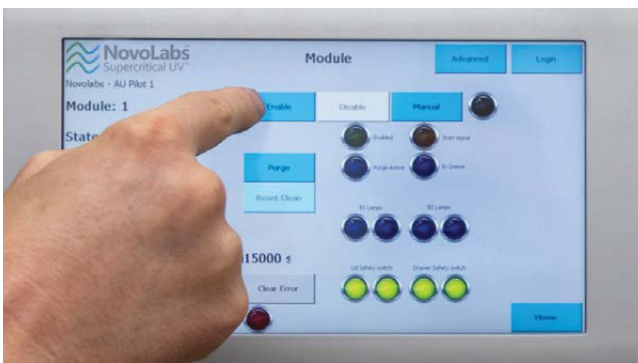


Optimising Efficiency to Save you Power

- Lamp temperature significantly impacts on ultraviolet output performance, so the *NovoLabs™* disinfection system constantly monitors and actively manages lamp temperature to ensure that they are always operating in the optimal temperature window for ultraviolet light output. This contrasts with legacy ultraviolet systems which have no active temperature control.
- *NovoLabs™* 'Automatic Flowrate Management System' makes use of the parallel processing configuration to automatically 'jog' modules on or off in response to variations in flowrate – optimising efficiency and reducing operating costs.

Easy User Interface

- Intuitive, easy-to-use PLC Interface and flow meter array makes operating and monitoring straight-forward.
- Capability for remote access monitoring and control.



Installation requirements

- *NovoLabs™ Supercritical UV™* disinfection systems can be installed into an existing structure or delivered as a pre-assembled 'plug and play' system housed in a 20' high cube shipping container fully fitted out with aluminium checker plate flooring, high-quality lighting, and spare power points.
- Our containerised solutions are delivered ready for connection into your plant. They come pre-tested with all internal plumbing and power connections, significantly reducing any onsite commissioning.
- Your site preparations simply require providing a suitable level structure for the container to sit on, a power connection, and supply of the inflow and drainage pipework adequate to meet the maximum capacity of the treatment unit.



Our Team — You're in safe hands

NovoLabs™ is a New Zealand based manufacturer with a growing global presence that is underpinned by solid evidence-based R&D.

The *NovoLabs™ Supercritical UV™* disinfection system is a world-first developed at Massey University of New Zealand, under the leadership of Andy Shilton. Andy is an Emeritus Professor of Environmental Engineering; a Fellow of Engineering New Zealand; and has been repeatedly ranked a 'world class' research engineer by an independent government panel. Andy leads the R&D programme at *NovoLabs™* as Chief Technology Officer, supported by a highly skilled science and engineering team.

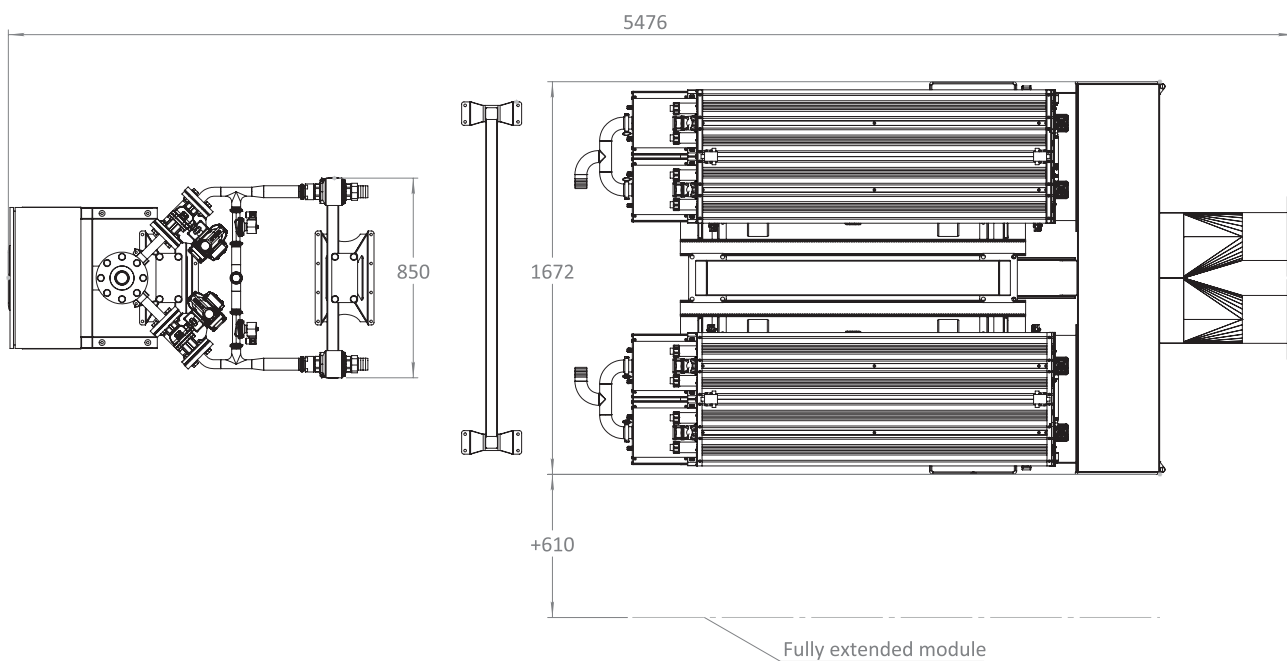
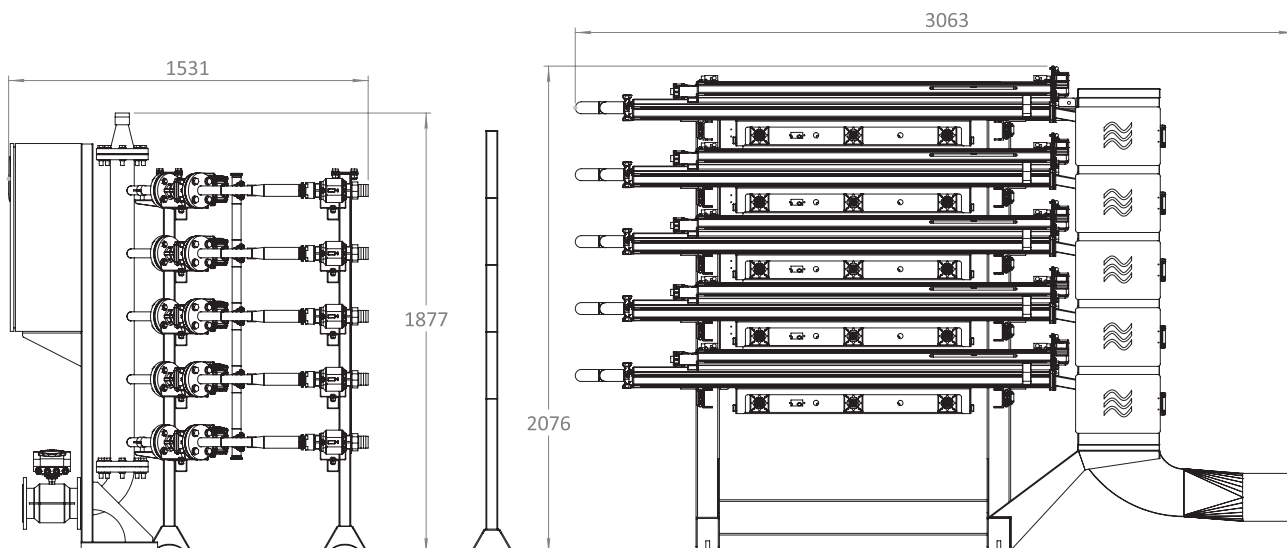
NovoLabs™ offers rapid response, and direct, easy contact with the design and engineering team who provide an exceptional level of service and support.

NovoLabs™ can carry out on-site trials with its mobile test units and offers a convenient service programme to ensure your system is maintained for optimal performance.

Contact us for more information at info@novolabs.co.nz

Technical Data/System Specifications

NovoLabs™ Modular Supercritical UV™ disinfection systems



Modular SCUV™ Series – for Low UVT applications

Standard-Power Systems

Model	SCUV™ 400	SCUV™ 800	SCUV™ 1200	SCUV™ 1600	SCUV™ 2000	SCUV™ 2400	SCUV™ 3200	SCUV™ 4000
No. of SCUV™ Treatment Modules	1	2	3	4	5	6	8	10
Max Flow Rate Capacity m³/day*	570	1140	1700	2280	2880	3450	4600	5700
Max Flow Rate Capacity m³/hr*	24	48	72	96	120	144	192	240
Max Flow Rate Capacity l/s*	6.7	13.3	20.0	26.7	33.3	40.0	53.3	66.7
Max Flow Rate Capacity US gal/min*	106	211	317	423	529	634	845	1057
* Note: Maximum flow rate differs for each application and lower throughput rates may be required for difficult-to-treat liquids.								
Lamps & Lamp Monitoring								
Number of Ultraviolet Lamps	2	4	6	8	10	12	16	20
Max. Lamp Power (Combined) W.	520	1040	1560	2080	2600	3120	4160	5200
Ultraviolet Lamp	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam
Energy Consumption (J/L) at max. flow rate.	78	78	78	78	78	78	78	78
Standard Features & Inclusions								
Individual Lamp Monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lamp Temperature Control	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Parallel Processing	Optional	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Automatic Flowrate Management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ultraviolet Intensity Sensor	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Automated Flush System	Recommended	Recommended	Recommended	Recommended	Recommended	Recommended	Recommended	Recommended
Automated Lamp-Out Alarm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Automated Lamp-Out Switch-Over	Optional	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Valve & Flow Meter Monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lamp Life-Time Hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lamp/status Indicator LED	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Safety Cut Out Switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stainless Steel Inlets and Outlet	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
User Interface Touch Screen	Optional	Optional	Optional	Optional	Yes	Yes	Yes	Yes
Control System	Embedded PC	Embedded PC	Embedded PC	Embedded PC	PLC	PLC	PLC	PLC
4G SIM Remote Monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continuous Monitoring Camera	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Containerised Housing	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Air Conditioning Unit	As Required	As Required	As Required	As Required	As Required	As Required	As Required	As Required
Operating Requirements								
Power Supply Requirements	1-PH, 10A	1-PH, 10A	3-PH, 16A	3-PH, 16A	3-PH, 20A	3-PH, 20A	3-PH, 32A	3-PH, 32A
	Excludes power allowance for air-conditioning			Includes power allowance for air-conditioning				
Max. Operating Pressure (Bar)	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar
Min. Operating Pressure (Bar)	0.5 Bar	0.5 Bar	0.5 Bar	1 Bar	1 Bar	1 Bar	1 Bar	1 Bar
Max. Particulate Size (micron)*	1000	1000	1000	1000	1000	1000	1000	1000
pH Range	**	**	**	**	**	**	**	**
Max. Liquid Viscosity	***	***	***	***	***	***	***	***

* larger particle throughput possible on request (subject to treatment goals)

** Contact *NovoLabs™* to discuss liquids that are not neutral

*** Contact *NovoLabs™* to discuss any highly viscous liquids requiring treatment

High-Power ‘Plus’ Systems

Model	SCUV™ 400 Plus	SCUV™ 800 Plus	SCUV™ 1200 Plus	SCUV™ 1600 Plus	SCUV™ 2000 Plus	SCUV™ 2400 Plus	SCUV™ 3200 Plus	SCUV™ 4000 Plus
No. of SCUV™ Treatment Modules	1	2	3	4	5	6	8	10
Max Flow Rate Capacity m³/day*	570	1140	1700	2280	2880	3420	4600	5700
Max Flow Rate Capacity m³/hr*	24	48	72	96	120	144	192	240
Max Flow Rate Capacity l/s*	6.7	13.3	20.0	26.7	33.3	40.0	53.3	66.7
Max Flow Rate Capacity US gal/min*	106	211	317	423	529	634	845	1057
* Note: Maximum flow rate differs for each application and lower throughput rates may be required for difficult-to-treat liquids.								
Lamps & Lamp Monitoring								
Number of Ultraviolet Lamps	4	8	12	16	20	24	32	40
Max. Lamp Power (Combined) W.	1040	2080	3120	4160	5200	6240	8320	10400
Ultraviolet Lamp	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam	High Output, Low-pressure Amalgam
Energy Consumption (J/L) at max. flow rate.	156	156	156	156	156	156	156	156
Standard Features & Inclusions								
Individual Lamp Monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lamp Temperature Control	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Parallel Processing	Optional	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Automatic Flowrate Management	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ultraviolet Intensity Sensor	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Automated Flush System	Recommended	Recommended	Recommended	Recommended	Recommended	Recommended	Recommended	Recommended
Automated Lamp-Out Alarm	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Automated Lamp-Out Switch-Over	Optional	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Valve & Flow Meter Monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lamp Life-Time Hours	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Lamp/status Indicator LED	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Safety Cut Out Switch	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Stainless Steel Inlets and Outlet	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
User Interface Touch Screen	Optional	Optional	Optional	Optional	Yes	Yes	Yes	Yes
Control System	Embedded PC	Embedded PC	Embedded PC	Embedded PC	PLC	PLC	PLC	PLC
4G SIM Remote Monitoring	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Continuous Monitoring Camera	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Containerised Housing	Optional	Optional	Optional	Optional	Optional	Optional	Optional	Optional
Air Conditioning Unit	As Required	As Required	As Required	As Required	As Required	As Required	As Required	As Required
Operating Requirements								
Power Supply Requirements	1-PH, 10A	1-PH, 16A	3-PH, 20A	3-PH, 20A	3-PH, 32A	3-PH, 32A	3-PH, 32A	3-PH, 32A
	Excludes power allowance for air-conditioning			Includes power allowance for air-conditioning				
Max. Operating Pressure (Bar)	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar	7.5 Bar
Min. Operating Pressure (Bar)	0.5 Bar	0.5 Bar	0.5 Bar	1 Bar	1 Bar	1 Bar	1 Bar	1 Bar
Max. Particulate Size (micron)*	1000	1000	1000	1000	1000	1000	1000	1000
pH Range	**	**	**	**	**	**	**	**
Max. Liquid Viscosity	***	***	***	***	***	***	***	***

* larger particle throughput possible on request (subject to treatment goals)

** Contact NovoLabs™ to discuss liquids that are not neutral

*** Contact NovoLabs™ to discuss any highly viscous liquids requiring treatment



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