



### Water Purification UVC LED Sterilizer

Aquatech Amsterdam 2025

Junglin Tsai

2025.03.05

Cristal Materials Corporation



### Innovation of the Year



#### Innovation 2025: 120 GPM UV-C LED solution for waste water





### UV-C water purification modules

### To drink a glass of purified water Is not unreachable any more

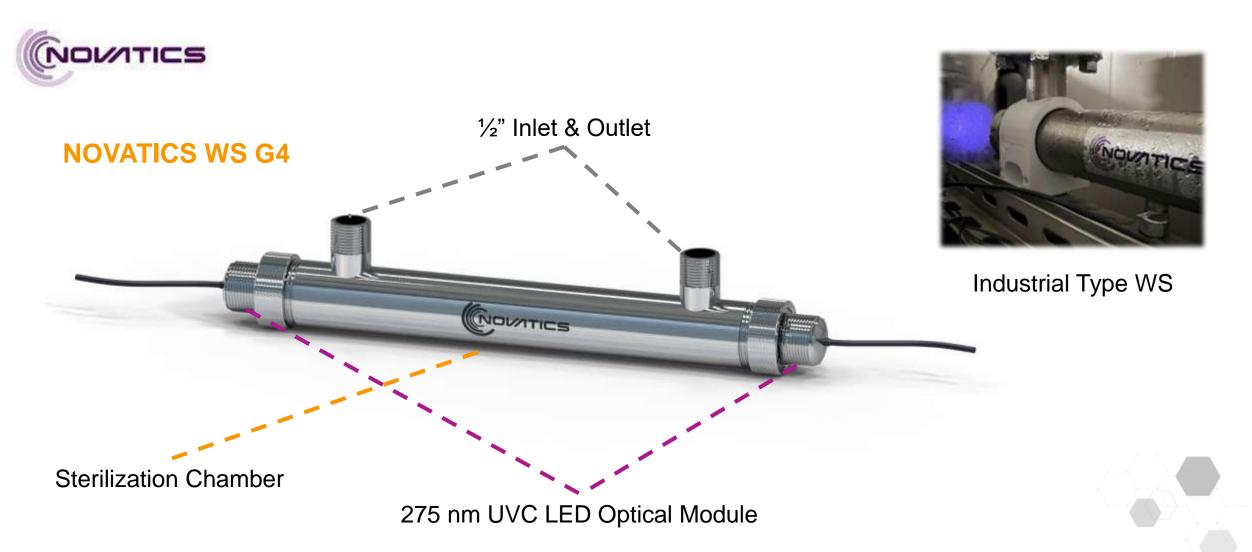






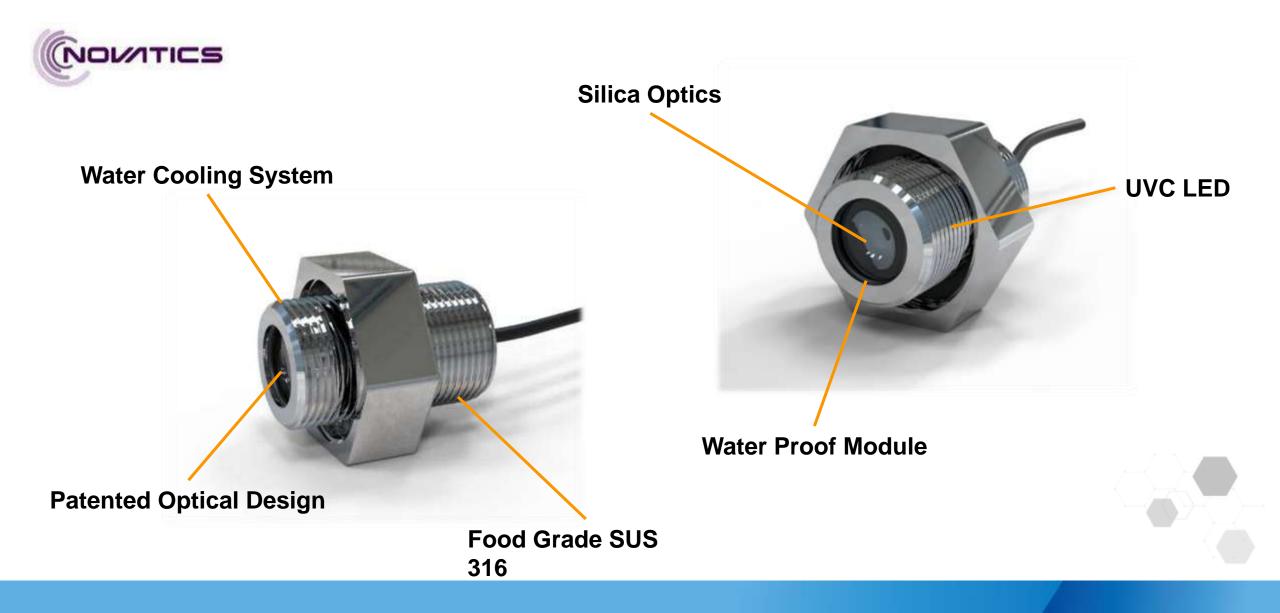
### **NOVATICS WS Series**





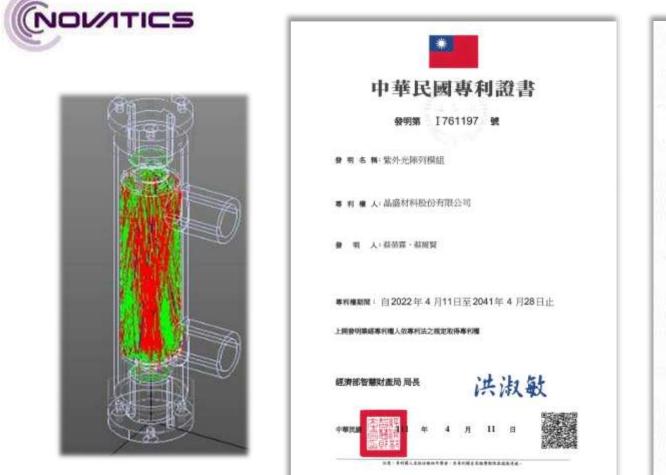
### NOVATICS UVC LED Module





### Patented Optical Design

















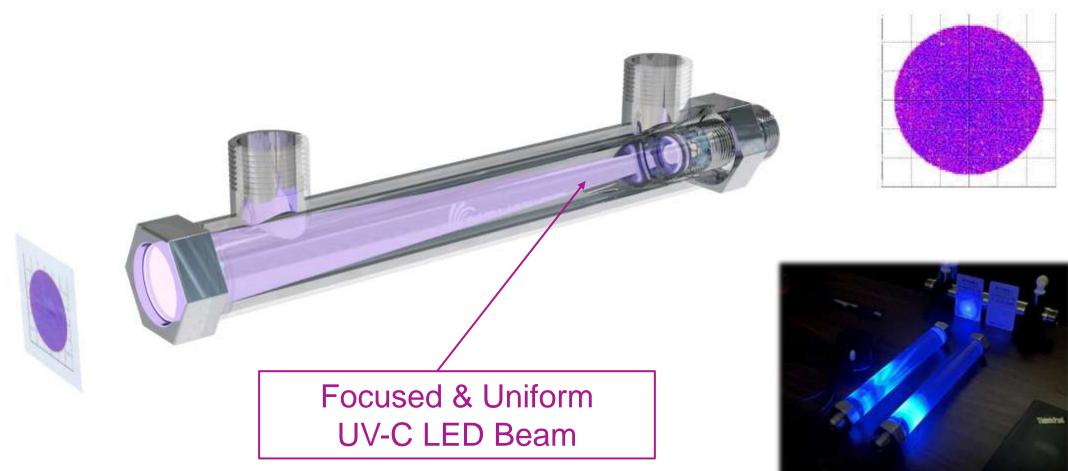




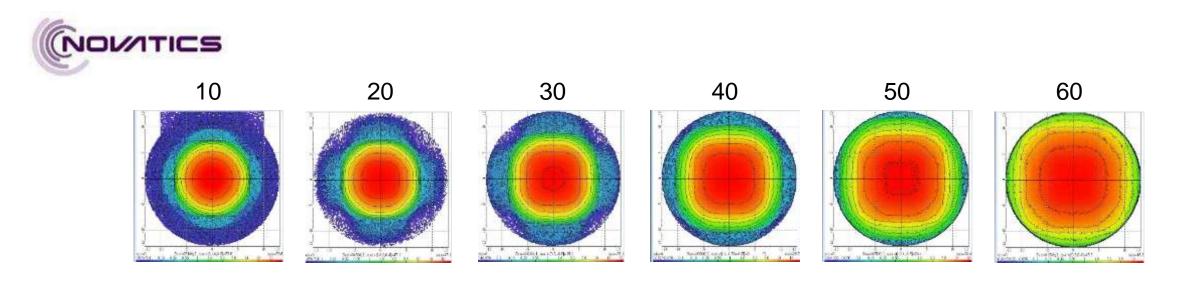




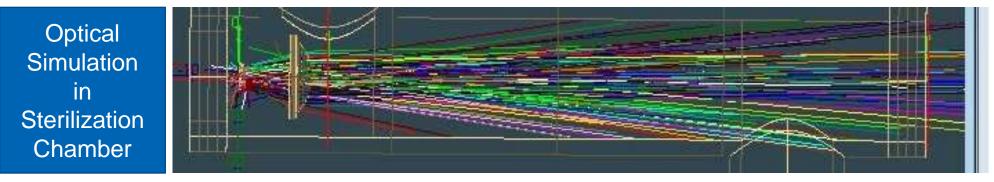






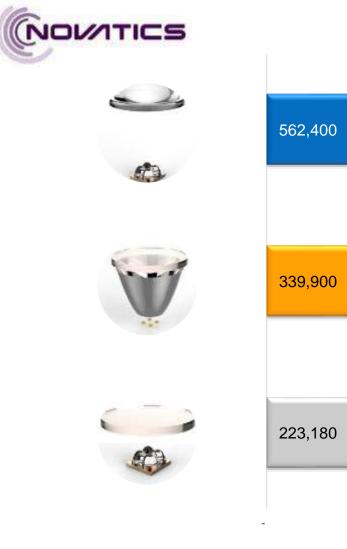


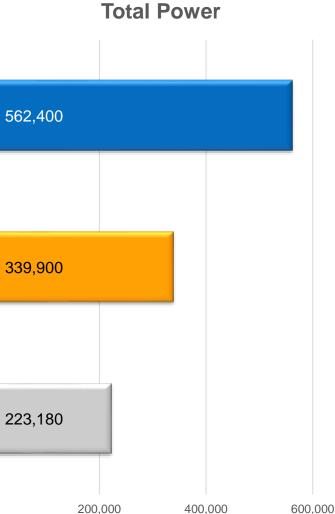
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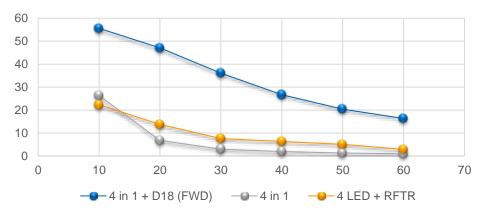




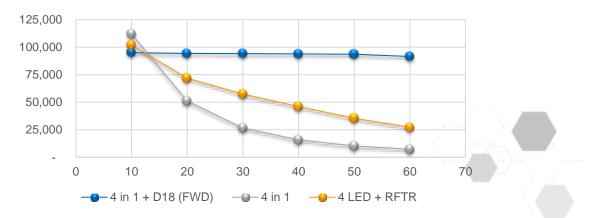




**Max Power** 



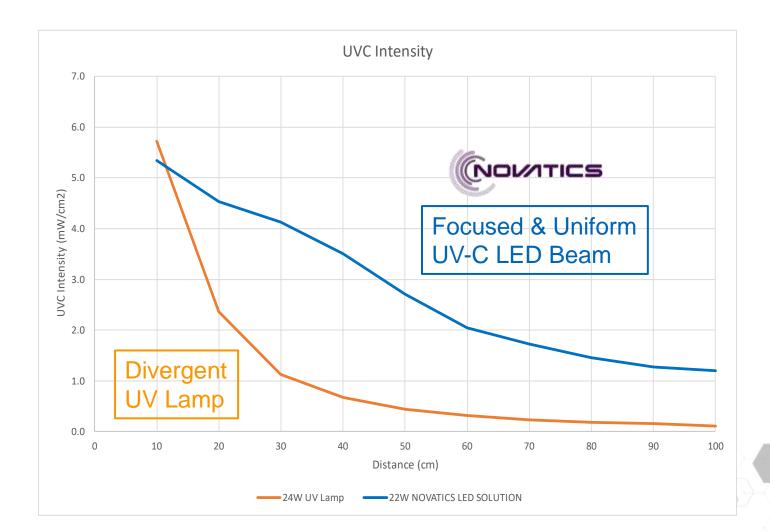
**Area Power** 





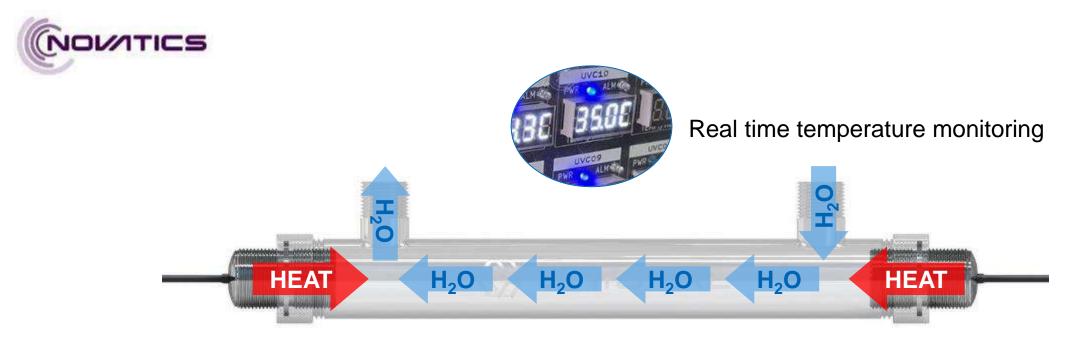


- NOVATICS WS is highly focused UV-C optical solution for long distance projection in limited channel
- Born for fluid system such as water purification and industrial air conditioner



### Water Cooling Design





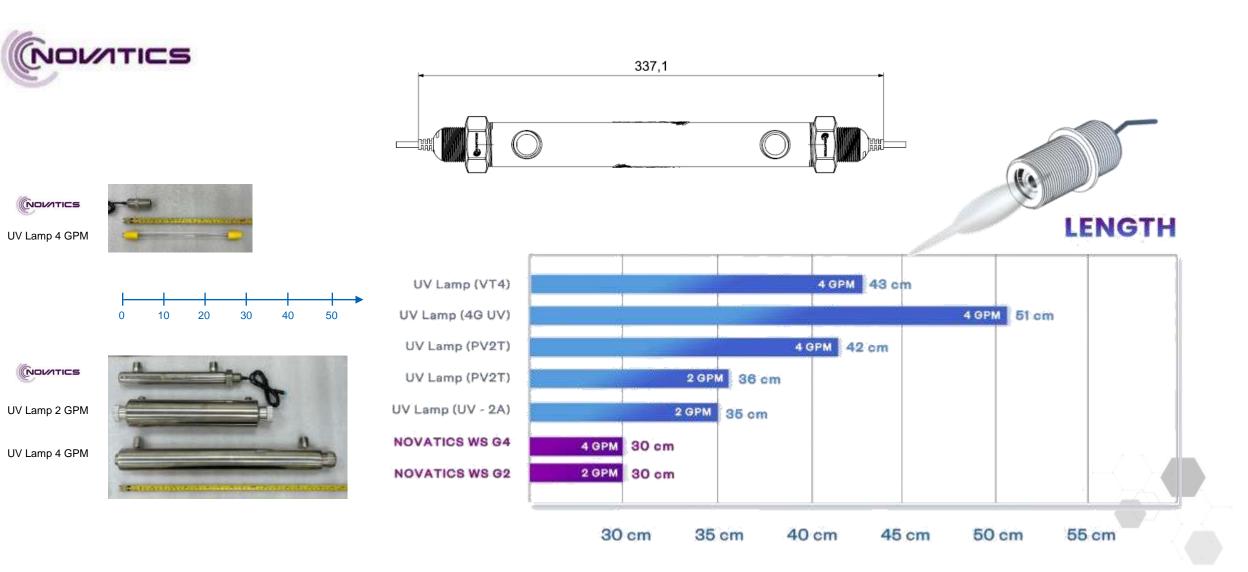
Water cooling LED module

Born for high flow rate water purification



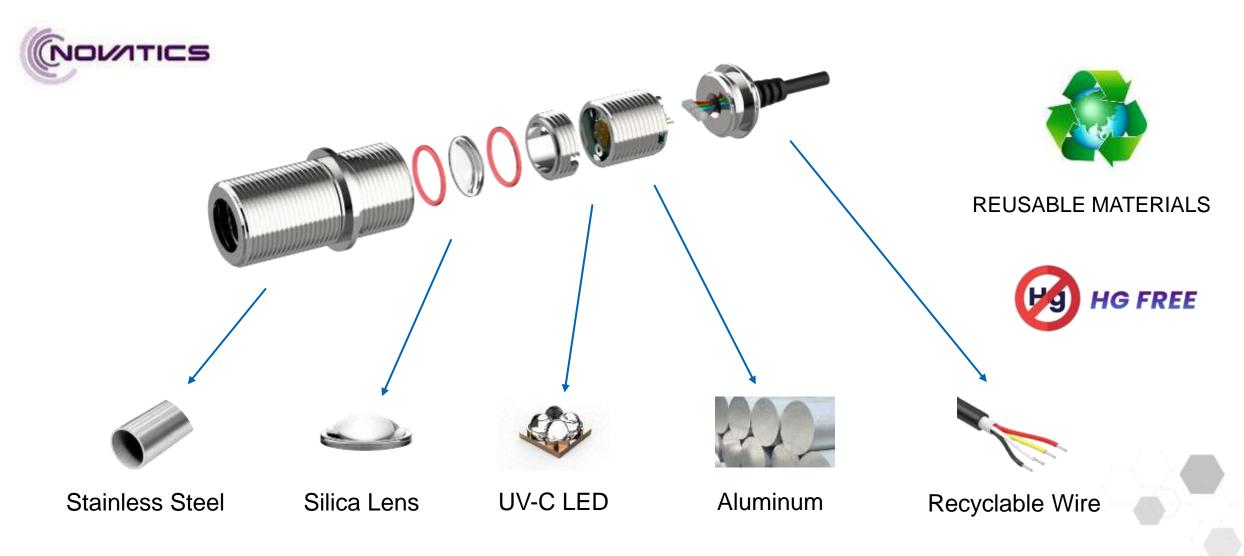
### **Compact Design**





### Eco Friendly Design





### ESG compliant product





		Reusable Materials		<b>Mercury Free</b>	e Eco	<b>Froduct</b>
	Image	Power Consumption	Size	Lifetime	Toxic Material	Recycling Cost
	NOVATICS WS CORE	7			MERCURY	0
	Mercury UV Lamp	<b>F F</b>			80 H9 Mercury 200 5920	

### **NOVATICS WS Features**





- UV-C LED technology
- Waterproof LED module
- Min power consumption

- Mercury (Hg) free
- Intelligent functions
- Compact Design





Mobile Food Truck

Food Industry Central Kitchen

Drinking Water





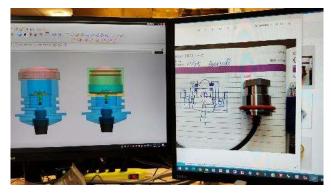
Fish Fank

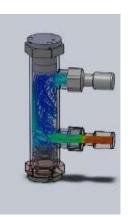


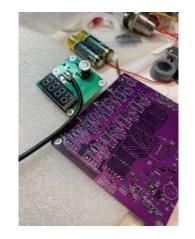
### **NOVATICS** Team Service



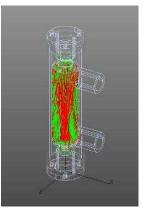








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### **NOVATICS Service**

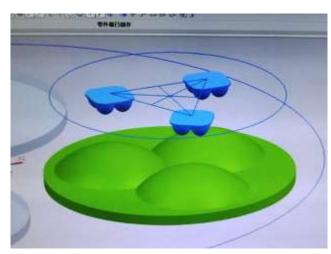
- Optical Design
- Optics Manufacturing
- Fluid Dynamics
- Mechatronics Design
- Module Design
- System Integration

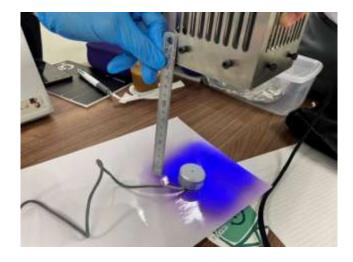


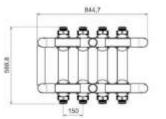
### NOVATICS Team Work

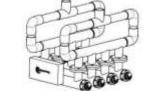


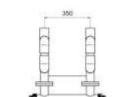
















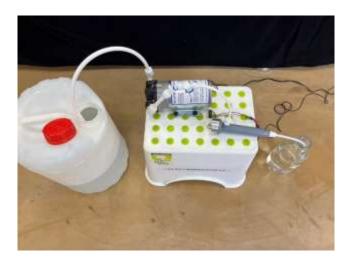
### **NOVATICS** in the Lab















### **NOVATICS** Team Design











# **Performance Results**



### **EMI/EMC** Tests Passed



# 

Test Report Number:	FTS23HR-6184E			Total Page	u); ;
Applicant Name:	Cristal Materials C	relation			
Applicant Address:	3rd Floor, No. 53, 1 City, Taiwan	ave 259, Ruigu	ang Road, Nei	he Datriet, To	Nipei
Test item:	NOVATICS WS U	-CLEO STEWL	ZER		
Model / Type Reference:	WS D4	_			_
Date of Issue	2023-11-03	Sub-	0	12	1
Testing Laboratory:	Guangdong Future Tatal Samlopo Do. LM No.228. Million & South Hall X within Tolen, Zhangshan City, Guangdong Priviletic Colora.				
Test Specification:	EN IEC 86014-20 EN IEC 61000-3-2 EN 61000-3-3 2017	2018-1A1-2021	221		
Test Result	Passed				_
Compiled by:		Reviewed by:		200	
2023-11-03 Grainte Cao	Cataline Cas	2023-11-03	Gordon Xie	Genda	Vie
Time Name	Spore	70m	Name	Spoter	
Remark: N:4					
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P	age 5 of 23 Report No.: FT023HR-518
6. Test Results Emission	in
6.1 Emission in the Freque	ency Range up to 30 MHz
6.1.1 Harmonics Current Emis	ssion on AC Mains
RESULT:	
	EN IEC 61003-322019+A12021 4 IEC 61000-4-7 5 A Cloure 7 3 W. according to EN IEC 61000-3-23019+A dual EUT is deemed to full? the requirement
Sear Connector Chagram	





#### Concentration: 10^5 CFU/100mL

Model	Flow Rate	E.Coli	Staphylococcus	Pseudomonas
WS G4	7.5 LPM	99.99%	99.95%	99.94%
4WS T5	75 LPM	98.85%	N/A	N/A

E.coli



#### Staphylococcus



#### Pseudomonas

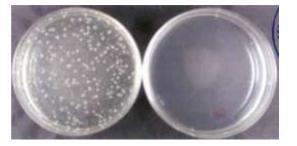


### **Sterilization Report**





#### E. Coli sterilization test





because results matter

Flow Rate (LPM)	Before Sterilization (CFU/100 mL)	After Sterilization (CFU/100 mL)	Sterilization Efficiency
2.0	4 x 10 <sup>5</sup>	<1	99.98%
7.5	2 x 10 <sup>5</sup>	60	99.97%

Client       Crind Materials Corporative         Crindt Materials Corporative       10025507/00         Crindt Materials (Now CLED Startling)         Model Type;       VS 664         Samula Noundrar,       SPA220 All(2400) -002         Text Bran and Method;       Performance toil         The rest solution was appared to SOS fabrication;       Income to SOS fabrication;         Adjustic for transmit       Construction         Materials       Construction         Materials       Using the processing through the processing the processing through the processing through t	_		10.000 (M/-)				SIIPER
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### SGS Test Result



Client:





#### Lab test results of WS G4

Target	Performance
Coliform	99.9%
E.Coli	99.9%
P.Aeruginosa	99.9%



Client:

**Product Name:** 

Model/Type :

TEST REPORT

> Report Receiv

Report

The nu

SGS SGS TAIWAN LTD. Cristal Materials Corporation **Product Name:** NOVATICS UV-C LED Sterilizer Model/Type : WS G4 Sample Number : NPX23A00124001-002

Sample Number: NPX>3A0012401-00>

Following Test Sample is provided and confirmed by client Cristal Materials Corporation NOVATICS UV-C LED Sterilizer WS G4 Sample Number : NPX23A00124001~002 Test Item and Method: Performance test

- 1. The test solution was prepared in SGS laboratory.
- 2. The test solution was analyzed before and after processing through the proc 3.6L/min for 5 minutes. Test Result :

Test Item	Unit	Before processing	After processing	Elimination ratio(%)
Coliform	CFU/100mL	3.8×10 <sup>3</sup>	<1	>99.9
Esherichia coli	CFU/100mL	3.5×10 <sup>3</sup>	<1	>99.9
Pseudomonas Aeruginosa	CFU/mL	5.6×10 <sup>3</sup>	<5	>99.9



### JP Lab Test Result





#### **Test Conditions**

Target: E. coli

Concentration: 10^5 CFU/mL

Flow Rate: 2 GPM

Test in Japan

#### 2GPM test results of WS G4

Model	Performance
WS G4	99.95%

 $\Box$  Sterilization Test(G2, <u>G4</u>)

Sample arrival date	August . 1
Sterilization Test	August . 3 ~ 10
Bacteria	E.Coli
Flow Rate	7.5 L/min (2 G/min)
Operating Condition	Use attached power supply





#### Result

$\backslash$	_	Sterilization[CFU/mL]	LRV	Fig.	
			LIXV	Before	After
G2	Before	7.9E+05			
GZ	After	2.2E+04	1.5		
<u>G4</u>	Before	<u>7.2E+05</u>		0	0
	<u>After</u>	3.2E+02	<u>3.3</u>		

### WS G4 Lab Performance







#### Lab test results of WS G4

Flow Rate	Performance
2 GPM	99.98%

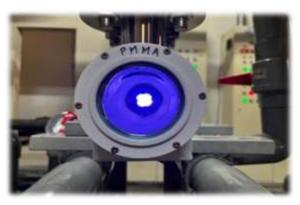
#### WS G4 performance test in Taiwan University Lab



### 4WS T5 Lab Performance







#### Lab test results of 4WS T5

Flow Rate	Performance
20 GPM	98.85%

#### **4WS T5 Concept** designed for industrial applications



### TIR 2LPM Lab Performance







#### Lab test results of WS TIR

Chip	Performance
2 LPM	99.9%

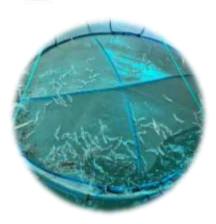
#### TIR 2LPM Concept designed for drinking machines



### Shrimp Farm Test







Model: WS T10 Matrix Flow Rate: 5 m<sup>3</sup>/hr





### Murry Cod Hatchery Test

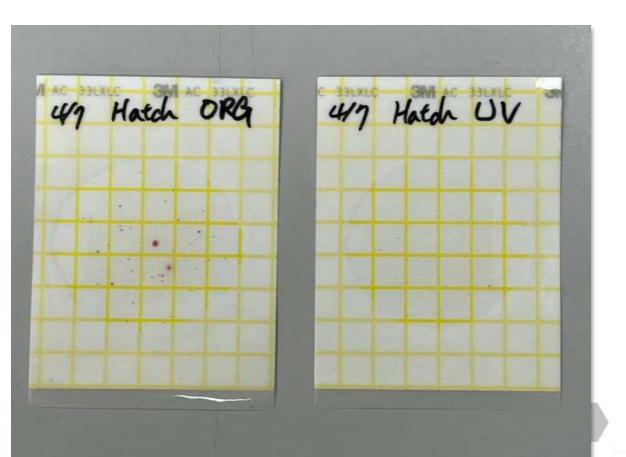






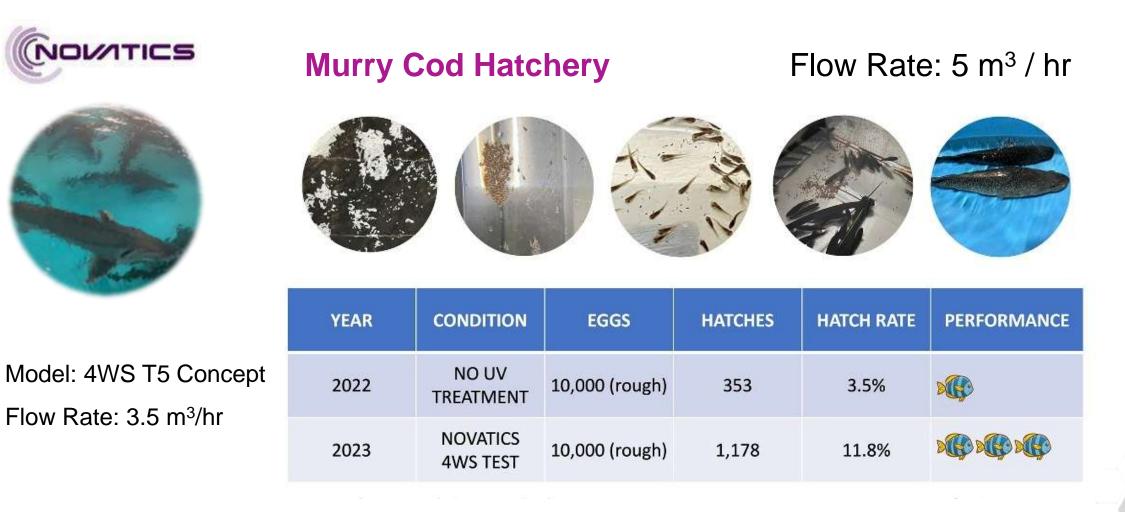






### Murry Cod Hatchery Test



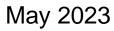


NOVATICS 4WS Concept enhances hatch rate by 3 times

### Murry Cod Hatchery



4WS T5

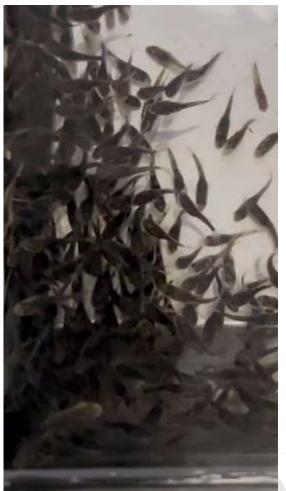




Jun 2023



Aug 2023



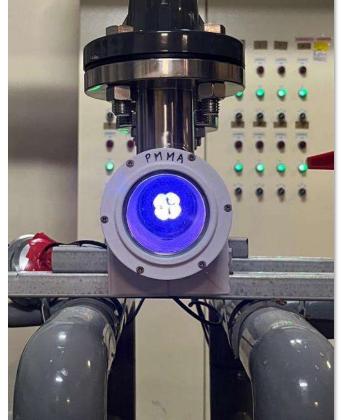
### SPA Pool Test







Model: WS T10 Matrix Flow Rate: 9 m<sup>3</sup>/hr





## **SPA Pool Test Comparison**

No treatment in water for 12 hrs



3x10^6 CFU/mL



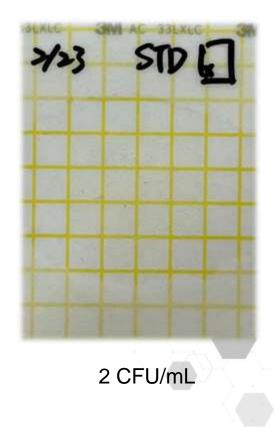
146 CFU/mL



CRISTAL

(Reference)

Regular Cl 1.5 ppm



1 CFU/mL

(NOV/ITICS

SPA [

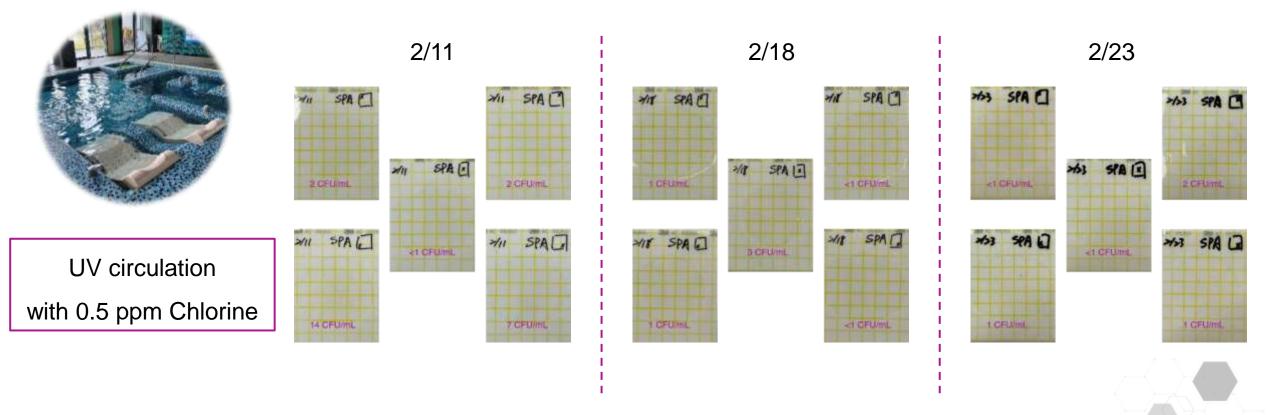
UV circulation + 0.5 ppm Cl

XII

### **Continuous Test Results**

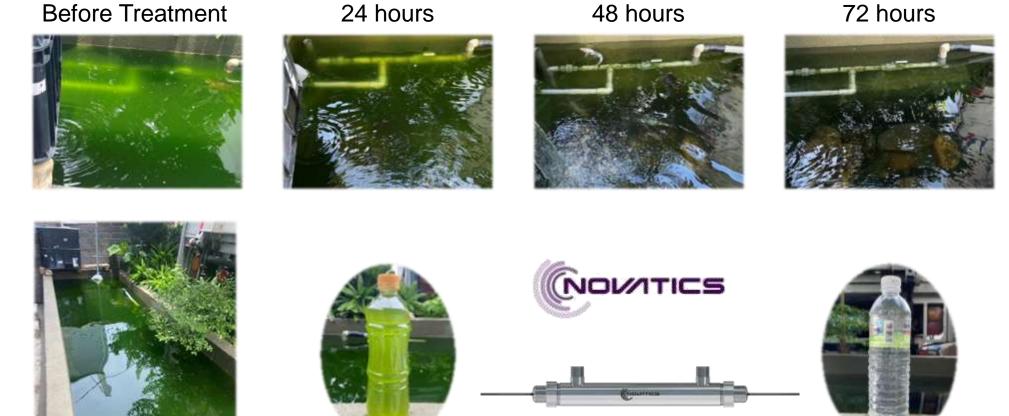






#### **Effective Algae Control**





96 hours





#### Effective Algae Control







24 hours



48 hours



72 hours



96 hours









## Arowana Aquatank















#### Fish Pond Algae Control





Before treatment

Treatment for 1 week



#### Seafood Tank







#### Algae Removal for Aquarium





#### Greenish algae water to be removed in 3 days by NOVATICS WS G2 (3 ft tank)





#### Algae Removal Test



NOVATICS WS G4

Greenish Water Test for 60 hrs



NOVATICS WS G4

Crystal Clear Water in 60 hrs



# **NOVATICS WS Specs**



#### NOVATICS WS Series



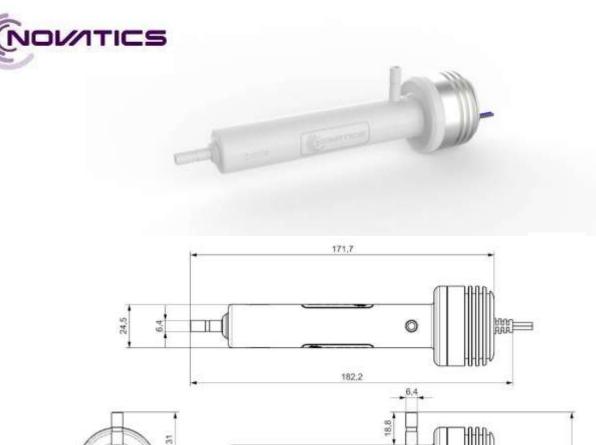




<b>NOVATICS WS Series</b>	WS G4	WS T5	WS T30
Max Flow Rate	4 GPM	20 GPM	120 GPM
LED Wavelength	275 nm		
LED Lifespan	10,000 hrs		
Inlet Diameter	1⁄2" male	1½" flange	3" flange
Input Voltage	100 – 240 VAC		
System Power	10 W	50 W	360 W
System Weight	1.5 kg	12 kg	75 kg
Applicable Temperature		5 – 45 °C	

**WS TIR** 





Courses

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24.5

18

#### **NOVATICS WS TIR**

- Max Flow Rate
   2 LPM
- Power
- Dimension 182 mm
- Lifetime

10,000 hrs

2.7 W



#### WS CORE



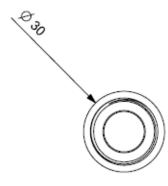


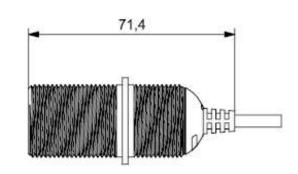


#### **NOVATICS WS CORE**

- Max Flow Rate 2 GPM
  Power 5 W
- Dimension 71.4 mm
- Lifetime

10,000 hrs



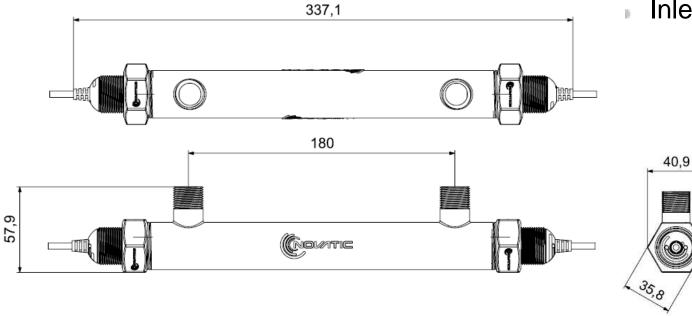












#### **NOVATICS WS G4**

- Max Flow Rate
   4 GPM
- Power
- Dimension
- Inlet Diameter

- 10 W
- 337 mm
  - ½ in

#### 4WS CORE







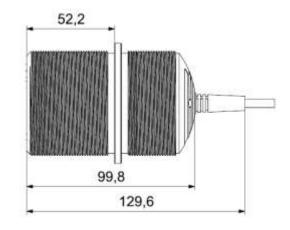
#### **NOVATICS 4WS CORE**

- Max Flow Rate
   10 GPM
- Power
- Dimension 99.8 mm
- Lifetime

10,000 hrs

25 W

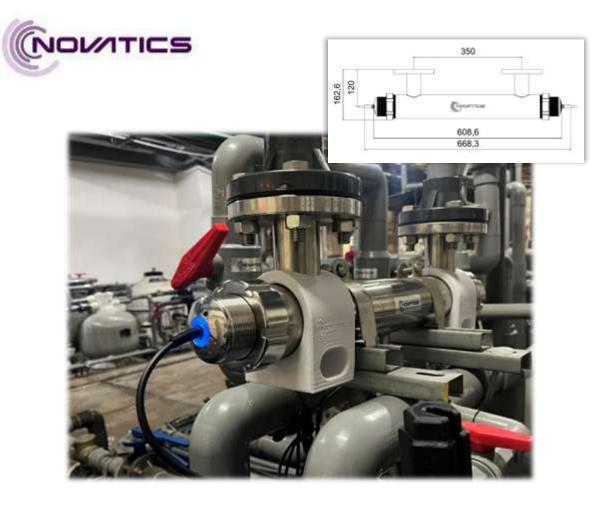






4WS T5





#### **NOVATICS 4WS T5**

- Max Flow Rate -00
- Power -05
- Height 6
- Width 8
- Depth 65
- Inlet Diameter
- **Control Panel** -00
- Power Supply 6

- 20 GPM
- 50 W
- 162 mm
- 668 mm
- 90 mm
- $1\frac{1}{2}$  in
- Option
- Standard

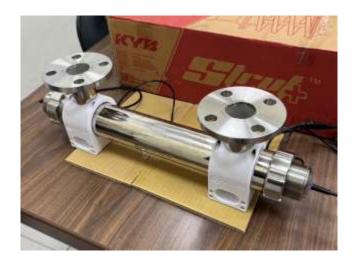
















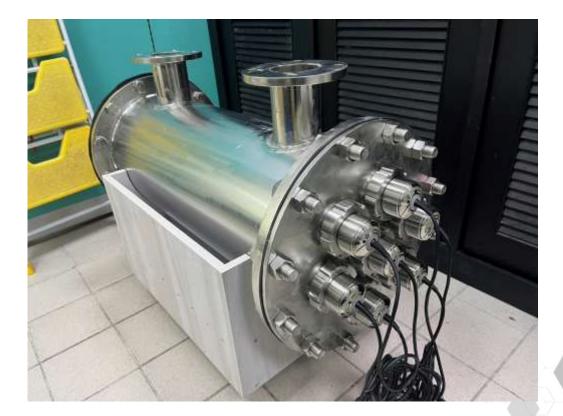
#### New Arrival WS T30



UV-C LED waste water treatment Capacity: **30 m<sup>3</sup>/hr** Power: 360 W



Innovation of the year Released in March 2025

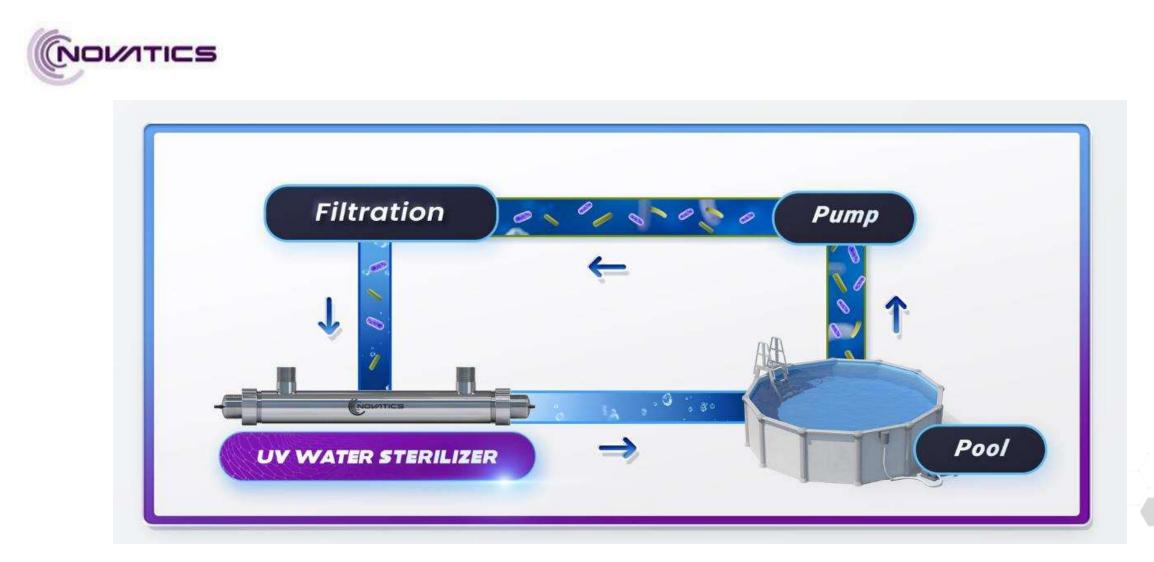


# **Real Site Achievements**



#### **Connection Example**

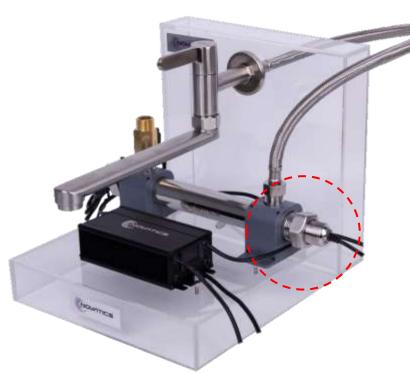




#### **NOVATICS** Assembly Example



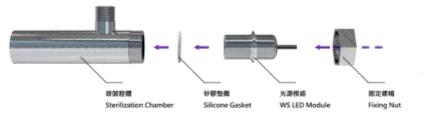




NOVATICS WS G4 for central kitchen



NOVATICS WS CORE UV-C LED Optical Module



#### **Emergency Water Package**







#### Household Drinking Water







#### Household Drinking Water









#### **Central Kitchen Faucet**









## Aquarium















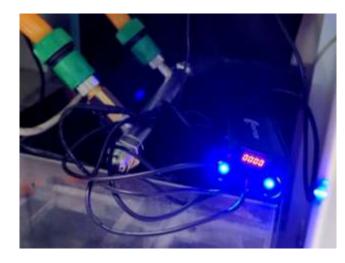
### Hi End Aquatank















#### Seafood Tank Sterilizer

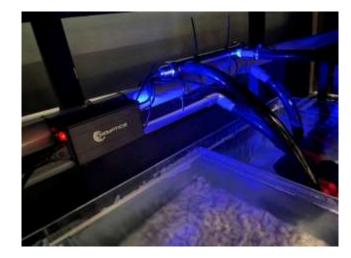














#### Natural Fish Pond















### Pig Farm Drinking Water

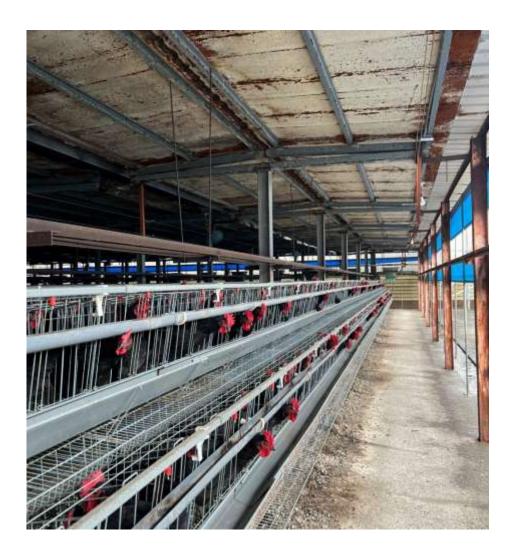






#### Chicken Farm Drinking Water



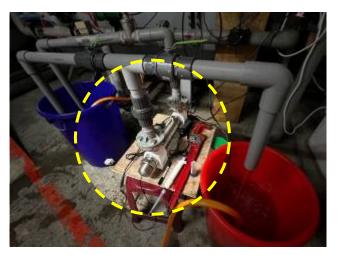




#### Hospital Waste Water



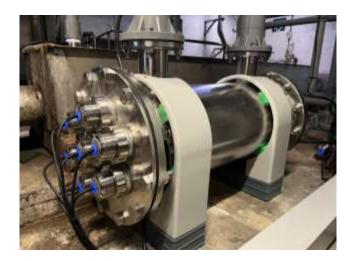






#### Hospital Waste Water















#### Hospital Waste Water









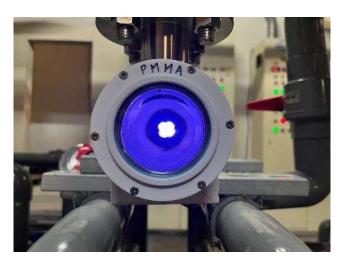


## SPA Pool (WS T10)















## Tilapia Farm (WS T10)









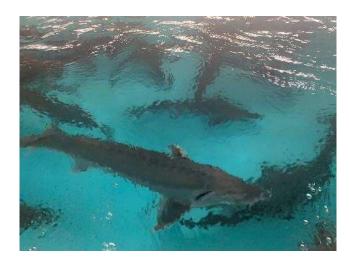






## Sturgeon Farm (WS T10)















## Sturgeon Farm (4WS T5)















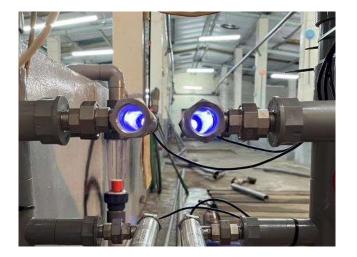
## Shrimp Farm (WS T5)

















# **Company Profile**



ter anne Tel

#### **Cristal Materials Corporation**



Company

Establish

Process

Material

Certificate

Brands

(NOLATICS

Service

**Cristal Materials Corporation** 

2006

Nano Sol-Gel process

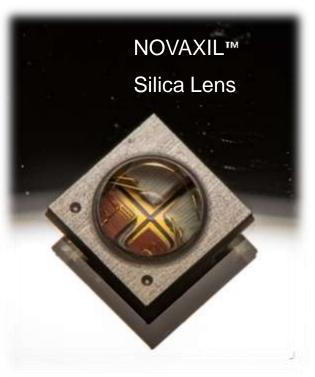
Fused Silica

ISO 9001 / ISO 14001

**NOVAXIL<sup>™</sup> silica optics** 

NOVATICS UV-C LED solutions

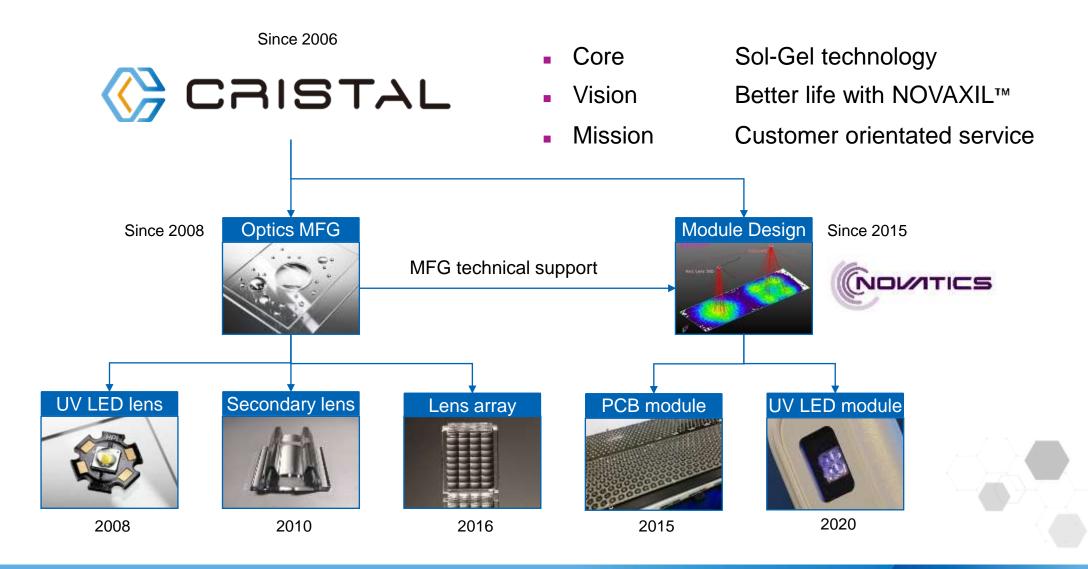
Optics manufacturing Optical design & Optical simulation UVC LED module integration





#### About us





# Silica optics MFG





#### **Continuous improvement**

- 1) Complex geometry
- 2) Freeform design
- 3) Microstructures



#### **Applications**



- 1) UV LED packages
- 2) PCB / 3DP / Printing
- 3) Laser projector



#### Advanced study

- 1) Head up display (HUD)
- 2) Laser optics
- 3) Bio-Med analysis
- 4) UVC sterilization



#### **Mass production**



- 1) Aspheric lens
- 2) TIR optics
- 3) Flyeye lens
- 4) Microlens array

#### NOVAXIL<sup>™</sup> silica optics





#### **NOVATICS LED** solutions





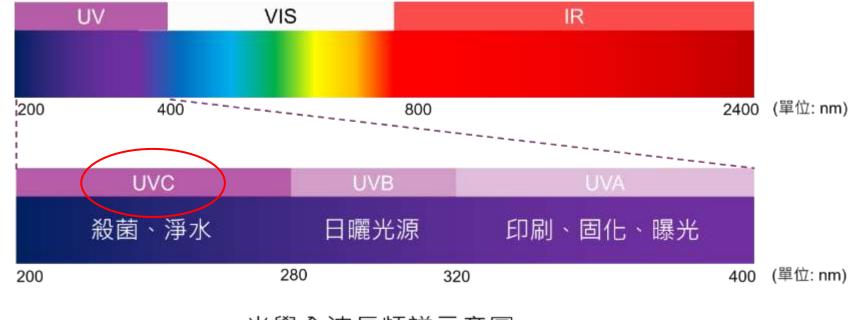
# **Backup Slides**

UVC spectrum & LED Sterilization



#### UV spectrum

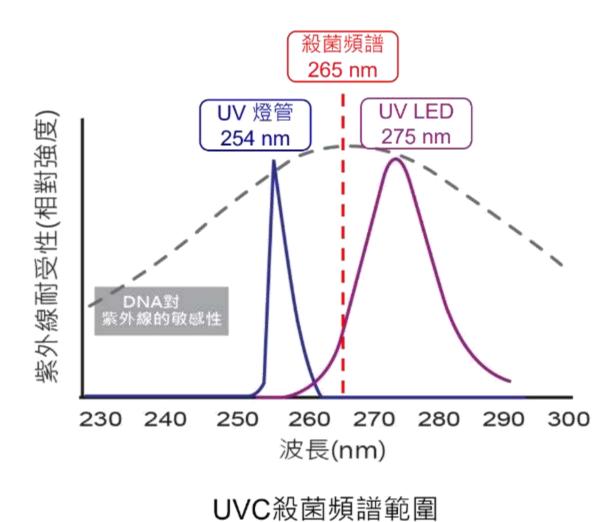




光學全波長頻譜示意圖

#### **UVC** sterilization









10 1 0

10 1 0

10 1

0

cristalmat.com