Phoseon®

VeriCure™ UV LED Curing System

User Manual

excelitas®

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service@phoseon.com

or complete the Return Merchandise Authorization form at:
https://phoseon.com/return-merchandise-authorization/

Table of Content

1. VeriCure™ Solid State UV LED Curing System

1.1. OVERVIEW AND SAFETY

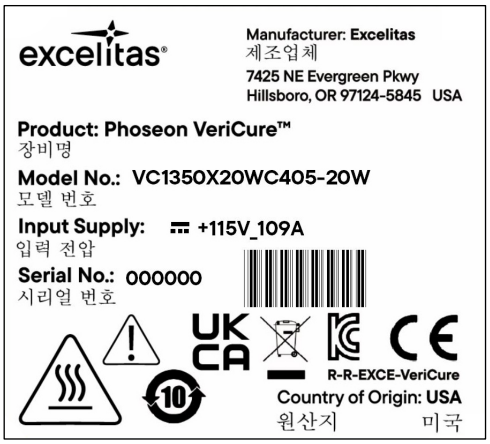
1.1.1. UV Curing System Components

The VeriCure™ system consists of the following components:

- VeriCure Light Source

The product label on the VeriCure light source identifies the production model and configuration. Figure 1.1 shows a sample label.

- Configuration information for the model number:
  Model No. VC1350x20WC405-20W
  A B C D E F
  - A = Product Name: VeriCure (VC)
  - B = Indicates the emitter length in mm, this is either 3 or 4 digits
  - C = Indicates the emitter width in mm
  - D = WC defines the unit as water-cooled
  - E = Defines wavelength in nm
  - F = Defines the total UV energy in W/cm^2



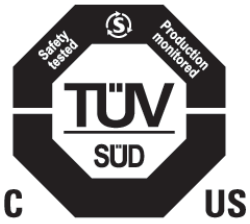


FIGURE 1.1 Safety Label Placement (Safety label on front of product)

Note: Current specifications on product label may vary based on product configuration.

CAUTION: The window frame may become a hot surface during UV operation.

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Product Safety Information

UV LED Curing Sources

Intended Use

Phoseon® light sources and optional power supplies are supplied as “open type” equipment. These system components must be mounted within an enclosure that is suitably designed for the specific environmental conditions present for the final product, and appropriately designed to prevent personal injury resulting from accessibility to live parts.

Protective Guards

Phoseon brand light sources include protective guards to fully enclose electrical mechanisms that may cause operator harm during normal use. These fixed guards adhere to the appropriate international safety standards.

CAUTION: **Do not operate the light sources or the machine in which they are installed while any safety guards are open, loose, damaged, or missing.**

Phoseon brand light sources are classified as Risk Group 3 under IEC 62471 at a distance of 200 mm.

Risk groups defined in IEC 62471:

Exempt – There is no photo-biological hazard for the end points in this standard.

Risk Group 1 – Low Risk. Does not pose a hazard due to normal behavioral limitations on exposure.

Risk Group 2 – Moderate Risk. Does not pose a hazard due to aversion response to very bright light sources or due to thermal discomfort.

Risk Group 3 – High Risk. May pose a hazard even for momentary or brief exposure.

WARNING: **DO NOT LOOK DIRECTLY AT THE UV LIGHT SOURCE WITHOUT WEARING UV SAFETY GOGGLES.**

Note: A portion of the UV light will be visible and will be a strong visual stimulus.

Minimum requirement: UVEX SCT-orange lens which reduces eye fatigue by absorbing blue and green light and allows the operator to clearly view components during curing and inspection processes while absorbing 99.9% of UV radiation and visible light up to 532 nm.

Note: **Phoseon brand UV LED products emit 90% or more of the total UV light energy in a narrow wavelength band:**

Wavelength	Band
365 nm	345 to 385 nm
385 nm	370 to 410 nm
395 nm	380 to 420 nm
405 nm	390 to 430 nm

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Hazard and Safety Notices

The symbols and labels in the following table are used in Phoseon brand s light source product documentation and on the product labels. Please familiarize yourself with the symbols and their meaning in order to avoid misuse of the product.

Table 1.1: Safety Notices

Symbol	English Description **Safety Notices**	French Description **Consignes de Sécurite**	Italian Description **Avvertenze sulla sicurezza**	German Description **Sicherheits-hinweise**	Spanish Description **Notas de Seguridad**	Dutch Description **Veiligheids-aanduidingen**	Polish Description **Ostrzeżenia dotyczące bezpieczeństwa**
	Attention Read manual for safety instructions	Attention Lisez les instructions de sécurité dans le manuel	Attenzione Leggere il manuale per le avvertenze sulla sicurezza	Achtung Bitte Vorsichtsmaß-nahmen in der Gebrauchsan-leitung lesen	Atención Lea el manual de Instrucciones de seguridad	Opgelet Lees handleiding voor veiligheids-voorschriften	Uwaga Zapoznaj się z zaleceniami bezpiec- zeństwa w instrukcji
	UV Light Read manual for safety instructions	Lumière UV Lisez les instructions de sécurité dans le manuel	Luce UV Leggere il manuale per le avvertenze sulla sicurezza	UV LICHT Bitte Vorsichtsmaß-nahmen in der Gebrauchsan-leitung lesen	Luz UV Lea el manual de Instrucciones de seguridad	UV-licht Lees handleiding voor veiligheids-voorschriften	Promieniowa- nie UV Zapoznaj się z zaleceniami bezpiec- zeństwa w instrukcji
	Hot Surface	Surface Chaude	Superficie calda	Heiße Oberfläche	Superficie Caliente	Heet oppervlak	Gorąca powierzchnia
	Warning RISK GROUP 3 UV EMITTED FROM THIS PRODUCT Avoid eye and skin exposure to unshielded product.	Avertissement Rayonnement UV À Risque de Groupe 3 Eviter l'exposition des yeux et de la peau sans protection adéquat.	Attenzione DA QUESTO PRODOTTO EMISSIONI UV DELLA CLASSE DI RISCHIO 3 Evitare l'esposizione di occhi e pelle al prodotto non schermato.	Warnung Dieser Strahler emittiert UV-Strahlung der Risikogruppe 3. Setzen Sie Haut und Augen nicht der Strahlung des nicht abgeschirmten Strahlers aus.	Advertencia RADIACION UV DE RIESGO GRUPO 3 EMITIDA POR ESTE PRODUCTO Evite la exposición de ojos y piel por el producto sin protección adecuada.	Waarschuwing UV-STRALING RISICOGROEP 3 UITGEZONDEN VAN DIT PRODUCT Vermijd blootstelling van ogen en huid aan niet-afgeschermd product.	Ostrzeżenie GRUPA ZAGROŻENIA 3 PRODUKT EMITUJE PROMIENIOW ANIE UV Unikać wystawiania skóry i oczu na działanie nieosło- niętego produktu.

Similar to the ANSI Z535.4 standard, the ISO 3864-2 standard defines the hazard severity panels as follows:

Yellow safety alert symbol Indicates possible human injury hazard exists.

DANGER signal word: used to indicate an imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING signal word: used to indicate a potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION signal word: used to indicate a potentially hazardous situation which, if not avoided, could result in minor or moderate injury.

Optical Safety Data

IEC 62471: Photobiological Safety of Lamps and Lamp Systems

Resulting Classification and Labelling

China RoHS

This symbol indicates that this product is in compliance with China RoHS requirements:

This table is compiled according to SJ/T 11364.

O : Indicates that the content of the hazardous substance in all homogeneous materials of the part is below the limit requirement of GB/T 26572.

X : Indicates that the content of the hazardous substance in at least one of the homogeneous materials of the part exceeds the limit requirement specified by GB/T 26572.

Part Name	**Hazardous Substances**					
	Lead (Pb)	Mercury (Hg)	Cadmium (Cd)	Hexavalent Chromium (Cr (VI))	Polybrominated biphenyls (PBB)	Polybrominated diphenyl ethers (PBDE)
Printed circuit board assemblies	X	O	O	O	O	O

本表格依据SJ / T 11364的规定编制。

O：表示该有害物质在该部件所有均质材料中的含量均在GB / T 26572规定的限量要求以下。

X：表示该有害物质至少在该部件的某一均质材料中的含量超出GB / T 26572规定的限量要求。

部件名称	**Hazardous Substances**					
	铅 (Pb)	汞 (Hg)	镉 (Cd)	六价铬 (Cr (VI))	多溴联苯 (PBB)	多溴二苯醚 (PBDE)
印刷电路板组件	X	O	O	O	O	O

Restriction of Hazardous Substances (RoHS)

This is to certify that the parts and/or products indicated above meet the requirements of EU Directive 2011/65/EU amended by EU Directive 2015/863/EU on the restriction of use of certain hazardous substances in electrical and electronic equipment. These parts/products do not exceed the maximum concentration values set for these restricted substances listed below at homogeneous material level:

RoHS Restricted Substance	Maximum Allowable Limit
Cadmium	100 ppm (0.01% by weight)*
Mercury	1000 ppm (0.1% by weight)*
Hexavalent Chromium	1000 ppm (0.1% by weight)*
Lead	1000 ppm (0.1% by weight)*
Polybrominated biphenyls (PBB)	1000 ppm (0.1% by weight)*
Polybrominated diphenyl ethers (PBDE)	1000 ppm (0.1% by weight)*
Bis(2-Ethylhexyl) phthalate (DEHP)	1000 ppm (0.1% by weight)*
Butyl benzyl phthalate (BBP)	1000 ppm (0.1% by weight)*
Dibutyl phthalate (DBP)	1000 ppm (0.1% by weight)*
Diisobutyl phthalate (DIBP)	1000 ppm (0.1% by weight)*
*Maximum concentration by weight in homogeneous material	

Exemptions Applied: 6.a-l, 6.c, 7.a, 7.c-I

Registration, Evaluation, Authorization and Restriction of Chemicals (REACH)

Excelitas Technologies has determined that Phoseon brand light sources are not subject to EU REACH directive registration requirements.

With regards to the projected candidate list of substances of very high concern (SVHC), it is further declared that, to the best of our knowledge, our products do not contain any currently listed SVHC above the level 0.1% by weight.

The most up-to-date substance list can be found at the following link:
https://echa.europa.eu/candidate-list-table

Product Recycling

This symbol is an internationally agreed indicator that the product bearing it should not be disposed of as general waste or garbage which might end up in landfill sites, but should instead be returned to Excelitas for reuse or be disposed of in accordance with local laws.

Figure 1.1: Do Not Dispose in Trash Symbol

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1.2. SETUP & INSTALLATION

Refer to the following documents for detailed information regarding integration into OEM equipment.

TABLE 1.1: VERICURE DOCUMENTATION

VeriCure	750x20	900x20	1050x20	1200x20	1350x20
VeriCure Product Specifications	54831				
VeriCure Control Drawing (all lengths)	55212				
VeriCure DC Power Cable*	54452-05M / 54467-05M /54751-05M / 54750-05M				
Reducing Light Reflection	28658				
Water Cooling Requirements	28384				
Window Cleaning Instructions	27182				
Declaration of Conformity	29321				

*Other cable lengths are available upon request

With the exception of the 3rd party power supplies, the above documents are included in this manual and available as individual documents on the Phoseon Brand Customer Resource Center (CRC) website at www.phoseonsupport.com.

1.2.1. Electrical

120Vdc +/- 5V delivered to the light source from constant voltage output source.

12kW to 15kW minimum delivered to the light source based on configuration (see 54831 *Product Specifications*).

It is recommended to use only the Meanwell RST-15K-115 power supply as the power supply for the VeriCure UV LED light source (Note: other power supplies have not been tested with the VeriCure system). The Meanwell RST-15K-115 power supply manufacturer-supplied documentation includes other wiring configurations however they will not provide power with acceptable leakage current and therefore must not be used. Follow the wiring diagram below:

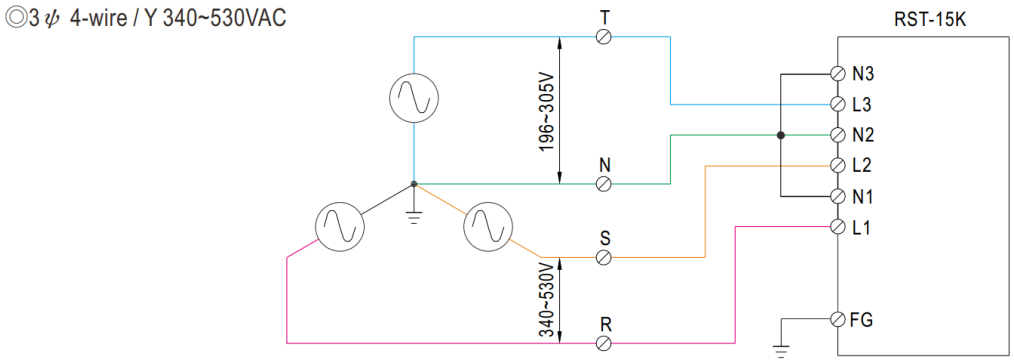

FIGURE 1.2: Required Electrical Wiring for Meanwell RST-15K-115 power supply

If using the RST-15K-115 power supply, or any other 3rd party power supply, refer to the manufacturer's website for up-to-date dimensions and specifications. Particularly note any derating needed for operation in the target environment.

1.2.2. Mechanical Installation

Refer to the Control Drawing for the specific VeriCure model for detailed dimensions and mounting point information. Make special note of the following information listed on the Control Drawing:

- Quantity and size of mounting hardware
- Maximum depth of mounting hardware

The following mechanical installation sequence should be followed:

1. Ensure the power supply main switch is turned OFF before servicing, removing or installing a VeriCure system.
2. Install the VeriCure housing to a rigid structure using the recommended hardware.
3. Attach the water inlet and outlet hoses to the bulkhead.
4. If required for the application, connect CDA hose to the bulkhead.

CDA requirements: oil-free, dew point –40F, particle filtration 25um or less.

5. Attach the M12 17-Pin Cable and/or the M12 Ethernet Cable to the bulkhead.
6. Attach the DC cable from the power supply to the bulkhead.

Refer to the 54831 *Product Specifications* document for the following information:

- DC power
- PLC Comm

CAUTION: The light source may be damaged if these specifications are not followed. To prevent potential damage to the primary and/or protective secondary glass window, avoid putting the VeriCure system down on the emitting window side of the unit.

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VeriCure™ UV LED Curing System

Product Specifications

Water-cooled

Excelitas® is the world leader in UV LED solutions for commercial and industrial applications with products that deliver superior performance and real-world reliability for UV curing of adhesives, coatings and inks. Our patented Semiconductor Light Matrix (SLM)™ technology was developed with meticulous design engineering of LEDs, arrays, optics, and cooling architecture to deliver optimum UV LED curing performance.

The Phoseon VeriCure™ water-cooled UV light source, which features a unique UV LED SLM™ design, delivers an ultra-high UV dose that is ideal for demanding industrial applications. Patented SLM control technology allows uniformity to be optimized during operation, in real time, without the need to take the UV LED source offline. Additionally, this unique technology allows for the UV emitting area to be adjusted if process width requirements change, and for discrete LED module intensity levels to be set to optimize curing of irregular substrate contours.

Light Source Overview

Clean Dry Air Inlet
Not required, optional use only

PLC Interface
Supported Protocols: OmniCure AC Series communication protocol, Analog

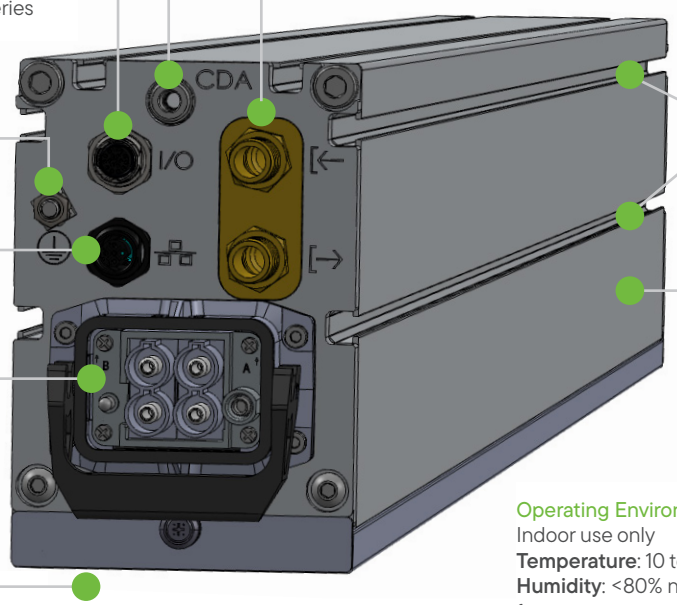
Earth Ground

Ethernet Connection
Supported Protocols: Modbus TCP/IP, Phoseon CLIP protocol

Electrical Interface

Removable Secondary Glass
Optional

Coolant Supply/Return
Temperature: 20 to 35 °C (dependent on environmental conditions)
Water: Distilled required, with corrosion inhibitors. Refer to *28384 Water Cooling Requirements*



T-Slots

IP66-Rated Housing

Operating Environment
Indoor use only
Temperature: 10 to 40 °C
Humidity: <80% non-condensing for temperatures up to 30 °C
Altitude: up to 3,000m
Storage Temperature: -20 to 85 °C

OPTICAL PERFORMANCE[1]

Wavelength (nm)	365	395/405
Typical Dose (@50 mm Working Distance & 50 m/min)	300 mJ/cm²	500 mJ/cm²
Peak Irradiance (@window)	15 W/cm²	20 W/cm²
Peak Irradiance (@30mm)	4 W/cm²	6 W/cm²
Pressure Drop (Typical)	4.0psi/0.257 Bar @ 8LPM	4.7psi/0.324 Bar @ 8LPM

1 Without secondary glass. 385 nm wavelength available on request.

INTERFACE MECHANICAL SPECIFICATIONS

Coolant	⅜" NPT to ½" ID Hose Barb fitting (Can be removed and replaced with any ½" NPT fitting)
Clean Dry Air	⅛" NPT to ¼" tube fitting
PLC Connection	Phoenix Contact 17-Pin M12 Socket Cable: Phoenix Contact 1430213 or equivalent
Earth Ground	M6 fitting
T-Slots	Accepts M6 square hardware
Ethernet Connection	Phoenix Contact 4-Pin M12 Socket Cable: Phoenix Contact 1403499 or equivalent
Power Connection	Phoenix Contact HEAVYCON B6

CHILLER & INPUT POWER REQUIREMENTS

Model	750	900	1050	1200	1350
Amperage/Power (+/-10%)	60A/7.2kW	72A/8.6kW	84A/10.1kW	96A/11.5kW	109A/13.1kW
Input Voltage (+/- 5 VDC)	120 VDC	120 VDC	120 VDC	120 VDC	120 VDC
Chiller/Cooler Capacity	6.5kW	7.0kW	8kW	9kW	10 kW
Chiller/Cooler Flow Rate	8 LPM	8 LPM	8 LPM	10 LPM	10 LPM
Coolant Temperature[1]	30 °C	30 °C	30 °C	30 °C	30 °C
Pressure Drop (Typical)	4.0psi/0.257 Bar @ 8LPM	4.7psi/0.324 Bar @ 8LPM	5.0psi/0.345 Bar @ 8LPM	8.4psi/0.579Bar @ 10LPM	9.1psi/0.627Bar @ 10LPM

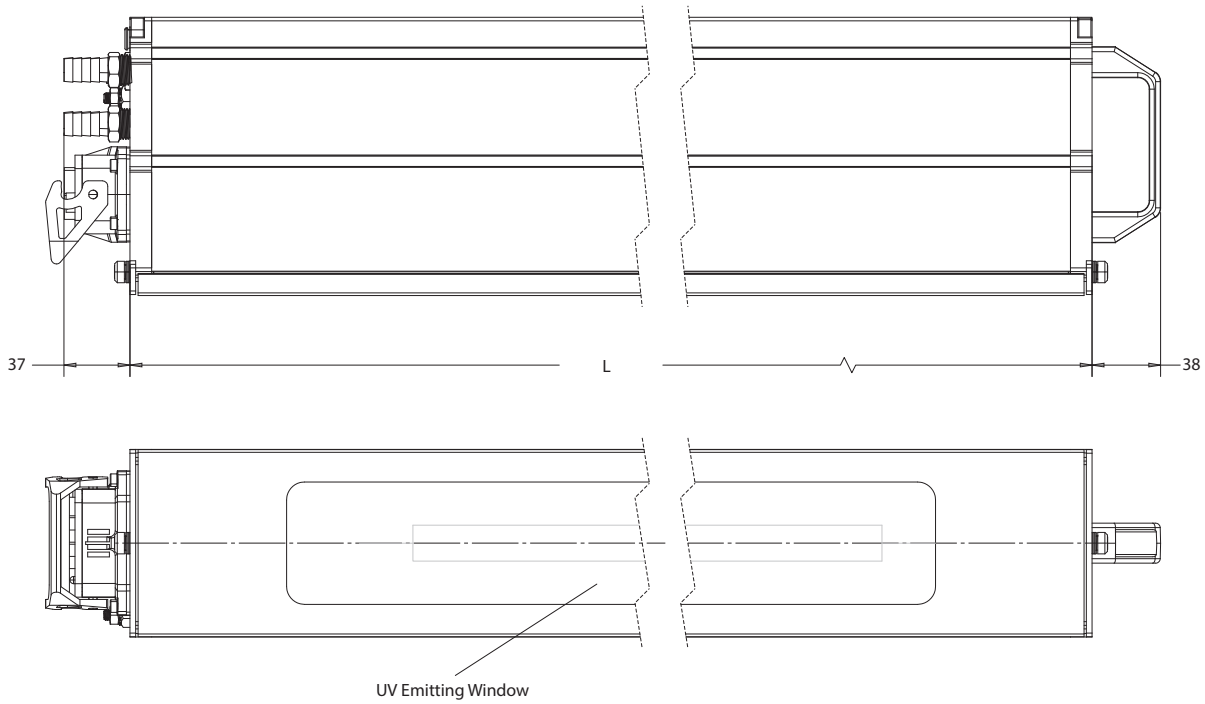
1 Coolant temperature is dependent on environmental conditions. Refer to *28384 Water Cooling Requirements.*

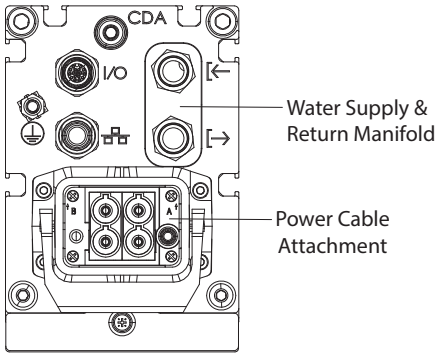
DIMENSIONS[1]

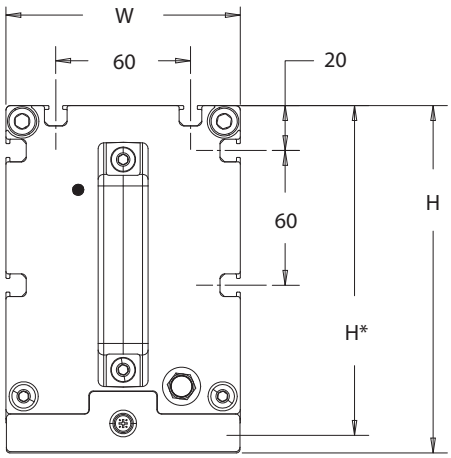
Model: VeriCure

Model	750	900	1050	1200	1350
Emitting Window	750 x 20	900 x 20	1050 x 20	1200 x 20	1350 x 20
Length (L)	1024	1174	1324	1474	1624
Width (W)	104	104	104	104	104
Height (H) Secondary Window Installed	155	155	155	155	155
Height (H*) No Secondary Window Installed	147	147	147	147	147
Weight (kg)[1]	18.1	21.7	23.3	26.1	29.5

1 **Units of measurement (rounded)**: mm



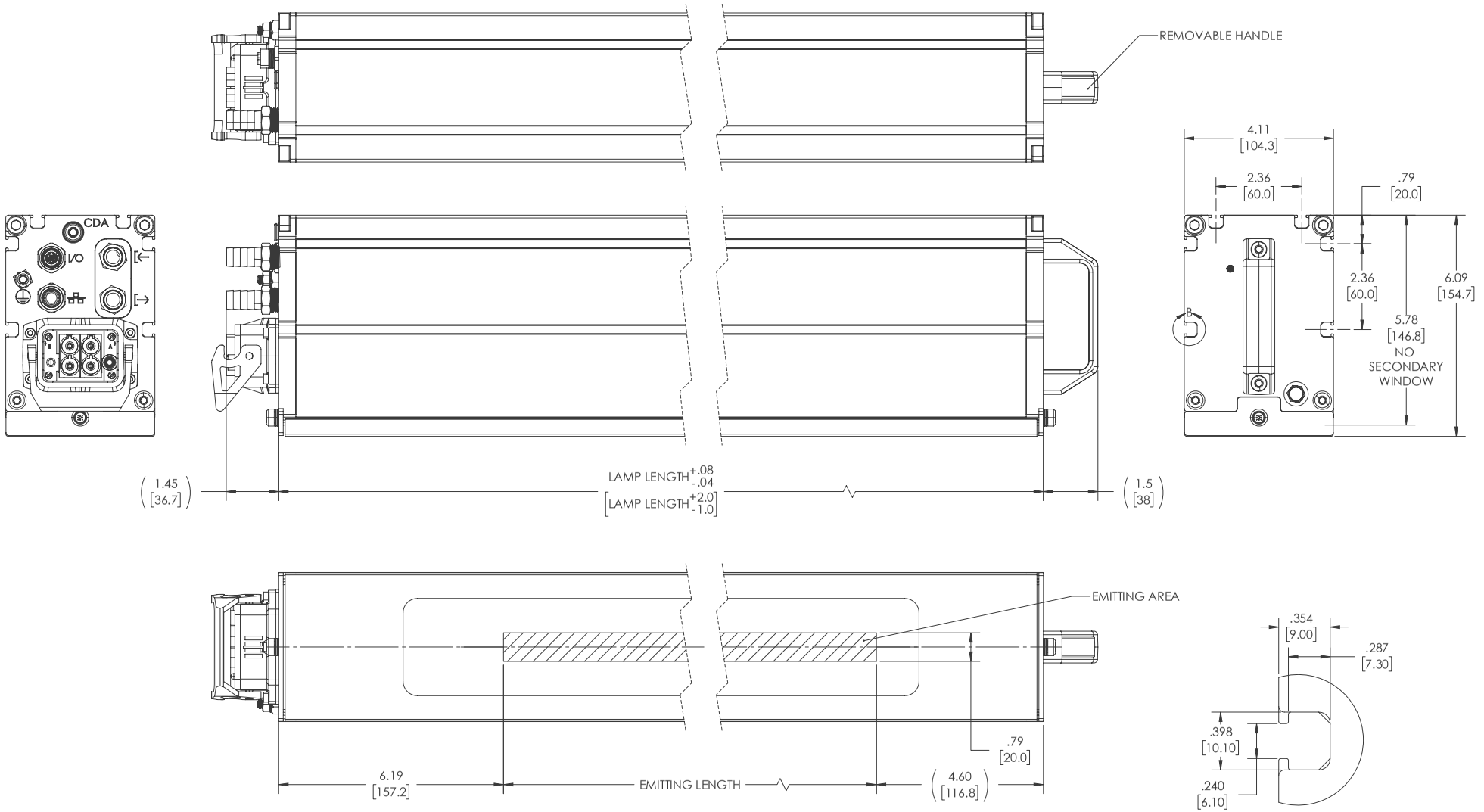




NOTES:
1. LAMP MAY BE MOUNTED IN ANY ORIENTATION
2. MOUNT LAMP USING T-SLOT CHANNELS PROVIDED IN LAMP HOUSING
3. M6 SQUARE NUTS MAY BE USED IN T-SLOT CHANNELS
4. SELECT THE CORRECT FASTENER LENGTH TO AVOID DAMAGING LAMP HOUSING

REVISIONS

REV.	DESCRIPTION	ENGR	DATE	ECO	APPROVED	APPROVED DATE
1	INITIAL RELEASE	CL	02/13/2025	---	---	---
2	ADD TABLE FOR ADDITIONAL VERICURE LAMP LENGTHS	CL	1/21/2026	---	---	---



T-SLOT X6
DETAIL B
SCALE 2 : 1

VERICURE SERIES LAMP DIMENSIONS AND WEIGHT

LAMP DESCRIPTION*	EMITTING LENGTH	LAMP LENGTH	LAMP WEIGHT (kg)
VC750-20WCYYY-ZZW	29.5 [750]	40.3 [1024]	18.1
VC900-20WCYYY-ZZW	35.4 [900]	46.2 [1174]	21.7
VC1050-20WCYYY-ZZW	41.3 [1050]	52.1 [1324]	23.3
VC1200-20WCYYY-ZZW	47.2 [1200]	58.0 [1474]	26.1
VC1350-20WCYYY-ZZW	53.1 [1350]	63.9 [1624]	29.5

*YYY - denotes wavelength, i.e. VC750-20WC395-ZZW is a 395nm lamp
ZZ - denotes intensity, i.e. VC750-20WCYYY-20W is a 20 W/cm^2 lamp

3RD ANGLE VIEW | MATERIAL: N/A | FINISH: N/A

TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X: ±0.050 [1.3]
X.XX: ±0.020 [0.5]
X.XXX: ±0.005 [0.13]
ANGLE: ±1°

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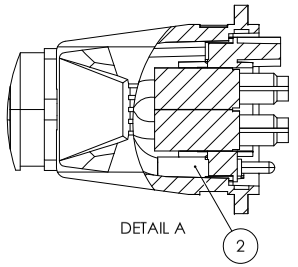
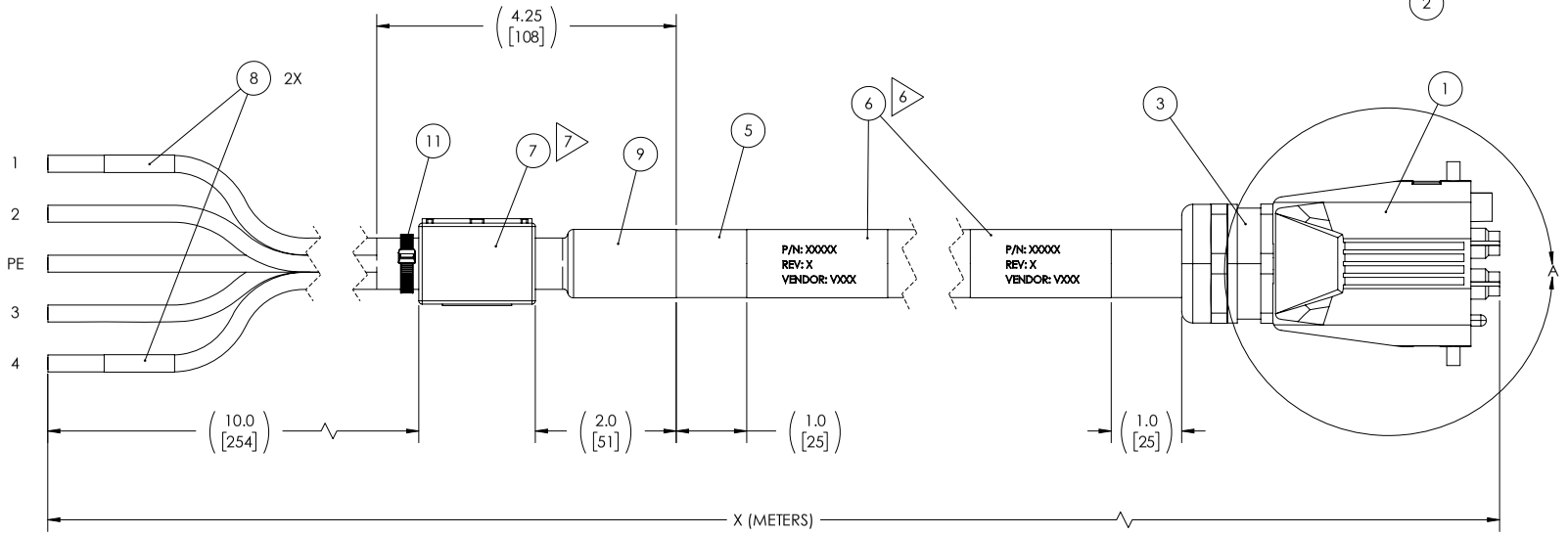
TITLE: CONTROL DRAWING, VERICURE
PART NUMBER: 55212 | REV. 2
ISSUED BY: C. LUTH | ISSUE DATE: 02/13/2025
3D DATABASE:
ASME/ANSI Y14.5 | EGF-44275-01 | SCALE: 1:2 | SIZE: C | SHEET 1 OF 1

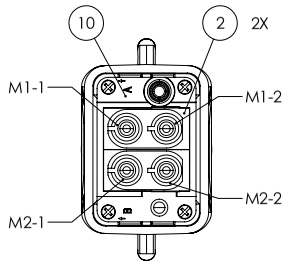
REVISIONS						
REV.	DESCRIPTION	ENGR	DATE	ECO	APPROVED	APPROVED DATE
A	ENGINEERING RELEASE	CL	4/4/2024	---	---	---

NOTES:

1. DRAWING NOT TO SCALE
2. ASSEMBLE PER IPC/WHMA-A-620C STANDARD
3. ASSEMBLE COMPONENTS PER COMPONENT MFR'S PROCEDURES
4. TEST CONTINUITY OF EACH NET PIN TO PIN AND BETWEEN GROUND POINTS (SEE NETLIST TABLE)
5. USE PREFFERED COMPONENT MFR LISTED IN BOM OR PHOSEON APPROVED EQUIVALENT
6. LABEL TO INCLUDE PHOSEON PART NUMBER, CURRENT REV AND ASSIGNED VENDOR CODE
7. CLAMP ON FERRITE (ITEM 7) MUST FIT SNUG AROUND CABLE ASSEMBLY. IF NECESSARY, USE CABLE TIE (ITEM 11) TO SECURE FERRITE.
8. CABLE LENGTH TOLERANCE PER IPC A-620 STANDARD







ITEM NO.	PHOSEON PN	REV	DESCRIPTION	MFR	MFR PN 5	QTY.
1	(36303)	-	HOUSING, 6B, STRAIGHT, M32, PHX	PHOENIX CONTACT	1412567	1
2	(33494)	-	MODULE, 2-PIN, 70A, 6B, FEMALE, PH	PHOENIX CONTACT	1417296	2
3	(32571)	-	CABLE GLAND, BRASS, NICKEL-PLATED, M32	PHOENIX CONTACT	1646010	1
4	(50304)	-	LUG, ADAPTER, NX1 CABLE, 6AWG TO 10AWG	PHOENIX CONTACT	1636981	1
5	(39950)	-	CABLE, 5 COND. 6 AWG, UNSHIELDED	HELUKABEL	62982	A/R
6	(36263)	-	LABEL, INFO, WIREMARKER, 1.5"X4.0"	BRADY	THT-27-427	2
7	(19716)	-	CORE, FERRITE, HINGED, 210 OHM	LAIRD-SIGNAL	28A5776-0A2	1
8	(36261)	-	HEAT SHRINK, FP301, 3/8", RED	3M	FP-301-3/8-RD 200'	A/R
9	(37457)	-	HEAT SHRINK, ITCSN, 2" BLK	3M	ITCSN-2000-25'-BLACK-REEL	A/R
10	(33389)	-	FRAME, 2-MODULE, HOUSING, 6B, SLEEVE	PHOENIX CONTACT	1182087	1
11	(32568)	-	ZIP TIES, NYLON, 8" X .17"	BELDEN	DT-07-50-0-C	1

PART NUMBER FORMAT
54452-_ _M
LENGTH, IN METERS

NETLIST		
J1	WIRE LABEL	DESTINATION J1
M1-1	1	+V
M1-2	2	-V
PE	YL+GN	GND
M2-1	4	+V
M2-2	3	-V

3RD ANGLE VIEW

DIM UNITS: IN [mm]
TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X:±0.1 [2.5]
X.XX:±0.1 [2.5]
ANGLE:±1°

MATERIAL: SEE BOM
FINISH: NONE
TITLE: CABLE, FT, DC, PH 4-PIN, 6 AWG
PART NUMBER: 54452-_ _M
REV. A
ISSUED BY: C. LUTH
ISSUE DATE: 4/4/2024
3D DATABASE: N/A
ASME/ANSI Y14.5 | EGF-44275-01 | SCALE: 3:4 | SIZE: C | SHEET 1 OF 1

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Reducing Light Reflection

Technical Note

Overview

One of the many benefits of UV LED technology is divergent light, meaning there is no focal point of the light output. This creates a longer exposure time for media traveling under the light source, and therefore typically higher dose for curing the adhesive, coating, ink or other UV curable material.

When the light source is mounted adjacent to a print head, there may be a concern when using very sensitive inks that light could reflect off the media into the print head and begin curing prematurely. This document describes techniques to reduce reflected light.

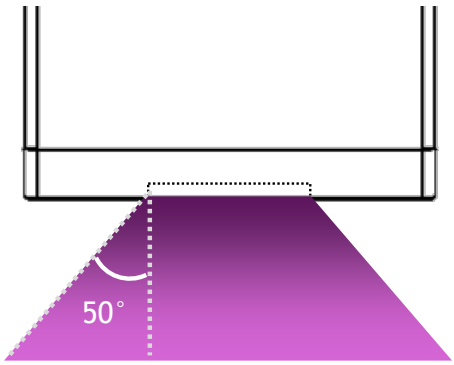
Notes:

- The types of print media (surface roughness, reflectivity, color, etc.) will change the behavior and amount of any UV light reflection.
- Increasing or decreasing the distance of the light source to the media changes the peak intensity of the UV and may affect cure speed.
- Uses of recommendations in this document are done solely at the user's risk; Phoseon claims no responsibility for damage of any inkjet components.

Light Output Angle

The typical half angle of light output from Phoseon UV LED light sources with a 20 mm wide emitting window is approximately 50° from the edge of the glass.

For products with a 10 mm wide emitting window, the half angle varies depending on the type of optic; please refer to the Optics Option Technical Note for more information regarding the shape of the light output.



Reducing Light Reflection

To reduce the light reflection, the following techniques can be used:

- Use materials around the light source that absorb or do not reflect UV (examples below) and avoid materials that are good UV reflectors such as bare Aluminum.
  - Black anodized or black painted materials.
  - Optical absorption and anti-reflective coatings.
  - Thorlabs blackout materials, e.g. black metal foil (http://www.thorlabs.com)
  - Steel.

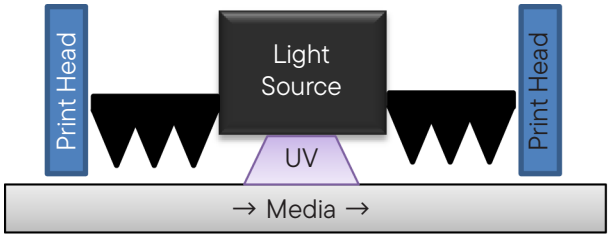
- Increase surface roughness of materials between the light source and print head.
  - Avoid smooth surfaces, which are good reflectors.
  - Bead blasting or other roughening techniques reduce reflection of flat surfaces.

- Use light traps or a baffles between the light source and print heads.
  - Saw-tooth forms and straight-fins are good for capturing any reflected light.
  - Increase number of grooves and increase depth of baffles.

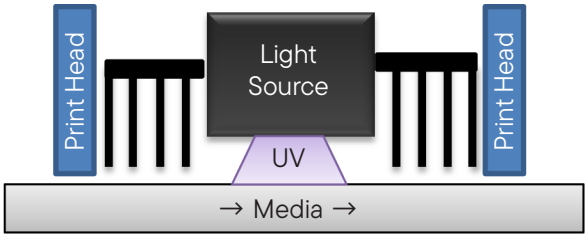
- Keep the light source close to the surface to reduce light spread.

Light Baffle Examples (not to scale)

Adding a light baffle creates a surface to catch the reflected light beams and prevents them from reflecting (bouncing) off of other materials in the system and reduces the light spread.



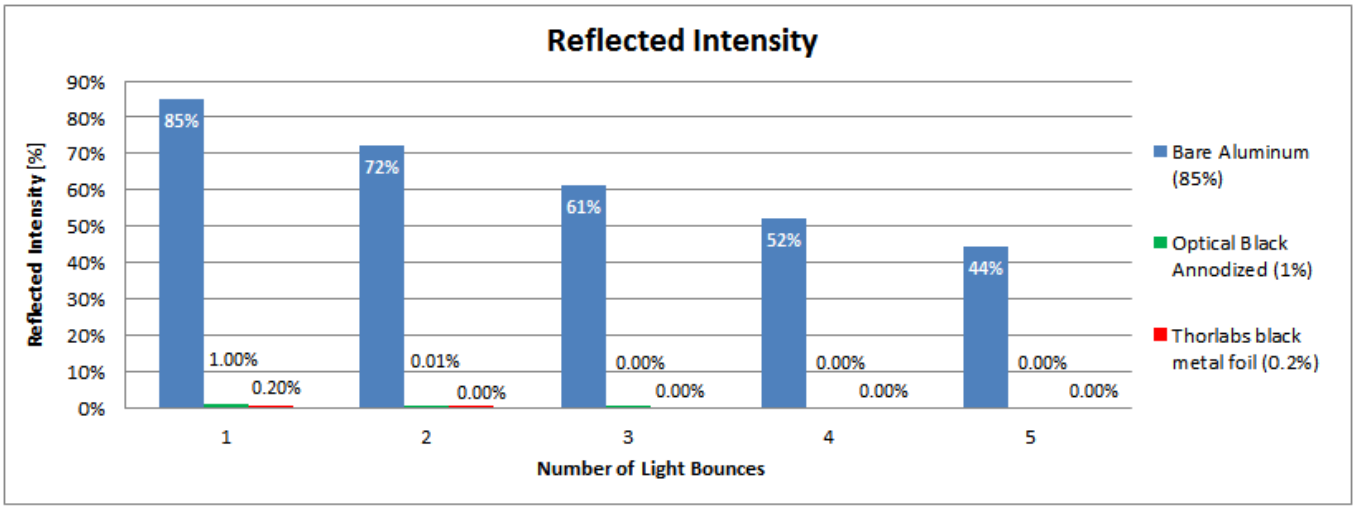
Saw-tooth form light baffle



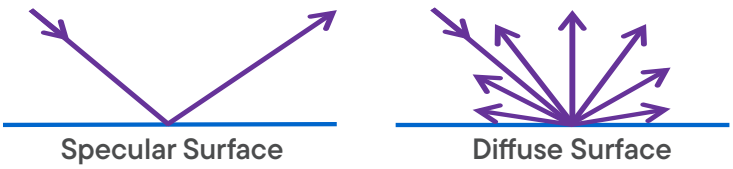
Straight-fin form light baffle

Materials

As stated above, avoid reflective materials such as bare Aluminum, as it has a UV reflectivity rating of 85%, whereas a surface that has been anodized optical black has a UV reflectivity rating of 1% and the Thorlabs black metal foil has a rating of 0.2% (see chart below). The intensity of the light will decrease every time it reflects (or 'bounces') off of a surface.



The surface finish of the material also affects how the light spreads. A specular surface is a smooth, mirror-like finish that allows a light beam to remain intact as it reflects off of the surface. A diffuse surface is a rough, textured finish that scatters the beam, causing the beam to reflect in many different directions. An example of a specular surface could be a mirror or polished metal. An example of a diffuse surface could be paper or textured paint.

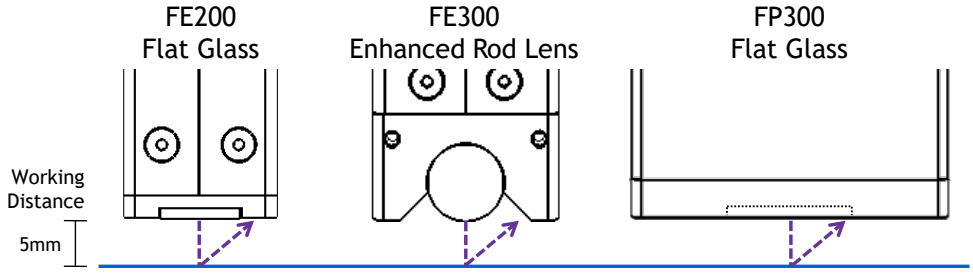


Light Reflection Examples

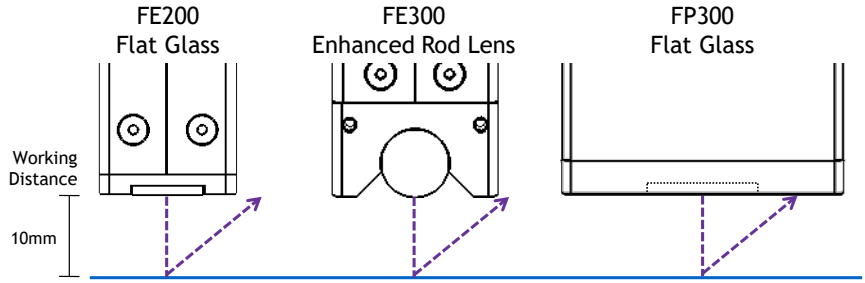
When curing with a reflective surface, like bare or polished aluminum, the size of the window frame and the working distance from the emitting window to the media, will affect how much light is allowed to reflect past the light source. Adding a light catch or shield that extends past the light source will catch some of this reflected light.

The amount of reflected light from a light source will vary based on the setup including:

- The peak intensity of the light source: directly correlates to the intensity of the reflected light, especially on a specular surface
- The type of window frame and optic: a focused light like the FE300 concentrates the light into a smaller area on the surface, where the FE200 Flat Glass and FP300 allows the light to spread due to the half-angle of the light output
- The working distance height between the light source and media: a larger working distance allows more room for the light to reflect past the emitting window frame
- The type of media surface: a highly reflective specular surface will reflect light more intensely than a non-reflective diffuse surface



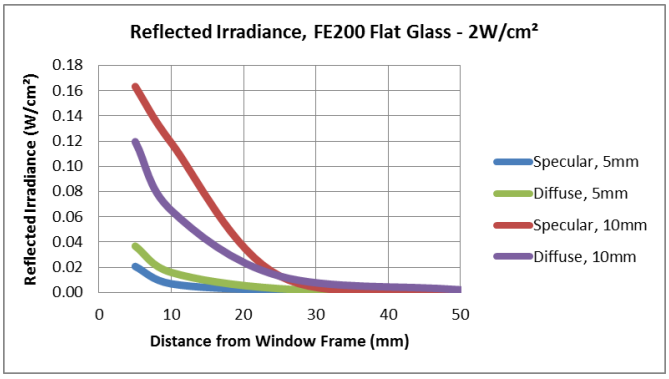
Phoseon Product Examples at 5 mm Working Distance



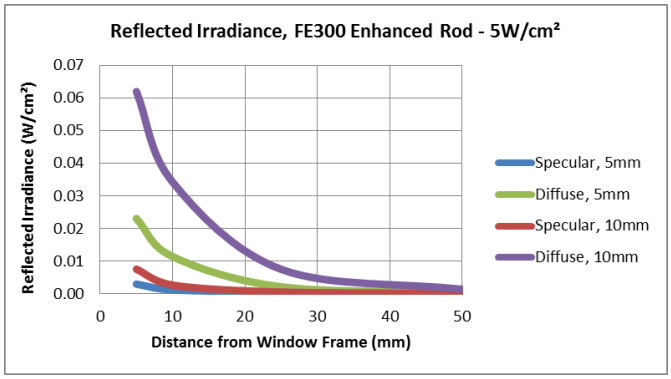
Phoseon Product Examples at 10 mm Working Distance

The charts below illustrate the irradiance values of reflected light with 3 different light sources; the FE200-2 W/cm² with Flat Glass, the FE300-5 W/cm² with Enhanced Rod Lens, and an FP300-20 W/cm².

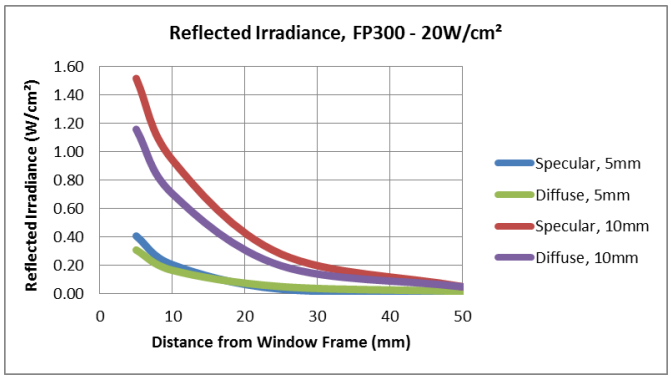
- The media is shown as a worst-case scenario with 100% reflectivity, meaning the media is not absorbing any of the UV energy, even if it is a specular or diffuse surface
  - For comparison, bare aluminum is 85% reflective as shown in the previous chart
  - In actual use, most surfaces will absorb some of the UV energy, which is either used to kick off a UV reaction (inks, coatings, or adhesives), or turns into heat
- The media is shown in two forms: a specular (smooth) surface and a diffuse (rough) surface
- Each media type is shown at two different working distances: 5 and 10 mm from the emitting window to the media
- The point of measurement for the reflected light is on the same plane as the emitting window at varying distances away from the edge of the light source (window frame, not the glass)



FireEdge FE200 Flat Glass, 2 W/cm²



FireEdge FE300 Enhanced Rod, 5 W/cm²



FirePower FP300, 20 W/cm²

Observations from the charts above:

- The intensity of the light reflections from the FE200 are 10x less than the FP300, due to the difference in peak intensities (2 W/cm² versus 20 W/cm²)
- The FE300 has less intense light reflections and less specular reflection than the FE200 due to the Enhanced Rod Lens creating a narrower light output
- Other Phoseon products with 20 mm emitting windows will have similar reflected irradiance patterns to the FP300, but the distance from the emitting window is different due to the width of the window frames

Water Cooling Requirements

Technical Note

Overview

Phoseon offers several water-cooled light sources. Water cooling is the most efficient way to remove excess heat from any device. Water cooling is a closed system, consisting of water channels internal to the light source, an external cooler or chiller, and the water lines connecting the two. The cooling water runs through the light source to transfer heat away from the UV LEDs, and the chiller or cooler then removes the excess heat from the water before it is circulated back to the light source.

Proper setup and regular maintenance of the water cooling system is a requirement of the Phoseon warranty. Failure to follow the requirements listed below can result in permanent damage to the light source. This document supersedes any recommendations or requirements in the Cooling Water or Water Condensation Hazard sections of the product manuals.

Warranty Requirements

The following requirements must be met to maintain the optimum performance of the light source. Failure to meet these requirements voids the warranty.

The water chiller must meet the flow rate and cooling capacity requirements of the Phoseon light source. Flow rates and cooling capacities are listed on the product specification sheets and in the OEM manuals.

- **Use distilled water only.** Do not use tap water or deionized water. They are harmful to the cooling system.
- **Use an anti-corrosion additive.** Water is very corrosive to metals, so protection against corrosion is essential.
- **Avoid conditions that cause condensation** to form on the water lines and inside the light source.
- **Use a flow switch** or other safeguard to insure the light source is not enabled without cooling water.

See below for additional details on these requirements.

Water Preparation

Use distilled water only

The minerals typically found in tap water are detrimental to the cooling system, and in extreme cases will cause complete blocking of the water channels inside the light source. Do not use deionized water in the cooling system. Deionized water is extremely corrosive, and will quickly degrade the water channels.

Use an anti-corrosive additive

Anti-corrosion additives are required to keep the water channels clear. Using distilled water alone reduces, but does not eliminate, the build-up of deposits in the channels due to galvanic corrosion. A convenient way to add anti-corrosion ingredients to the water cooling system is through the use of readily available coolants (anti-freezes). Most coolants contain proprietary anti-corrosion additives which are effective in preventing deposits. Simply verify that the coolant is specified to provide protection for multiple metals, including copper, aluminum and brass.

Phoseon has tested:

DowFrost™ Heat Transfer Fluid

- Concentration of Propylene Glycol: 96% before dilution
- Coolant/Distilled water mix: 25%-30% concentration, remainder distilled water

Coolant requirements:

- Type: DowFrost™ Heat Transfer Fluid or equivalent
- Concentration of Propylene Glycol: 96% before dilution
- Coolant/Distilled water mix: 25%-30% concentration, remainder distilled water
- Protection for multiple metals, including copper, aluminum and brass

Propylene glycol based coolant is also classified as non-toxic and is available worldwide. In addition, a coolant mixture of at least 25%, as required by Phoseon, eliminates the need for an algaecide. However, do not use a mixture of more than 30% coolant, as it will reduce the cooling capacity by too great an amount.

In some environments, a 25% to 30% concentration of coolant produces foam in the cooling water, lowering the cooling efficiency. If foam is present in the cooling water, an alternative is a 20% concentration along with an algaecide.

Phoseon has tested:

PolyScience Lab Algicide

General purpose lab algaecide.

- Dosage: 20 drops/gal
- 8 oz. (treats 400 gallons)

Be aware that the chiller manufacturer may require specific additives in order to remain under their warranty. Always check with the chiller manufacturer before using a coolant.

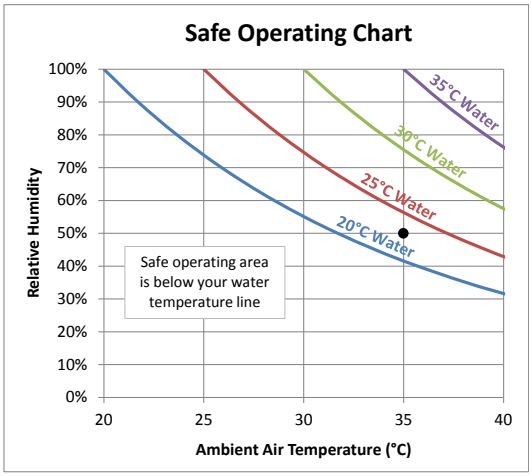
Understanding Condensation

Condensation must be avoided under all conditions. If water collects inside the light source or other equipment, permanent damage will result. It is therefore important to be aware of ambient conditions that lead to condensation.

Dew point

Condensation occurs when humid air makes contact with a colder surface. If the surface is cold enough, the air cools to the point where it can no longer hold its water vapor. This causes liquid water to form on the surface.

The temperature at which condensation occurs is known as the dew point. For any combination of ambient air temperature and relative humidity the dew point is predictable. Therefore the conditions under which condensation occurs can be avoided.



Note: Output irradiance will decrease <2% for every 10°C rise in water temperature. All Phoseon light sources are set at the factory using 30°C cooling water.

Risk conditions

Phoseon water cooled products are specified for operation with a water temperature of 20 - 35°C. Refer to the Safe Operating Chart at right. On this chart the water temperature lines indicate where the dew point matches the water temperature. Any combination of relative humidity and ambient temperature that is above a given water temperature line represents a condition where condensation can occur.

Phoseon recommends using a higher water temperature of 30 to 35°C to reduce the risk of condensation. As an example suppose the ambient conditions are 35°C and 50% RH, shown as a black dot on the chart. If the cooling water temperature is 20°C there is a risk of condensation. In this case increasing the water temperature to 25°C or higher will avoid condensation.

Look at your water lines for a quick way to determine if your current conditions are causing condensation. If the water lines coming from the chiller are forming condensation, increase the water temperature to eliminate condensation. Note that in extreme conditions, it may be necessary to reduce the ambient temperature and/or reduce the relative humidity to eliminate condensation.

Operating Requirements

Avoid conditions that cause condensation

The chart at right lists the operating environment specifications for Phoseon water-cooled light sources. Select a water temperature based on your maximum ambient air temperature and relative humidity. In addition, it is good practice to turn off the cooling water whenever the UV output is turned off for more than a few minutes. This allows the water channels to adjust to the ambient air temperature, reducing the chances of condensation.

Operating Environment	
Ambient Temp	10 to 40°C
Water Temp	20 to 35°C
Max Relative Humidity	Varies (See below)
w/ 35°C Water	<80% RH up to 37°C ambient <70% RH up to 40°C ambient
w/ 30°C Water	<80% RH up to 32°C ambient <55% RH up to 40°C ambient
w/ 25°C Water	<80% RH up to 27°C ambient <40% RH up to 40°C ambient
w/ 20°C Water	<80% RH up to 22°C ambient <25% RH up to 40°C ambient

Use a flow switch

As an added safety measure, the use of a water flow switch is required. A flow switch inserted at chiller's water path output will guard against enabling the UV output when the water flow is off. The output of a flow switch is a simple contact closure. By choosing a switch that matches the light source's Interlock or UV Override control pin function, the UV output is disabled when no water is flowing. The flow switch may be replaced by an equivalent function in an integrated control system.

Phoseon has tested:

Gems Sensors
Flow Switch part number:
129661 Normally open with no flow (3.7LPM)
129667 Normally closed with no flow (3.7LPM)
129666 Normally closed with no flow (1.9LPM)

2. Operation

2.1. ON/OFF CONTROL

The UV output of the light source can be enabled and disabled through the VeriCure communication protocol command sets and therefore can be turned on and off electronically. The light source does not require external shutters and can be enabled only when needed.

CAUTION: **Any material exposed to UV, when not in motion, can reach very high temperatures. Turn off the light source when not actively UV curing.**

WARNING:

The level of UV energy supplied by the VeriCure light source is sufficient to ignite flammable substances. Therefore, when the system is operated unattended in an automated environment, an alarm function must be provided by the user to indicate a malfunction in the associated equipment used. During installation, the appropriate measure must be included to prevent any such occurrence.

2.2. UV LED CONTROL BOX

The UV LED Control Box is an available accessory that provides a simple way to manually control Phoseon brand UV LED light sources. If using the Control box, refer to *30477 Control Box Gen3 Spec Sheet* for additional information.

2.3. SOFTWARE DEVELOPMENT KIT

The software development kit provides communication protocol and command sets used to communicate with and control the VeriCure family of UV LED curing systems. For additional information, refer to *55211 Instr, VeriCure SDK Dev Kit*.

2.4. EMITTING WINDOW GLASS CLEANING/REPLACEMENT

Clean the emission window on an as needed basis. The cleaning procedure varies depending on the lamp configuration, as outlined below.

Systems Without a Secondary Glass Kit

1. Ensure the power supply main switch is turned OFF before servicing, removing, or installing the VeriCure system.
2. Clean the emission window according to the *Window Cleaning Instructions, Document #27182*.

Systems With a Secondary Glass Kit Installed

1. Ensure the power supply main switch is turned OFF before servicing, removing, or installing the VeriCure system.
2. Loosen the thumb screw and remove the Cover Glass Keeper.
3. Carefully slide out the Secondary Window Frame.

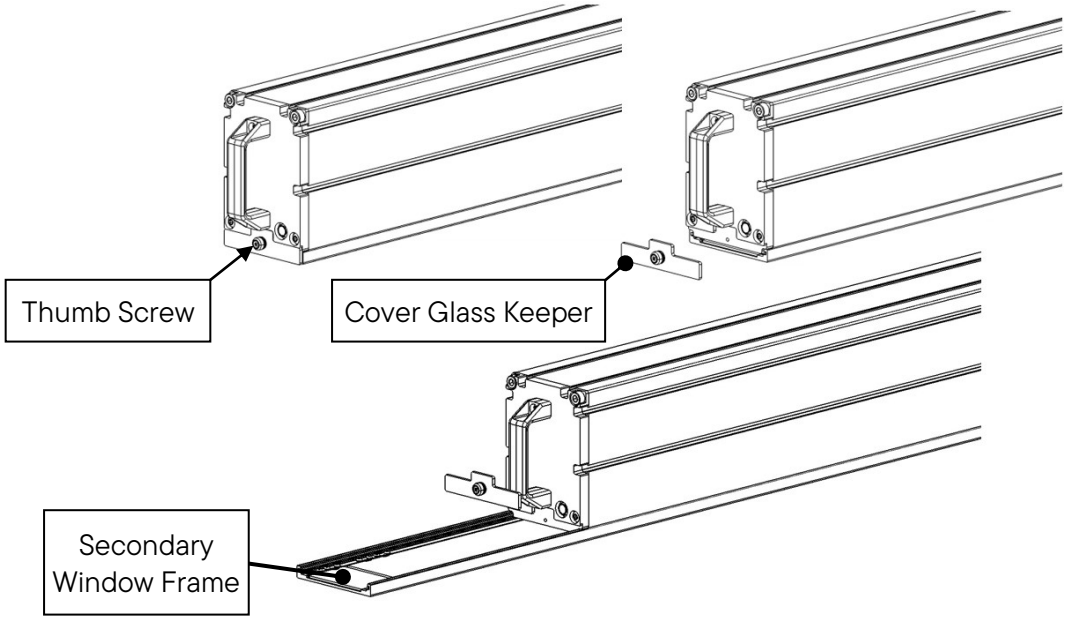


FIGURE 2.1: VeriCure Glass Assembly

4. Clean the emission window according to the Window Cleaning Instructions, Document #27182.
    - If the glass in the secondary kit is damaged, replace the glass per *VeriCure™ Secondary Glass Kit Installation Instructions, document 56626*.
5. Carefully slide the assembly back into place.
6. Reinstall the Cover Glass Keeper.

2.5. IRRADIANCE AS A FUNCTION OF DISTANCE

The UV emission from the VeriCure UV light source diverges with distance away from the window glass. However, it is important to note that as the distance between the media and the emitting window increases, the total energy (dose) delivered by the light source remains constant. Peak irradiance decreases as the working distance increases, but it is offset by an increase in the exposure area (light footprint), keeping the dose constant.

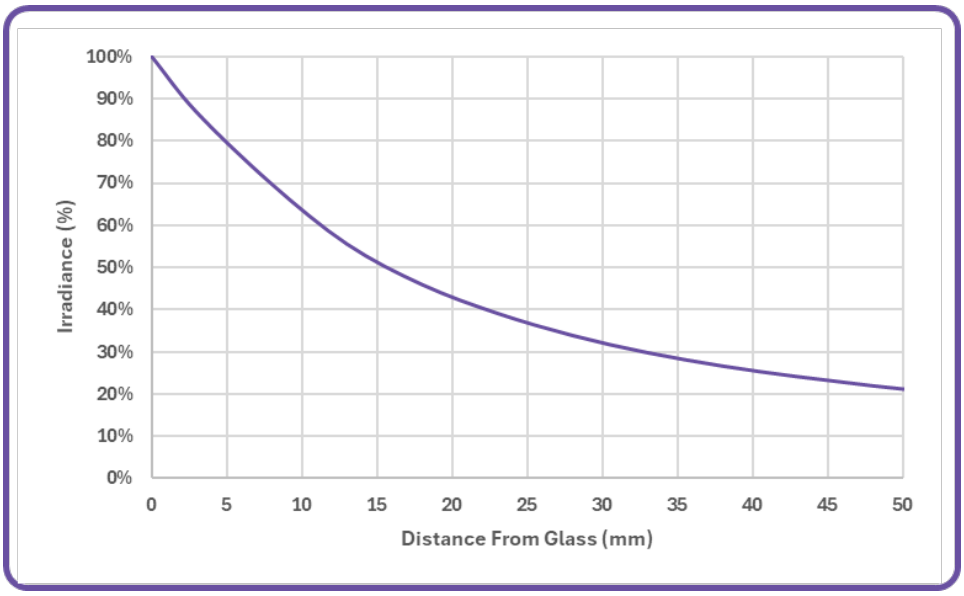


FIGURE 2.2: Irradiance as a Function of Distance

2.6. SERVICE

For Technical Assistance Contact:

Toll-free:
888-780-7132

Standard:
971-713-2690

Service email:
service@phoseon.com

or complete the Return Merchandise Authorization form at:
https://phoseon.com/return-merchandise-authorization/

2.7. TROUBLESHOOTING GUIDE

The external status LED indicates the operational state of the LED system. See Table 1.1 for the meanings of status LED.

Fault and log information can be obtained from the LED system using Ethernet or RS485 communications, as described in document *55211 VeriCure SDK Dev Kit*.

TABLE 2.1: EXTERNAL LED STATUS INDICATOR MEANINGS

Color	Meaning
Solid Green	System ready and no critical faults active
Solid Yellow	UV is on
Solid Red	One or more critical errors exist
Flashing Green	System initialization ***or*** LED system interlock signal preventing UV emissions
Flashing Yellow	Warning exists while UV is on

TABLE 2.2: TROUBLESHOOTING GUIDE

Fault	Cause of Fault	Recommended Action
Over Voltage	Input voltage too high (>= 132 VDC)	Ensure input voltage to LED system is stable and within the limits specified.
Under Voltage	Input voltage too low (<= 108 VDC)	Ensure input voltage to LED system is stable and within the limits specified.
Over Temperature	Maximum heatsink temp (>= 75C)	Check chiller flow rate Check chiller coolant temperature
Blown Fuse	An SLM driver circuit fuse was detected as blown	Contact Excelitas
No Current	No SLM current was detected after UV enabled	Contact Excelitas
Unexpected Current	SLM current was detected when UV is disabled	Contact Excelitas
LED WDT	LED WDT timer value reaches zero	Ensure LED WDT timer value is non-zero while feature is enabled
Thermal Cycle Limit	An excessive number of unacknowledged thermal faults occurred.	Check chiller flow rate Check chiller coolant temperature
DB Comms	Internal PCBA communication problems detected	Contact Excelitas
No Water Flow	Water flow below threshold of sensor	Check chiller flow rate

Fault	Cause of Fault	Recommended Action
NVM	Non-volatile storage corruption detected	Contact Excelitas
POST	Power-on self-test failure	Contact Excelitas
Temperature Sensor Failure	Failure of temperature sensor was detected	Contact Excelitas

Window Cleaning Instructions

User Guide

Phoseon requires inspecting and cleaning the emitting window of the light source for any debris or UV material on a regular basis, up to daily if needed, to maintain the quality of UV light output.

Note: Do not submerge the light source or spray any liquid directly onto the light source.

The materials needed to properly clean the Phoseon light source, can be purchased from most home improvement supply stores, paint stores, or auto-body repair shops.

Materials Needed:

- Dry Paper Towels
- Razor Blade and Handle
- IPA Pre-moistened Wipe
- Gloves: Vinyl and Sharp Resistant (i.e. Kevlar)
- Sharps Disposal Container

Instructions:

1. Disconnect DC Power from the light source.

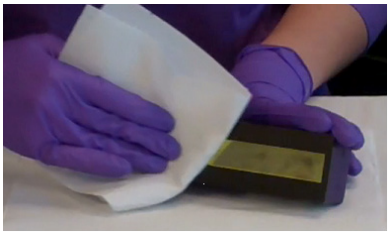
   CAUTION: Wearing vinyl gloves is recommended to avoid getting any uncured UV material on the skin.

2. Wipe down the glass with a dry paper towel to remove any uncured UV material.
3. Carefully scrape large debris off the window using the sharp edge of the razor.

   CAUTION: Wear sharp-resistant gloves.

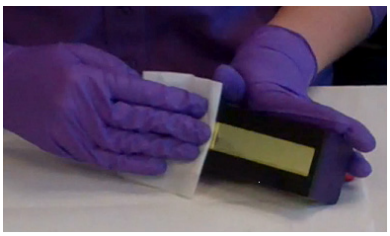
   Note: If the razor needs to be replaced, dispose of the razor blade in a properly marked sharps container.

4. Use the pre-moistened IPA wipe to remove any remaining dust or debris left on the window during the cleaning process.
5. Repeat steps 2 through 5 until the window is clear of all contaminants.
6. If needed, use a dry paper towel to wipe down the light source.



Wipe Glass

Scrape with Razor



Wipe with IPA

info@phoseon.com
www.phoseon.com

27182 Rev 7.0
February 2017

EU Declaration of Conformity

Phoseon®

Product Identification

Brand	Phoseon						
Product Family	**Product Models**						
FireEdge™	75x5 FE100 80x10 FE200 75x10 FE300 75x10 FE400 80x10 FE410 80x10	FE100 120x10 FE200 110x10 FE300 110x10 FE400 120x10 FE410 120x10	FE100 180x10 FE400 160x10 FE410 160x10	FE100 240x10 FE400 180x10 FE410 180x10	 FE400 240x10 FE410 240x10		
FireFlex™	75x50	150x50	225x50				
FireFly	25x10 50x20 FF200 25x20	25x20 75x20 FF200 50x20	25x25 150x20				
FireJet™	225x20 ONE 75x20 FJ100 75x20 FJ100 G2 75x20 FJ240 75x40 FJ601 225x20 FJ605 300x20 FJ800 100x100 FJ801 100x100	 ONE 150x20 FJ100 150x20 FJ100 G2 150x20 FJ200 150x20 FJ240 150x40 FJ601 300x20 FJ605 375x20	 FJ50 225x20 ONE 225x20 FJ100 225x20 FJ100 G2 225x20 FJ200 225x20 FJ200SLD 225x20 FJ228 225x20 FJ240 225x40 FJ601 375x20 FJ605 450x20	 ONE 300x20 FJ100 300x20 FJ100 G2 300x20 FJ200 300x20 FJ240 300x40 FJ601 450x20 FJ605 525x20	 ONE 375x20 FJ100 375x20 FJ100 G2 375x20 FJ200 375x20 FJ240 375x40 FJ601 525x20 FJ605 600x20	 FJ605 675x20	
FireLine™	125x20 350x20 FL200 75x10 FL400 125x20 FL400SLD 125x20	150x20 450x20 FL200 125x10 FL400 150x20 FL400SLD 150x20 FL440 150x40 FL440SLD 150x40	225x20 550x20 FL400 225x20 FL400SLD 225x20 FL440 225x40 FL440SLD 225x40	300x20 675x20 FL400 250x20 FL400SLD 250x20 FL440 250x40 FL440SLD 250x40	 FL400 300x20 FL400-I 300x20 FL400SLD 300x20 FL440 300x40 FL440SLD 300x40	 FL400 350x20 (96V) FL400SLD 350x20 (96V) FL440 350x40 (96V) FL440SLD 350x40 (96V)	 FL440SLD 375x40 (96V)
FirePower™	FP200 150x20 FP300 150x20 FP501 300x20 FP601 300x20	FP200 225x20 FP300 225x20 FP501 350x20 FP601 350x20	FP200 300x20 FP300 300x20 FP501 450x20 FP601 375x20	FP200 350x20 FP300 350x20 FP501 525x20 FP601 450x20	FP200 450x20 FP300 450x20 FP501 600x20 FP601 525x20	 FP300 900x20 FP501 700x20 FP601 600x20	 FP601 675x20
Nexus ONE™	FG, NX1 300x20AC395-65W FG, NX1 375x20AC395-65W FG, NX1 375x20AC365-50W FG, NX1 450x20AC395-65W FG, NX1 525x20AC395-65W FG, NX1 600x20AC395-65W FG, NX1 675x20WC395-90W		FG, NX1 300x20AC395-65W_NH FG, NX1 375x20AC395-65W_NH FG, NX1 375x20AC365-50W_NH FG, NX1 450x20AC395-65W_NH FG, NX1 525x20AC395-65W_NH FG, NX1 600x20AC395-65W_NH FG, NX1 675x20WC395-90W_NH				
Nexus II™	FG, NXII 300x20AC395-65W FG, NXII 375x20AC395-65W FG, NXII 450x20AC395-65W FG, NXII 525x20AC395-65W FG, NXII 600x20AC395-65W FG, NXII 300x20AC395-65W_NH FG, NXII 375x20AC395-65W_NH FG, NXII 450x20AC395-65W_NH FG, NXII 525x20AC395-65W_NH FG, NXII 600x20AC395-65W_NH		FG, NXII 300x20WC395-90W FG, NXII 375x20WC395-90W FG, NXII 450x20WC395-90W FG, NXII 525x20WC395-90W FG, NXII 600x20WC395-90W FG, NXII 675x20WC395-90W FG, NXII 300x20WC395-90W_NH FG, NXII 375x20WC395-90W_NH FG, NXII 450x20WC395-90W_NH FG, NXII 525x20WC395-90W_NH FG, NXII 600x20WC395-90W_NH FG, NXII 675x20WC395-90W_NH				

excelitas®

Brand	Phoseon						
Product Family	**Product Models**						
Nexus Tower	FG, NX Tower, 1stn, 300/375, IHMI, MNT, 208V FG, NX Tower, 1stn, 300/375, RHMI, 220VAC FG, NX Tower, 1stn, 300/375, RHMI, 400V FG, NX Tower, 2stn, 300/375, RHMI, 400VAC FG, NX Tower, 3stn, 300/375, RHMI, 400VAC FG, NX Tower, 4stn, 300/375, RHMI, 400VAC FG, NX Tower, 5stn, 300/375, RHMI, 400VAC FG, NX Tower, 6stn, 300/375, RHMI, 400VAC FG, NX Tower, 8stn, 300/375, RHMI, 400VAC FG, NX Tower, 9stn, 300/375, RHMI, 400VAC FG, NX Tower, 1stn, 450/525, RHMI, 208VAC FG, NX Tower, 1stn, 450/525, RHMI, 400VAC			FG, NX Tower, 2stn, 450/525, RHMI, 208VAC FG, NX Tower, 2stn, 450/525, RHMI, 400VAC FG, NX Tower, 3stn, 450/525, RHMI, 400VAC FG, NX Tower, 5stn, 450/525, RHMI, 400VAC FG, NX Tower, 6stn, 450/525, RHMI, 400VAC FG, NX Tower, 7stn, 450/525, RHMI, 400VAC FG, NX Tower, 8stn, 450/525, RHMI, 400VAC FG, NX Tower, 8stn, 450/525, RHMI, 400VAC FG, NX Tower, 6stn, 600, RHMI, 400VAC FG, NX Tower, 1stn, 675, RHMI, 208VAC FG, NX Tower, 1stn, 675, RHMI, 480V FG, NX Tower, 4stn, 675, RHMI, 480VAC			
StarFire™	100x20	150x20					
StarFire MAX™	75x20	150x20	225x20	300x20			
VeriCure™	FG, VC750x20WC365-10W FG, VC750x20WC395-20W FG, VC750x20WC405-20W FG, VC900x20WC365-10W FG, VC900x20WC395-20W FG, VC900x20WC405-20W FG, VC1050x20WC365-10W FG, VC1050x20WC395-20W FG, VC1050x20WC405-20W		FG, VC1200x20WC365-10W FG, VC1200x20WC395-20W FG, VC1200x20WC405-20W FG, VC1350x20WC365-10W FG, VC1350x20WC395-20W FG, VC1350x20WC405-20W				

Manufacturer

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Authorized EU Representative

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(+49) 6023 405 9600

Means of Conformity

Excelitas Technologies declares that the product listed as a result of its design and construction is in conformity with the essential requirements and provisions of the following Council Directives and standards:

Applicable Directives:

- 2014/35/EU (Low Voltage Directive)
- 2014/30/EU (Electromagnetic Compatibility)
- 2011/65/EU as amended by (EU) 2015/863 (RoHS)
- 2012/19/EU (WEEE)

Standards Used to Verify Compliance:

- EN 61010-1:2010/A1:2019/AC:2019-04/A1:2019
- EN 62471 (2008) IEC 62471 (2006)
- EN 61326-1 (2013)

Signature

Signature (electronic): Forest White

Name: Forest White, Senior Manager, Operations

Place: Hillsboro, OR

Date: 2026-06-20