



ZENITH INTERNATIONAL ENTERPRISE LIMITED

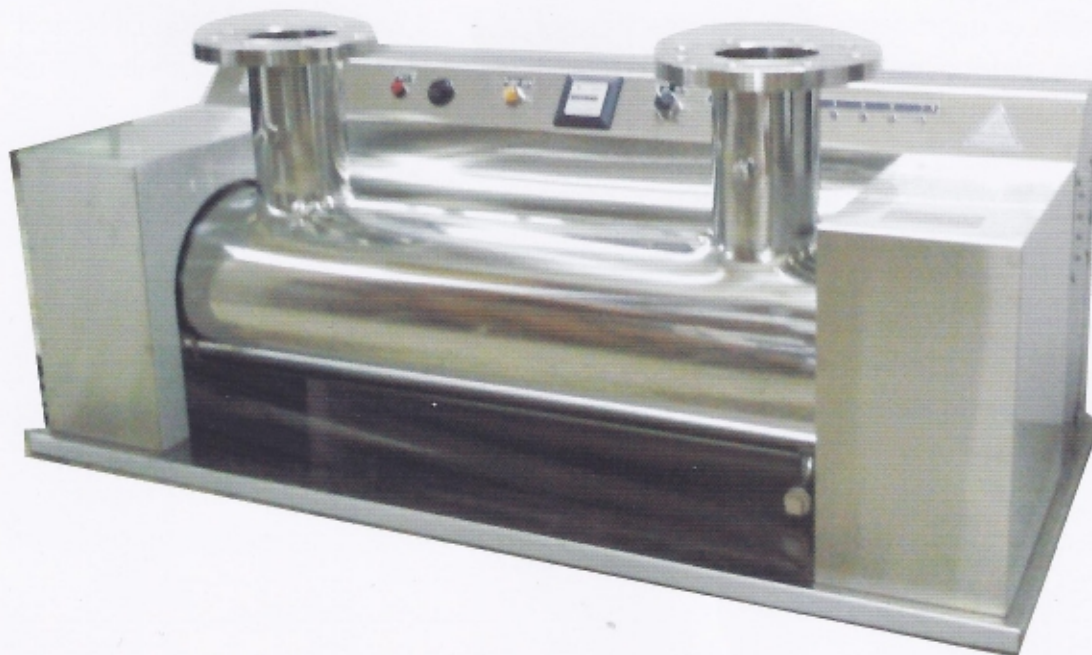
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CRYSTAL-FINE®

ULTRAVIOLET WATER PURIFIERS

CRSL HORIZONTAL MULTI-LAMP SERIES



APPLICATIONS:

- * Drinking water
- * Effluent
- * High purity and ultra-pure water
- * Swimming pools and fountains
- * Residual ozone destruction
- * TOC reduction
- * Feed water pretreatment for membrane separations systems
- * Process water
- * Syrups, brines, whey etc.
- * Aquaculture and hydroponics
- * Cooling towers
- * Advanced oxidation processes
- * Spas

UV FUNDAMENTALS

UV ENERGY

Light is electromagnetic radiation or radiant energy traveling in the form of waves. UV energy is found in the electromagnetic spectrum between visible light and x-rays and can best be described as invisible radiation. The energy employed for UV water treatment is further categorized into two primary levels measured as wavelengths 254nm and 185nm.

HOW UV WORKS

All living organisms contain DNA (deoxyribonucleic acid) that provides the mechanism for all functions needed to sustain life. Most germicidal UV systems emit 254nm (the most effective germicidal wavelength) UV energy that penetrates the outer cell membrane of microorganisms, passes through the cell body, reaches the DNA and alters the genetic material. The microorganism is thereby deactivated or killed in a non-chemical manner.

For residual ozone destruction, 254nm UV systems are also applied to provide UV energy to ozone, catalyzing it to harmless oxygen.

In ultrapure water systems, UV systems are also used for effective reduction of organics, commonly referred as TOC (total oxidizable carbon). The 185nm UV applied to TOC reduction is shorter in its wavelength and consequently more powerful than the common germicidal 254nm UV. In this case, UV energy promotes free radicals (OH) in varying degrees of photochemical excitation. These free radicals break various chemical bonds of organics which in turn produce chain reactions, oxidizing most TOC to CO_2 and H_2O .

Different liquid has a different UV absorption coefficient or transmission rate. Average tap water has an absorption coefficient between 0.06 and 0.1 while highly polished DI or distilled water has an absorption coefficient of 0.008.

The scientific community documented the minimum UV dosage required for 99.9 % destruction of different microorganism (see Table A). The dosage of UV radiation required to deactivate 90% kill of a specific microorganism is called D_{10} of the microorganism. Doubling this dosage achieves a 99% deactivation. Taking E. Coli ($D_{10}=2200\mu\text{Ws}/\text{cm}^2$) as an example, the dosage needed to achieve a 99.999% deactivation can be calculated as shown below:

E. Coli % deactivation against UV dosage

Multiple	Deactivation (%)	Dosage ($\mu\text{Ws}/\text{cm}^2$)
$1 \times D_{10}$	90	2,200
$2 \times D_{10}$	99	4,400
$3 \times D_{10}$	99.9	6,600
$4 \times D_{10}$	99.99	8,800
$5 \times D_{10}$	99.999	11,000

All the CRYSTAL-FINE® CRSL Horizontal multi-lamp models provide in excess of 40,000 $\mu\text{Ws}/\text{cm}^2$ of UV dosage (NSF 55, Class A) at the listed flow-rate of water with 0.02 UV absorption coefficient and 40°C UV lamp temperature.

Table A

Ultraviolet Dosage ($3 \times D_{10}$) Required for 99.9% Deactivation of Various Micro-organisms ($\mu\text{Ws}/\text{cm}^2$)

Bacteria					
Bacillus Anthracis	8,700	S. Enteritidis	7,600	B. Megatherium (veg.)	2,500
Bacillus Anthracis spores.	46,200	B. Paratyphosus	6,100	B. Subtilis	11,000
B. Megatherium spores.	5,200	Clostridium Tetani	22,000	Corynebacterium diphtheriae	6,500
B. Subtilis	11,000	Escherichia Coli	6,600	Leptospira Interrogans	8,000
B. Subtilis spores	22,000	Neisseria catarrhali	8,500	Phytomonas Tumefaciens	8,500
Eberthella Typhosa	4,100	Pseudomonas Aeruginosa	6,600	Salmonella Typhosa	26,420
Mycobacterium Tuberculosis	10,000	Serratia Marcescens	3,400	Shigella Dysenteriae	4,200
Proteus Vulgaris	6,600	Streptococcus Lactis	8,800	Vibrio Cholerae	6,500
Sarcina Lutea	4,200	Spirillum Rubrum	6,160		
Mold Spores					
Aspergillus Flavus	99,000	Mucor Racemosus	35,200	Oospora Lactis	11,000
Penicillium Expensum	22,000	Penicillium Roqueforti	26,400		
Protozoa					
Chlorella Volgaris (algae)	22,000	Nematode Eggs	40,000	Paramecium	200,000
Virus					
Bacteriophage (E-coli)	6,600	Influenza	6,600	Coronavirus (SARS)	7,400
Virus of Infectious Hepatitis	8,000				
Yeast					
Baker's Yeast	8,800	Brewer's Yeast	6,600	Common Yeast Cake	13,200
Legionella Pneumophila (legionnaire's Disease)	2,760				

GENERAL SPECIFICATIONS

Power:	Protected 220V / 50-60Hz / single phase
Design pressure:	150 psig, rated
Water temperature:	1°C to 50°C; 25°C rated

GENERAL INFORMATION

- ★ Provides a minimum of 35,000 μ Ws/cm² of 254nm UV dosage throughout the lamp life at the listed flow-rate for effective water disinfection (Minimum UV dosage required for effective water disinfection stated by Dept. of Health –USA and the National Health and Medical Research: 16,000 μ Ws/cm²)
- ★ US made high quality UV lamps and high purity quartz sleeves ensure maximum UV intensity throughout the contact chamber.
- ★ Low mercury UV lamps put less impact to the environment and are rated for 13,000 hours of continuous operation.
- ★ Specially designed CRYSTAL-FINE electronic ballast with flicker free and maximum protection circuit ensures the optimum UV lamp output and life.
- ★ Inside out polished 304 or optional 316L SS UV chamber ensures high reflection of radiation and effectiveness of bacteria killing. The chamber is equipped with in /outlet sampling and drain connections for easy services and performance tests.
- ★ Bi-color LED for individual UV lamp on and lamp out indication.
- ★ Audible and visible UV lamp out alarm with mute push button.
- ★ Non-resettable UV lamp operation time elapsed meter records the unit run hours for easy routine maintenance and services.
- ★ Elegant self-contained 304 SS electrical cabinet with removable service panel and lamp socket cover for easy installation, maintenance and services.
- ★ UV chamber temperature high protection for 700W up units.

OPTIONS

- ★ 316L SS sanitary UV chamber with Tri-clamp connections for food, beverage and pharmaceutical applications.
- ★ 185nm wavelength UV lamp with 316SS UV chamber for TOC reduction and advanced oxidation processes applications.
- ★ UV chamber temperature high protection for up to 700W units.
- ★ Larger capacity units and custom units.
- ★ UV intensity monitor.
- ★ Amalgam lamp units.
- ★ 1554mm long lamp units.

SIZING GUIDELINE

- ★ Recommended service flow-rate is based on 10 micron filtered city water. The service flow-rate may vary according to feed conditions and applications.
- ★ Different options for sizes and types of connections are available.
- ★ Please check with supplier if in doubt.

A) Models with CRYSTAL-FINE® G36T5L/C, 40W Single-pin UV lamps

Model	Flow gpm	In /Outlet inch	Lamp Power W	L×D×H, mm
CRSL-3-33	45	G1.5	3×40	1056×455×410
CRSL-4-33	65	G1.5	4×40	1056×455×410
CRSL-5-33	85	G2.0	5×40	1056×455×410
CRSL-6-33	105	G2.0	6×40	1056×455×410
CRSL-7-33	125	G2.0	7×40	1056×455×410
CRSL-8-33	160	2.5"Flange	8×40	1056×510×490
CRSL-9-33	180	2.5"Flange	9×40	1056×510×490
CRSL-10-33	200	2.5"Flange	10×40	1056×510×490

B) Models with CRYSTAL-FINE® G48T5L/C, 54W Single-pin UV lamps

Model	Flow gpm	In /Outlet inch	Lamp Power W	L×D×H mm
CRSL-3-48	80	G2.0	3×54	1365×455×410
CRSL-4-48	106	G2.0	4×54	1365×455×410
CRSL-5-48	132	G2.0	5×54	1365×455×410
CRSL-6-48	158	2.5"Flange	6×54	1365×455×410
CRSL-7-48	184	2.5"Flange	7×54	1365×455×410
CRSL-8-48	270	3.0"Flange	8×54	1365×510×490
CRSL-9-48	296	3.0"Flange	9×54	1365×510×490
CRSL-10-48	322	3.0"Flange	10×54	1365×510×490
CRSL-11-48	348	4.0"Flange	11×54	1365×510×490
CRSL-12-48	374	4.0"Flange	12×54	1365×510×490

C) Models with CRYSTAL-FINE® GPH843T6L/4C, 80W Four-pin UV lamps

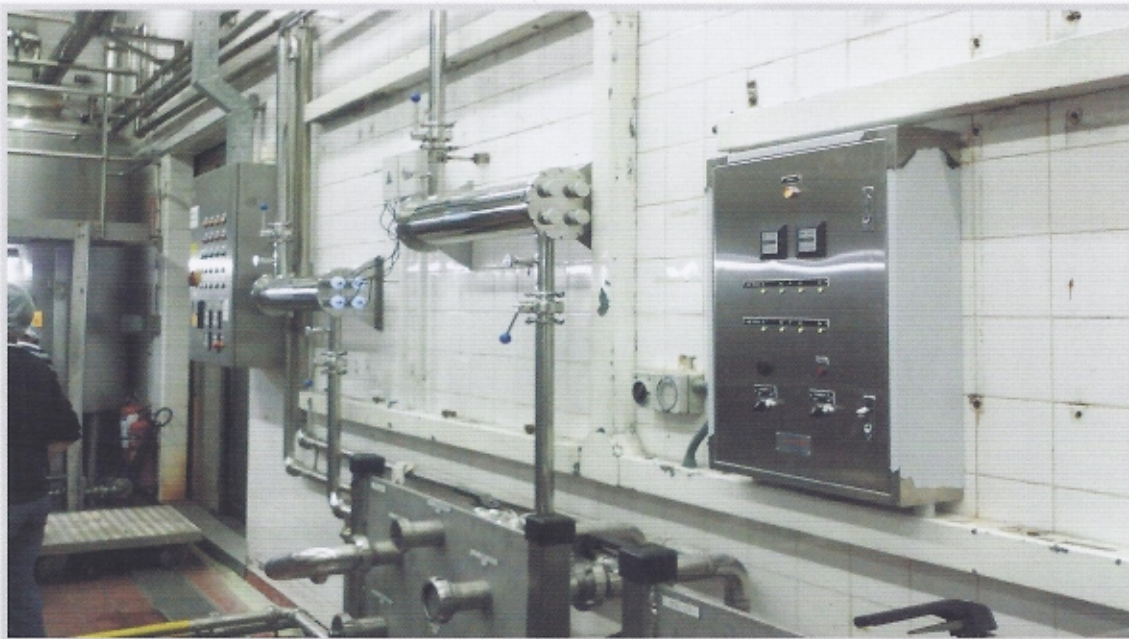
Model	Flow gpm	In /Outlet inch	Lamp Power W	L×D×H mm
CRSL-3-80	105	G2.0	3×80	1157×455×410
CRSL-4-80	145	2.5"Flange	4×80	1157×455×410
CRSL-5-80	185	2.5"Flange	5×80	1157×455×410
CRSL-6-80	225	3.0"Flange	6×80	1157×455×410
CRSL-7-80	330	4.0"Flange	7×80	1157×510×490
CRSL-8-80	370	4.0"Flange	8×80	1157×510×490
CRSL-9-80	410	4.0"Flange	9×80	1157×510×490
CRSL-10-80	450	4.0"Flange	10×80	1157×510×490

D) Models with CRYSTAL-FINE® GPH1148T6L/4C, 120W Four-pin UV lamps

Model	Flow gpm	In /Outlet inch	Lamp Power W	L×D×H mm
CRSL-3-120	170	2.5"Flange	3×120	1464×455×410
CRSL-4-120	230	3.0"Flange	4×120	1464×455×410
CRSL-5-120	290	3.0"Flange	5×120	1464×455×410
CRSL-6-120	350	3.0"Flange	6×120	1464×455×410
CRSL-7-120	520	4.0"Flange	7×120	1464×510×490
CRSL-8-120	580	5.0"Flange	8×120	1464×510×490
CRSL-9-120	640	5.0"Flange	9×120	1464×510×490
CRSL-10-120	700	5.0"Flange	10×120	1464×510×490
CRSL-11-120	760	5.0"Flange	11×120	1464×510×490
CRSL-12-120	820	5.0"Flange	12×120	1464×510×490

* The dimensions in this brochure are as a guide only

* Specification subject to change without notice. Please verify all specification prior to order.



30 m³/h sanitary UV water sterilizers for beverage



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