

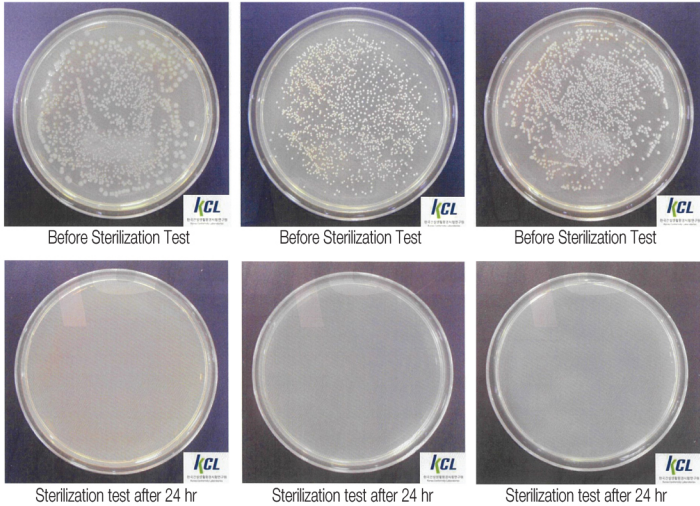
Korea Conformity Laboratories(KCL) /
Korea Testing & Research Institute(KTR) Results

- Escherichia coli

 - Distance between lighting and test strains :1m
 - Concentrate after 24hr
- Staphylococcus aureus

 - Distance between lighting and test strains :1m
 - Concentrate after 24hr
- Klebsiella pneumoniae

 - Distance between lighting and test strains :1m
 - Concentrate after 24hr

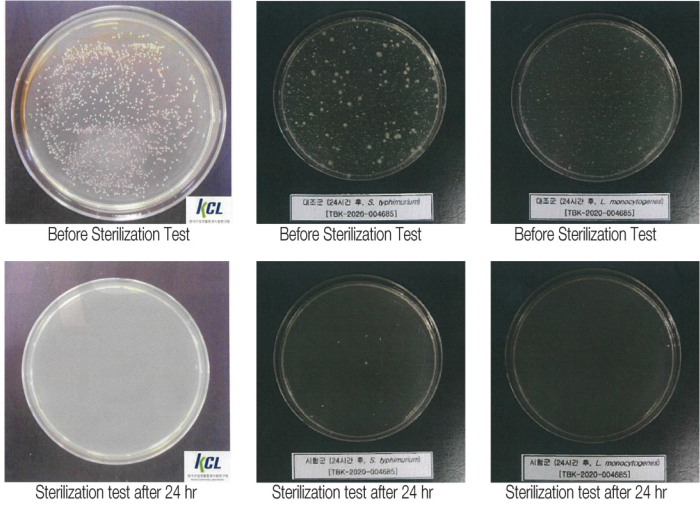


- MRSA(Staphylococcus aureus subsp.)

 - Distance between lighting and test strains :1m
 - Concentrate after 24hr
- S. typhimurium

 - Distance between lighting and test strains :1m
 - Concentrate after 24hr
- L. monocytogenes

 - Distance between lighting and test strains :1m
 - Concentrate after 24hr



* Material (glass, plastic, metal) which is hard to penetrate for germs will have shorter time for sterilizations.
Sterilization duration varies by surface materials.

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MALTANI Corp.
Maltani Bldg. 431, Yeoksam-Ro, Kangnam-Gu,
Seoul 06196, Korea
www.maltani.co.kr

KR Biotech Co., Ltd.
Institute of Infectious Disease Control

COVID-19 Sterilization Test Report

Test Report

Personnel: SUN HWA JOO, Tel. No. 82-2-555-0500

Client: MALTANI Corp., E-mail: shj26@maltani.co.kr

Address: Maltani B/D, Yeoksam-Ro, Kangnam-Gu, Seoul 06196, Korea

Request: Virucidal Activity Test by LED Irradiation

Product: CLEAN SERIES MODULE

Purpose of Use on the Product: Sterilization

Test Virus: COVID-19 (SARS-CoV-2), Cell Line: Vero E6

Test No.: KR-2009-042-MTN01-C, Test Period: 2020.09.04-09.11

Reaction Time: 30 min, 60 min, 90 min, Titration: CPE

Test Temperature: Room Temperature (Approx. 20°C), Tester: Hansam Cho

Test Result

Product Name	Virus Titer TCID ₅₀	Distance	Treatment time	Virus Reduction Rate (log) (%)	
CLEAN SERIES MODULE	6.81x10 ⁶	20 cm	30 min	2.42	99.62%
			60 min	≥ 4.42	≥ 99.99%
			90 min	≥ 4.00	≥ 99.99%

Result: As a result of the sterilization test for COVID-19 (SARS-CoV-2) by LED (405nm) generated in the CLEAN SERIES MODULE of MALTANI Corp., it showed more than 99.99% virucidal effect in 60 minutes treatment at a distance of 20cm.

September 17, 2020

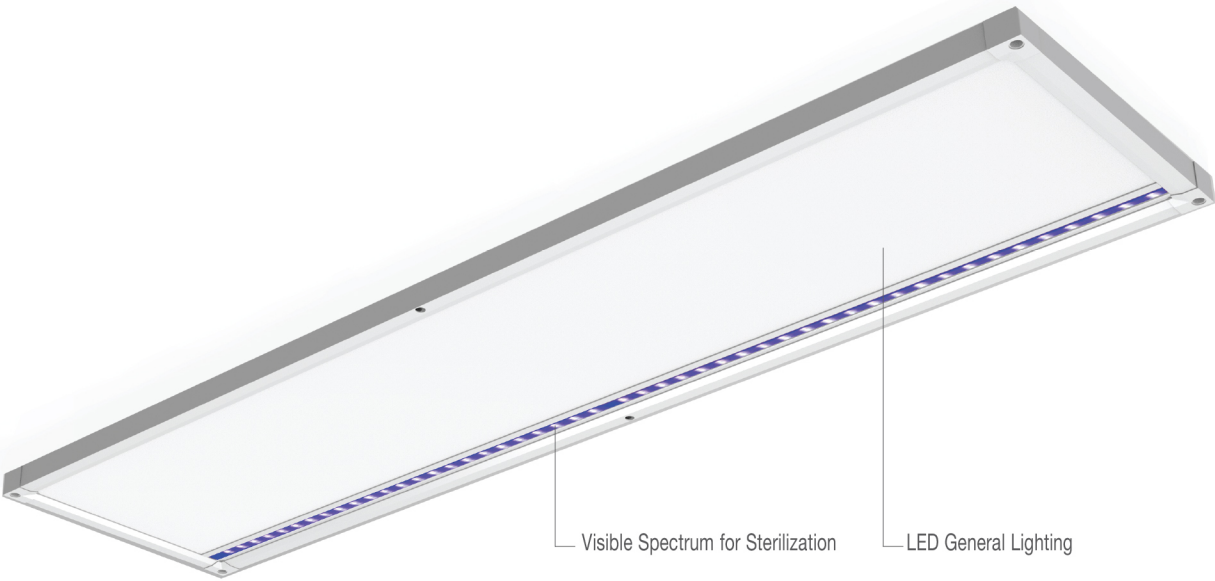
Test Manager: Young Bong Kim

KR BIOTECH Co., Ltd.

99.99%
of
COVID-19 Virus
has been eliminated.

CLEAN EDGE 1200

Office lighting with the visible spectrum for Sterilization



Sterilization INCLUDING COVID-19
by Maltani's Sterilization Lighting
By just turning on the light, germs are sterilized
and prevented from growth.
Protection from harmful germs in surroundings.

Viols new sterilization system which is also used in NASA's International Space Station is used in Maltani's Visible Sterilization Lighting. Our lighting system is certified by IEC62471 test for "exempt" level of safe to human skin and eyes.

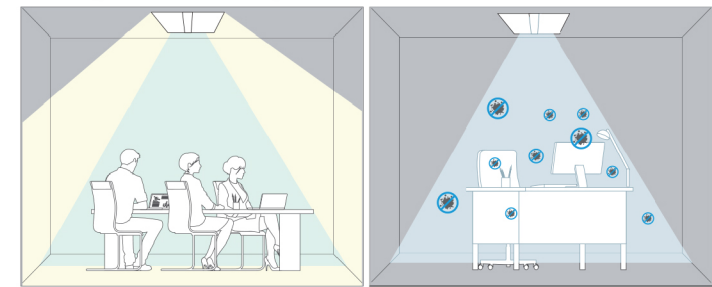
Maltani's Visible Sterilization Lighting can be installed in various locations



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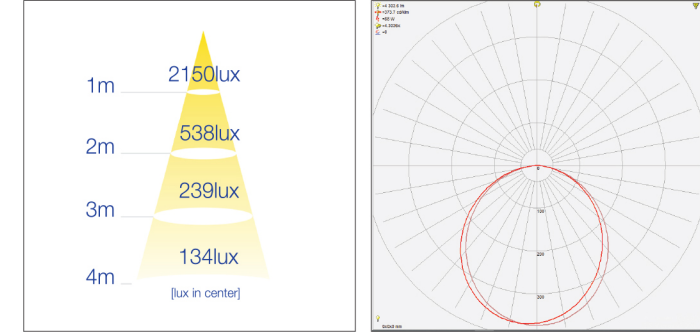
CLEAN EDGE 1200 (Office lighting with the visible spectrum for Sterilization)

Healthy + Eco-Friendly



Light Distribution

S-RLP3040-50-C001 / S-RLP3040-40-C001 / S-RLP3040-30-C001
(Excluding sterilization lights)



Human Influence Test _ General Type

IEC 62471(Human Influence Test Result) : **No risk to human body**

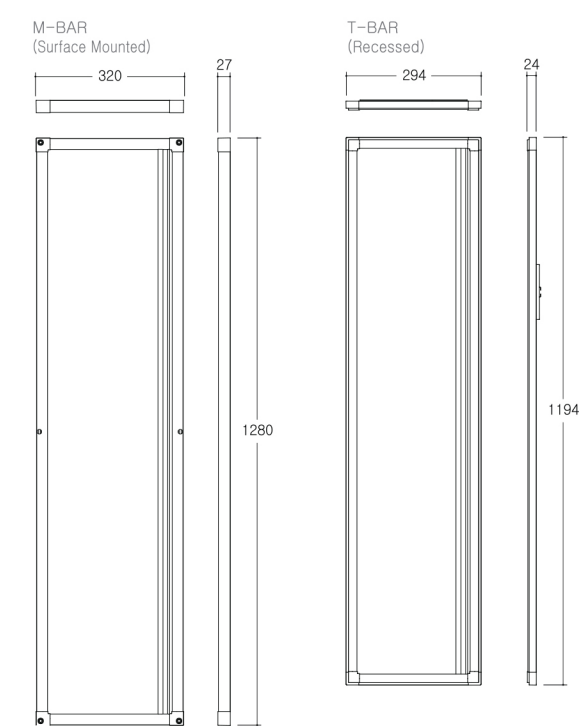
- IEC
National standards and standards coordinators in the fields of electricity, electronics, telecommunications, nuclear energy
- IEC 62471
Optical biological stability: Hazardous testing of the human body (eye, skin) of lighting equipment
Clean Edge measurement results : **Check exempt rating**
(Classification of grades : exempt / risk 1 / risk 2 / risk 3)

Products Spec.

Model NO.	Installation	Power (W)	Luminous Flux (lm)	CCT (K)	CRI (Ra)	Size (mm)	Weight (kg)	Input Voltage (VAC/Hz)
S-RLP3040-50-C002	T-BAR	30W + 40W(2ch or 1ch) / General	5,880	5,000	≥ 80	L1,194× W294 × H24	4.2	AC 200-250 50/60
S-RLP3040-40-C002	T-BAR	30W + 40W(2ch or 1ch) / General	5,880	4,000	≥ 80	L1,194× W294 × H24	4.2	AC 200-250 50/60
S-RLP3040-30-C002	T-BAR	30W + 40W(2ch or 1ch) / General	5,880	3,000	≥ 80	L1,194× W294 × H24	4.2	AC 200-250 50/60
S-RLP3040-50-C001	M-BAR	30W + 40W(2ch or 1ch) / General	5,880	5,000	≥ 80	L1,280× W320 × H27	4.5	AC 200-250 50/60
S-RLP3040-40-C001	M-BAR	30W + 40W(2ch or 1ch) / General	5,880	4,000	≥ 80	L1,280× W320 × H27	4.5	AC 200-250 50/60
S-RLP3040-30-C001	M-BAR	30W + 40W(2ch or 1ch) / General	5,880	3,000	≥ 80	L1,280× W320 × H27	4.5	AC 200-250 50/60
S-RLP6040-50-U002	T-BAR	60W + 40W(2ch or 1ch) / Ultra	5,880	5,000	≥ 80	L1,194× W294 × H24	4.3	AC 200-250 50/60
S-RLP6040-40-U002	T-BAR	60W + 40W(2ch or 1ch) / Ultra	5,880	4,000	≥ 80	L1,194× W294 × H24	4.3	AC 200-250 50/60
S-RLP6040-30-U002	T-BAR	60W + 40W(2ch or 1ch) / Ultra	5,880	3,000	≥ 80	L1,194× W294 × H24	4.3	AC 200-250 50/60
S-RLP6040-50-U001	M-BAR	60W + 40W(2ch or 1ch) / Ultra	5,880	5,000	≥ 80	L1,280× W320 × H27	4.6	AC 200-250 50/60
S-RLP6040-40-U001	M-BAR	60W + 40W(2ch or 1ch) / Ultra	5,880	4,000	≥ 80	L1,280× W320 × H27	4.6	AC 200-250 50/60
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* Please inquire about the size and color temperature of the standard product.

Size (mm)



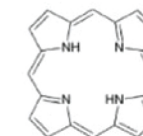
IEC 62471 Clean Edge measurement results

Test item particulars	
Tested lamp	☒ continuous wave lamps ☐ pulsed lamps
Tested lamp system	
Lamp classification group	☒ exempt ☐ risk 1 ☐ risk 2 ☐ risk 3
Lamp cap	N/A
Bulb	LED
Rated of the lamp	200-250 V~, 50/60 Hz, 74 W
Furthermore marking on the lamp	N/A
Seasoning of lamps according IEC standard	N/A
Used measurement instrument	Double monochromator
Temperature by measurement	(25 ± 3 °C)
Information for safety use	N/A
Possible test case verdicts:	
- test case does not apply to the test object	N/A
- test object does meet the requirement	P (Pass)
- test object does not meet the requirement	F (Fail)
Testing:	
Date of receipt of test item	2020-09-15
Date (s) of performance of tests	2020-09-15

CLEAN EDGE _ Visible spectrum hygiene sterilization mechanism

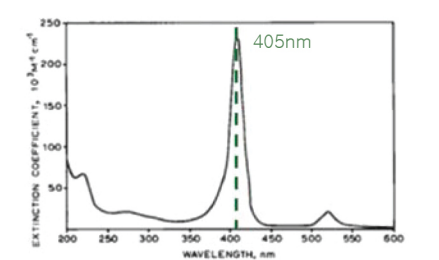
Visual Light Sterilization Principle

- Porphyrin reaction decomposition(405nm)
When irradiating 405 nm of porphyrin reaction, it destroys cells by producing "porphyrin extract" → Reactive oxygen species

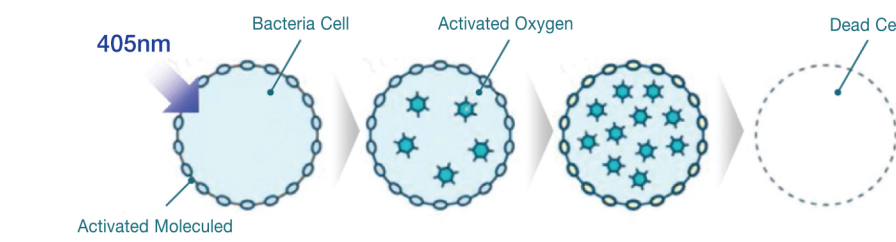


* Porphyrin:
405nm reactant present in bacteria

<Porphyrin Absorption Curve>



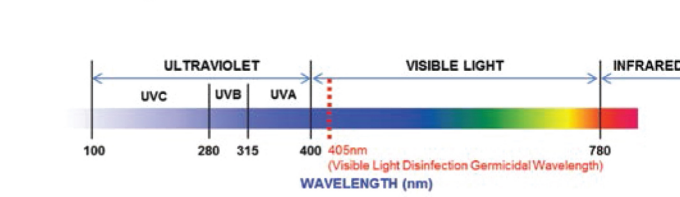
* Source : A journal published by Johnson Matthey Plc.



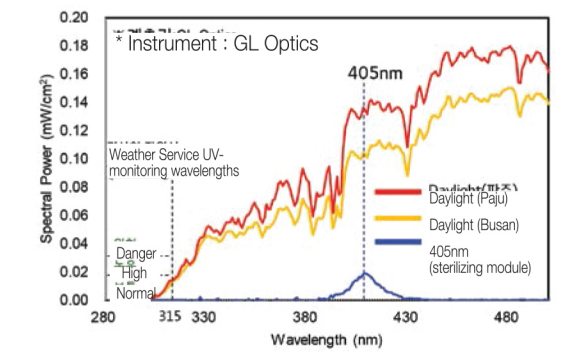
How to sterilize with Visual Spectrum(405nm) vs UV

Categorization	UVC (100~280nm)	UVB (280~315nm)	UVA (315~400nm)	Visible Light (405nm)
Feature	• Sterilization is done in short duration • Bacterial and Virus are burnt to death • Lighting Source can't be exposed directly to the users(Applicable space and structure will have limitations) • Eyes and skin can be damaged. Short wavelength (253nm) can destroy DNA and causes cancer	• Direct Sterilization is possible • Lighting source can't be directly exposed • Can damage eyes and skin (has the characteristics of short wavelength. When exposed, DNA is destroyed and can cause cancer)	• Lighting source can't be directly exposed • Can damage eyes and skin • This spectrum does not directly sterilize	• None contact Sterilization • 405nm light will react Porphyrin to decompose. Decomposition will increase with the amount of elimination with time • Sterilization is proportional to the time of investigation
Human Influence	When exposed, DNA is destroyed and can cause cancer			Human Influence Free

Visible light contactless sterilization



Spectral comparison (sunlight vs. sterilization module)



Sterilization Force Test _Test institutions : KCL / KTR Result : 99.9% extermination(after 24 hours)

Test items	Test Conditions	Test items		
		Initial Concentration (CFU/mL)	Concentration after 24 hours	Test Environment
Antimicrobial Test : Escherichia coli	Distance between lighting and test strains : 1m	1.1 x 10 ⁶ Bacteriophage :-	99.9%	(37.0±0.2) °C
Antimicrobial Test : Staphylococcus aureus		1.2 x 10 ⁶ Bacteriophage :-	99.9%	(37.0±0.2) °C
Antimicrobial Test : Klebsiella pneumoniae		1.2 x 10 ⁶ Bacteriophage :-	99.9%	(37.0±0.2) °C
Antimicrobial Test : MRSA(Staphylococcus aureus subsp. aureus)		1.2 x 10 ⁶ Bacteriophage :-	99.9%	(37.0±0.2) °C
Antimicrobial Test : S. typhimurium		1.1 x 10 ⁶ Bacteriophage :-	98.0%	(35.0±1.0) °C
Antimicrobial Test : L. monocytogenes		1.1 x 10 ⁶ Bacteriophage :-	99.7%	(35.0±1.0) °C