FireLine™ FL440 Solid State UV LED Curing System

User Manual

Revision: 5
December, 2023

For Technical Assistance Contact:

Phone +1 503 439 6446 • Fax +1 503 439 6408
Email: customerservice@phoseon.com
Website: www.phoseon.com
Contact Phoseon Sales for a Return Material Authorization (RMA)

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Overview and Safety

UV Curing System Components

The FireLine FL440 system consists of the following components:

- FireLine FL440 Light Source
- DC Power Supply
- Cooling Water
- Electronic Control (PLC)

The product label on the FL440 light source identifies the production model and configuration. See the example (pictured right):

- FireLine is the product family
- FL440 300x40 is the model number
  - 300 represents the UV emitting length in mm
  - 40 represents the UV emitting width in mm
- Configuration information follows the model number
  - WC defines unit as water-cooled
  - 395 defines the dominant wavelength in nm
- 16W defines the peak irradiance in W/cm^2

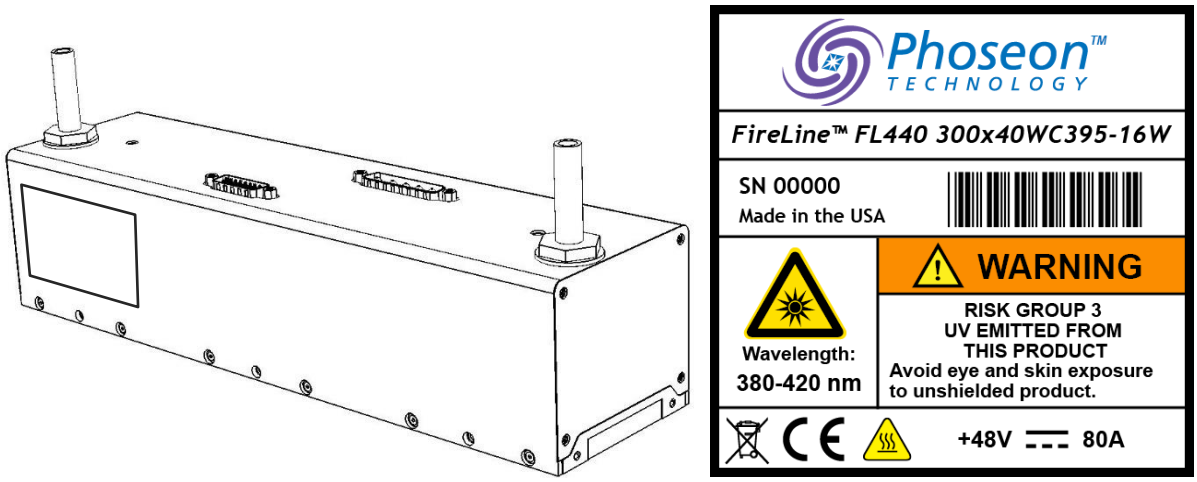


Figure 1.1: Safety Label Placement

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

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

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

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 532nm.

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

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

Hazard and Safety Notices

The symbols and labels in the following table are used in Phoseon'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.

Restriction of Hazardous Substances (RoHS)

Phoseon Technology declares, to the best of our knowledge based on available information conducted to us, that our light sources do not contain any homogeneous materials that:

- Contains lead (Pb) in excess of 0.1 weight -% (1000 ppm)
- Contains mercury (Hg) in excess of 0.1 weight-% (1000 ppm)
- Contains hexavalent chromium (Cr VI) in excess of 0.1 weight-% (1000 ppm)
- Contains polybrominated biphenyls (PBB) or polybrominated dimethyl ethers (PBDE) in excess of 0.1 weight-% (1000 ppm)
- Contains cadmium (Cd) in excess of 0.01 weight-% (100 ppm)

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

Phoseon Technology has determined our products are not subject to EU REACH directive registration requirements.

With regards to the projected candidate list of substances of very high concern (SVHC) – issued 10 October 2008, Phoseon Technology further declares that, to the best of our knowledge, our products do not contain any currently listed SVHC above the level 0.1% by weight.

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 Phoseon for reuse or be disposed of in accordance with local laws.

Figure 1.1: Do Not Dispose in Trash Symbol

Setup & Installation

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

Table 2.1: FL440 Documentation

FireLine FL440	125x40	150x40	225x40	250x40	300x40
Product Specification	35704				
Control Drawing	36777	36778	36779	36780	35925
DC Cable, 2m, 3W3	32932				
DC Cables, 5W5	33167-***xxM***, where ***xxM*** is the length of the cable, in Meters (2, 4, 6, 10 & 15M)				
Water Cooling Requirements	28384				
Reducing Light Reflection	28658				
Water Tube Installation	30741				
Compression Fitting Installation	32085				
Window Cleaning Instructions	27182				
Declaration of Conformity	29321				
Optional Power Supplies	Phoseon PN: 54113		Phoseon PN: 54113	Phoseon PN: 54113, 54114	Phoseon PN: 54114

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

If using the optional power supply, or any 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.

Electrical

The FireLine FL440 requires a switching power supply with constant voltage output. The power supply tested by Phoseon for use with the FireLine systems is the Mean Well RSP-series. The Mean Well specifications can be used as a guideline for selecting a switching power supply with the following critical specifications:

- 48Vdc +/- 1V delivered to the light source from constant voltage output source.
- Maximum ripple should be less than 4V peak-to-peak.
- See 35704 Product Specifications for minimum and maximum power delivered to the light source.

A power supply should be used that provides a Safety Extra Low Voltage (SELV) output and that is certified by a notified body and/or CE marked.

Requirements for FireLine Light Sources Configured End-to-End

Power requirements are based on individual light sources when configured end-to-end. For example, two FireLine 225 units can be used to create a 450x40 emitting window.

Each light source will have a dedicated DC power input based on the requirements defined in 35704 Product Specifications.

Phoseon can tailor a solution for particular integration needs.

Mechanical Installation

Refer to the Control Drawing for the specific FireLine FL440 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

Refer to the Product Specifications document for the following information:

- DC power/Data connector (manufacturer and model)
- MDC power/Data connector Pinout

CAUTION: **The light source may be damaged if these specifications are not followed.**

FireLine™ FL440

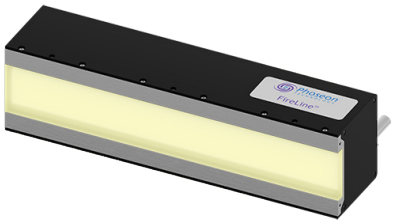
Product Specifications

Phoseon UV LED SLM™ Technology

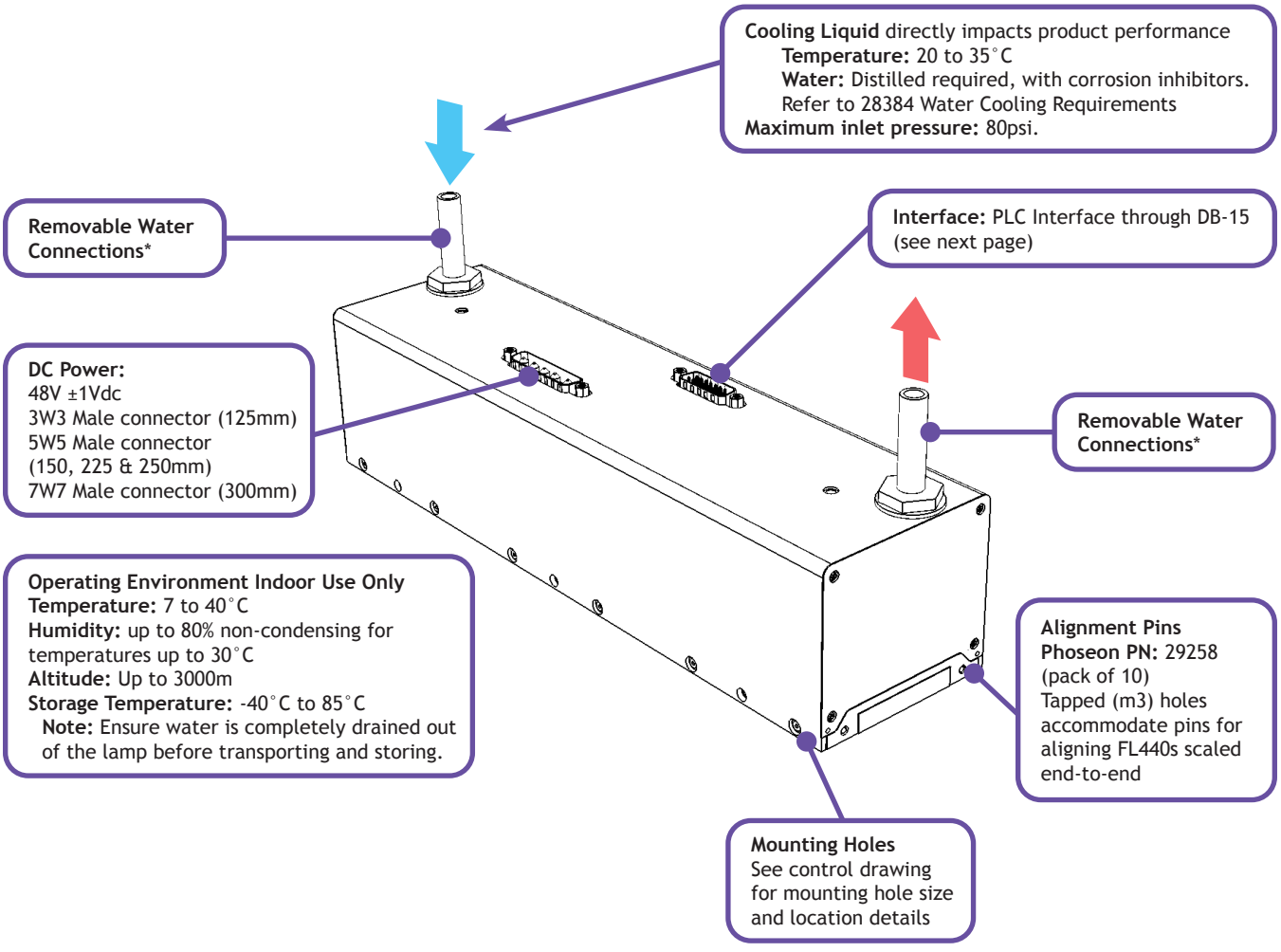
Phoseon Technology is the world leader in providing UV LED solutions for commercial and industrial applications. Phoseon's products deliver superior performance and real-world reliability for UV curing of adhesives, coatings and inks.

Phoseon's patented Semiconductor Light Matrix (SLM)™ technology encapsulates LEDs, arrays, optics and cooling to maximize UV LED curing performance. The FireLine™ FL440 light source is for use in high-performance curing.

Water Cooled



Light Source Setup



***Stainless Steel Water Connection Options:**
3/8" OD straight tube (PN 32941)
3/8" OD barbed (PN 32942)
3/8" NPT (PN 32943)
Adapter for 3/8" female NPT scaled water kit (PN 32945)

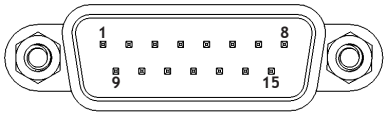
Performance

	385, 395, 405nm				
Peak Irradiance	16W/cm^2				
Emitting Window (mm)	125x40	150x40	225x40	250x40	300x40
48V Power In (Max)	1600W 33A	1920W 40A	2880W 60A	3200W 67A	3840W 80A
Chiller/Cooler Capacity	1312W	1575W	2362W	2625W	3150W
Chiller/Cooler Flow Rate	4LPM	6LPM	6LPM	8LPM	8LPM
Pressure Drop (Typical)	0.04 Bar 0.5 psi	0.09 Bar 1.2 psi	0.11 Bar 1.5 psi	0.18 Bar 2.5 psi	0.19 Bar 2.75 psi
Connector	3W3	5W5	5W5	5W5	7W7

	365nm				
Peak Irradiance	12/cm^2				
Emitting Window (mm)	125x40	150x40	225x40	250x40	300x40
48V Power In (Max)	1392W 35A	1670W 42A	2504W 63A	2743W 69A	3340W 84A
Chiller/Cooler Capacity	1312W	1575W	2362W	2625W	3150W
Chiller/Cooler Flow Rate	4LPM	6LPM	6LPM	8LPM	8LPM
Pressure Drop (Typical)	0.04 Bar 0.5 psi	0.09 Bar 1.2 psi	0.11 Bar 1.5 psi	0.18 Bar 2.5 psi	0.19 Bar 2.75 psi
Connector	3W3	5W5	5W5	5W5	7W7

PLC Interface

The male DB-15 connector is used to control the light source via PLC.



1* **Do Not Use**

2 **Intensity Control:** (Voltage Input: 0.1V-10V)
0.1V = 1% of full power
10V = 100% of full power
Internal resistive load on this Pin is 200kΩ

3 **Enable High:** (24V PLC Input)
0 to 6V (ground/open input) = OFF *or*
16 to 24V = ON
Internal resistive load on this Pin is 125kΩ

4* **Do Not Use**

5 **Thermal Fault Feedback:** (24V PLC Output)
0 to 6V (ground) = Fault *or*
16 to 24V (open) = No Fault
Connected to high impedance input
External resistive load on this Pin must be >3kΩ

6* **Do Not Use**

7 **UV Overide**
Pulled low to ground (0V) = UV Emission Stopped
Floating = UV Emission Allowed
(Internally pulled high to +24V)
DO NOT APPLY VOLTAGE TO THIS PIN
Sink Current Maximum = 2.4mA

8 **Ground**

9 **Ground**

10 **Ground**

11 **Fault:** (24V PLC Output)
0 to 6 (ground) = Fault or
16 to 24V (open) = No Fault
Internal resistive load on this Pin is >3kΩ
Sink Current Maximum = 6mA

Should be connected to high impedance input

12 **RS485 Communication:** Serial -

13 **RS485 Communication:** Serial +

14 **Ground**

15 **Temperature Monitor:** (Voltage Output)
Voltage proportional to SLM heat sink temperature 0.1V = 1°C
This value should not exceed approximately 6V

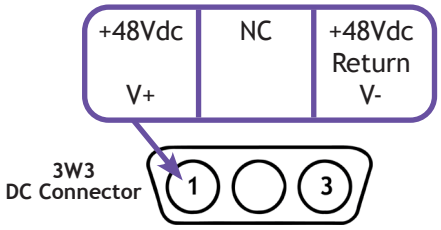
Pins may be tied together to control multiple light sources from a single DB-15 interface with the following exceptions:
* Leave these Pins open (unconnected).

DC Power Connectors

The male Dsub connector is used to provide power to the light source.

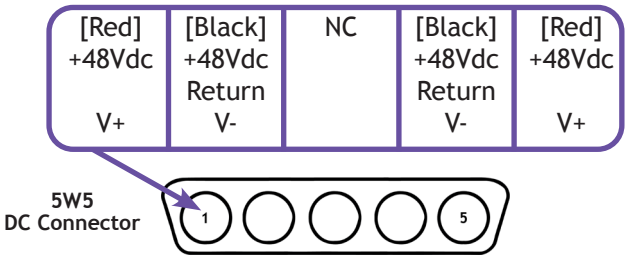
3W3 Connector

Mating DC Connector Options
3W3 Female Dsub connector
Connector Housing: FCI PN DA3W3SA00LF
Female Contacts:
FCI PN 8638PSS4005LF (40A Max Solder Contacts) or FCI PN 8638PSC4005LF (40A Max Crimp Contacts)
Phoseon Custom Backshell Kit PN: 33027
Female 40A 3W3 with Solder Contacts:
Norcomp PN 680S3W3203L401
Custom Backshell Components plus hardware
Phoseon 2m Cable PN: 32932



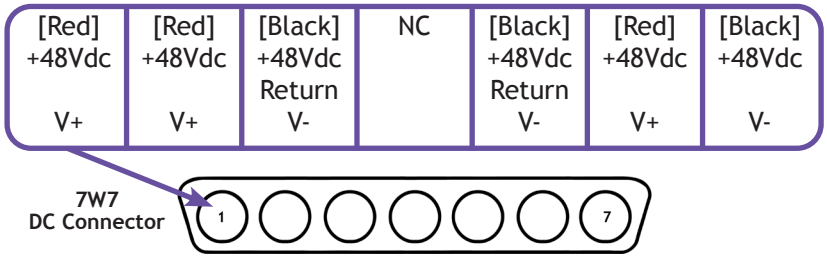
5W5 Connector

Mating DC Connector Options
5W5 Female Dsub connector
Connector Housing: FCI PN DB5W5SA00LF
Female Contacts:
FCI PN 8638PSS4005LF (40A Max Solder Contacts) or FCI PN 8638PSC4005LF (40A Max Crimp Contacts)
Phoseon Custom Backshell Kit PN: 32968
Female 40A 5W5 with Solder Contacts:
Norcomp PN 680S5W5203L401
Custom Backshell Components plus hardware
Phoseon 2m Cable PN: 33167



7W7 Connector

Mating DC Connector Options
7W7 Female Dsub connector
Connector Housing: Harting PN09694000077
Female Contacts:
FCI PN 8638PSS4005LF (40A Max Solder Contacts) or FCI PN 8638PSC4005LF (40A Max Crimp Contacts)
Phoseon Custom Backshell Kit PN: 37175
7W7 Connector Housing:
Harting PN 09694000077
Female 40A Solder Contacts:
Harting PN 09691815423
Custom Backshell Components plus hardware
Phoseon 2m Cable PN: 37168

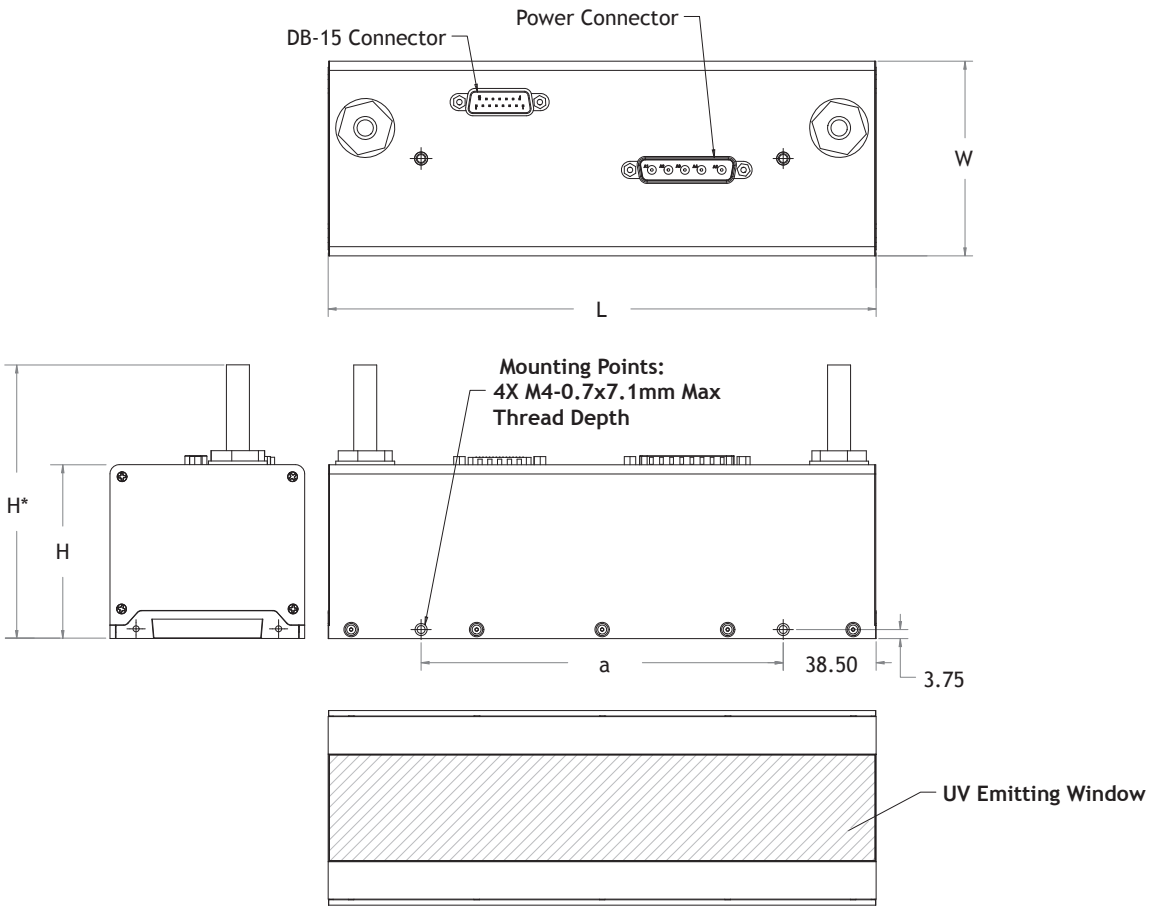


Dimensions

Units of measurement: mm

FireLine FL440					
UV Emitting Window (mm)	125X40	150X40	225x40	250x40	300X40
L	127	152	227	252	302
W	80.6	80.6	80.6	80.6	80.6
H	72	72	72	72	72
H*	113.3	113.3	113.3	113.3	113.3
a	50	75	150	175	200
Weight (kg)	1.4	1.6	2.4	2.6	3.0

*Height with 3/8" straight water fittings, which may vary with other options.



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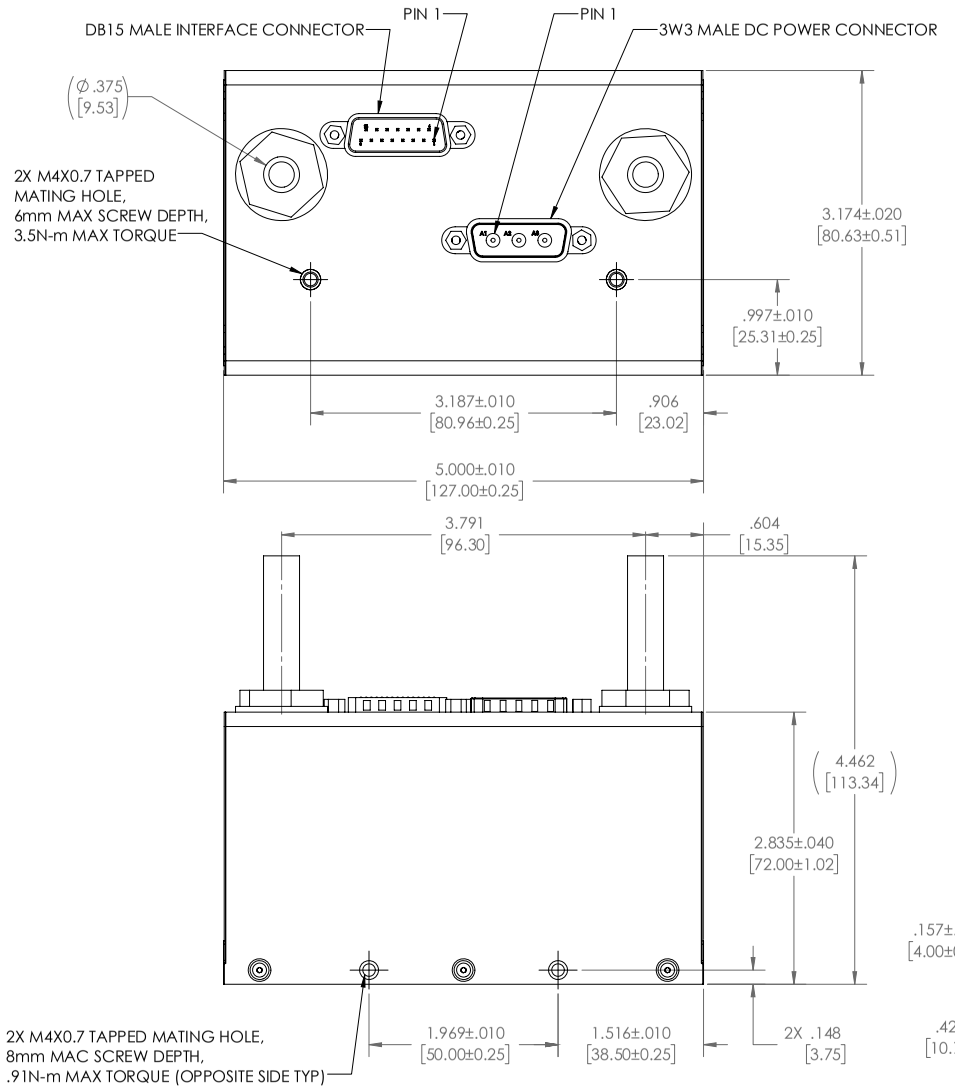

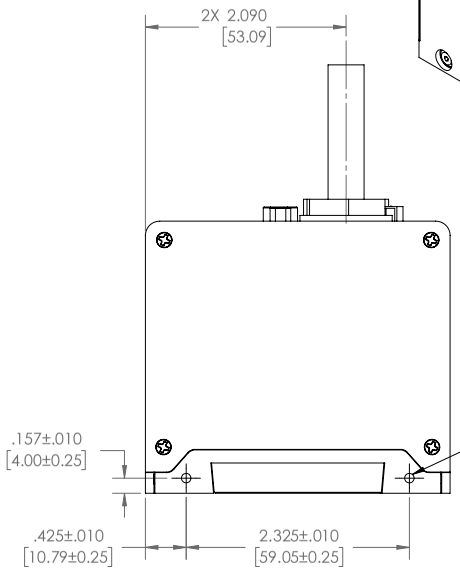

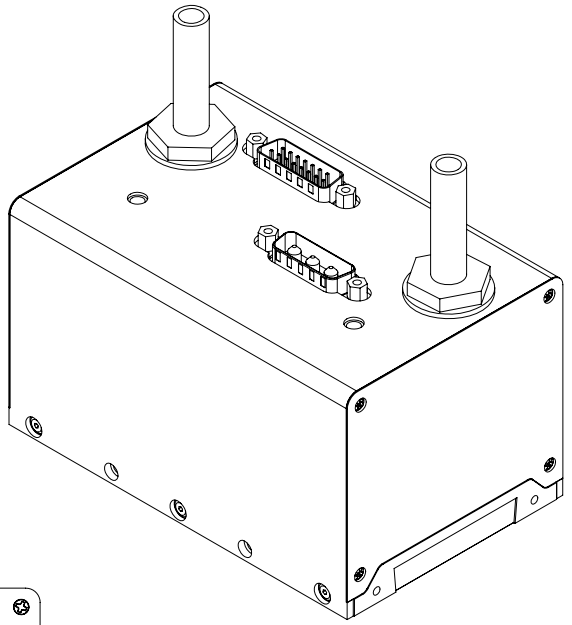

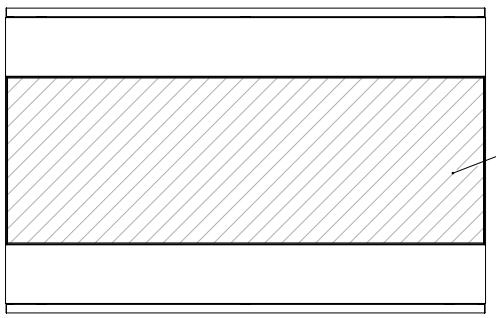

NOTES:

1. REFERENCE DOCUMENTS:
   28384 WATER COOLING REQUIREMENTS
   35704 FIRELINE FL440 SPEC SHEET

2. WINDOW FRAME WILL ALWAYS BE PROUD OF END CAPS AND ENCLOSURE

3RD ANGLE VIEW | MATERIAL: N/A | FINISH: N/A | TITLE: CONTROL DRAWING, FL440 125

DIM UNITS: IN [mm]
TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X: ±0.020 [0.5]
X.XX: ±0.010 [0.25]
X.XXX: ±0.005 [0.13]
ANGLE: ±1°

Phoseon TECHNOLOGY

PART NUMBER: 36777 | REV. 1
ISSUED BY: ALEX FARIAS | ISSUE DATE: 9/13/2018
3D DATABASE: 36777 - Control Drawing, FL440 125.STEP
ASME/ANSI Y14.X | EGF-44275-01 | SCALE: 1:2 | SIZE: C | SHEET 1 OF 1

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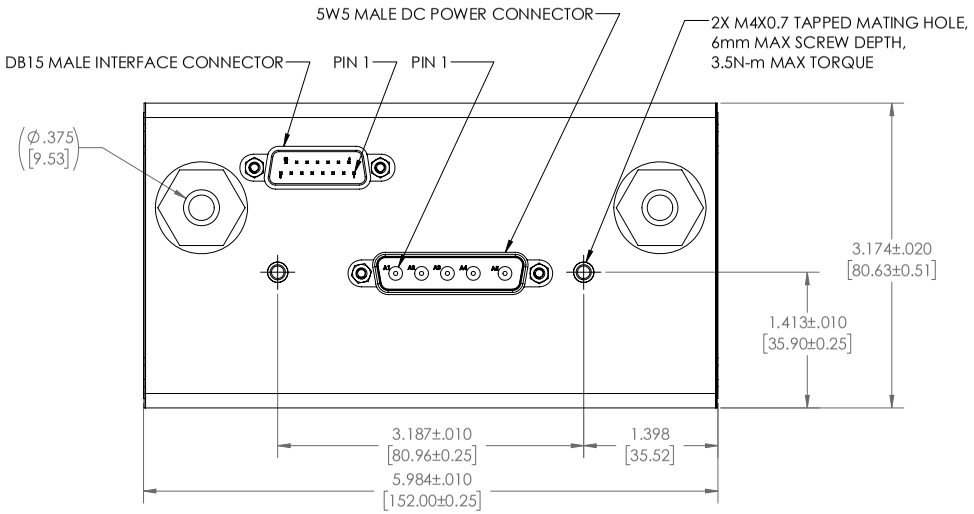

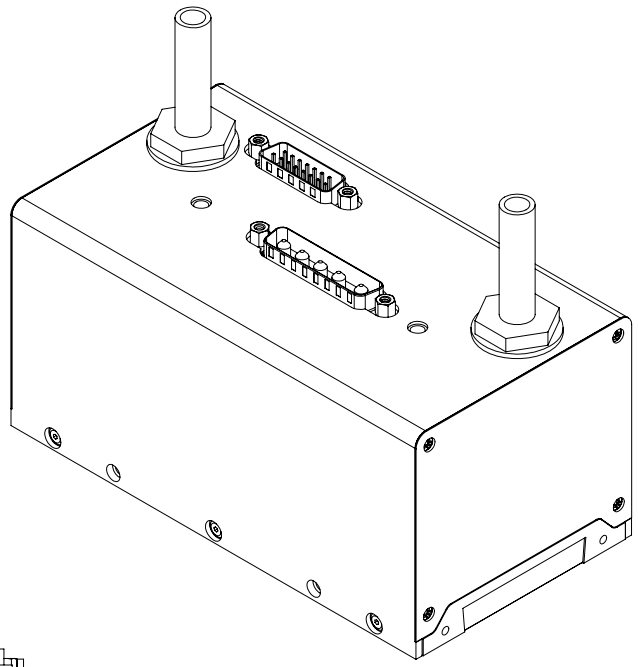

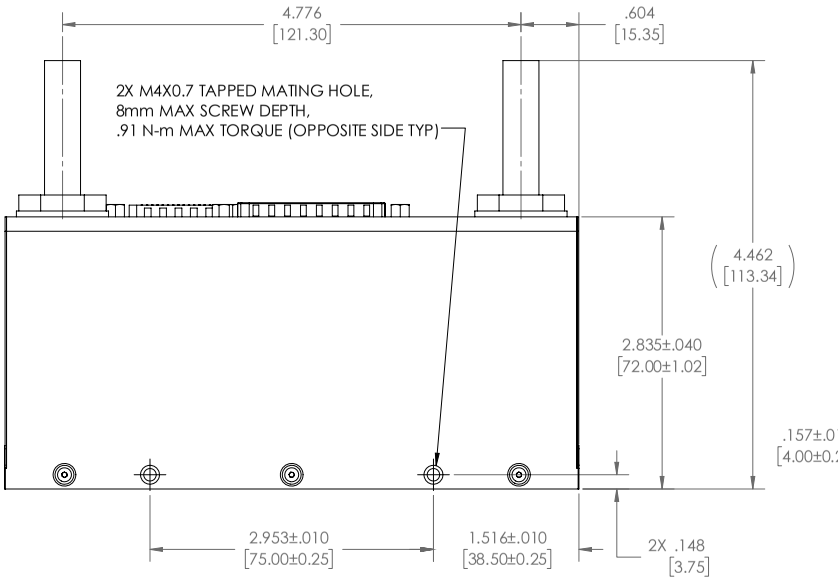

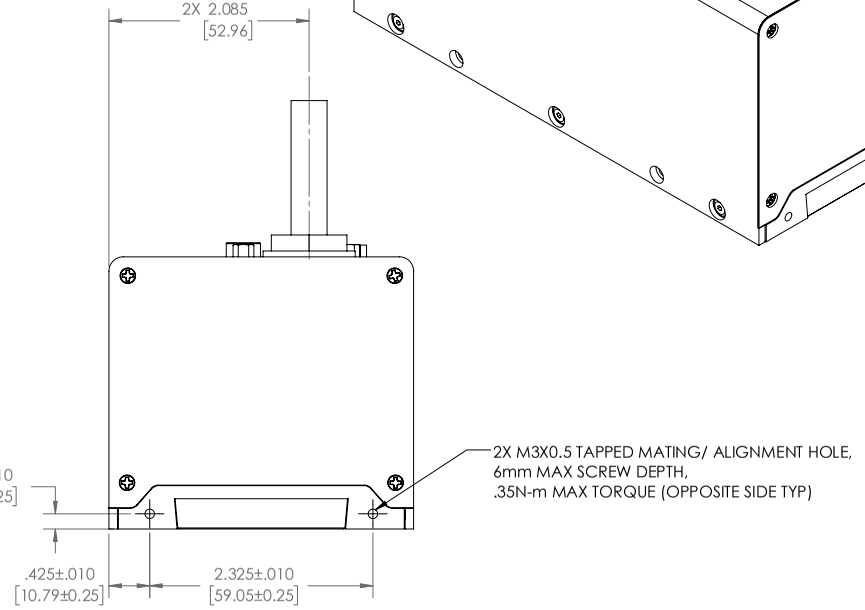

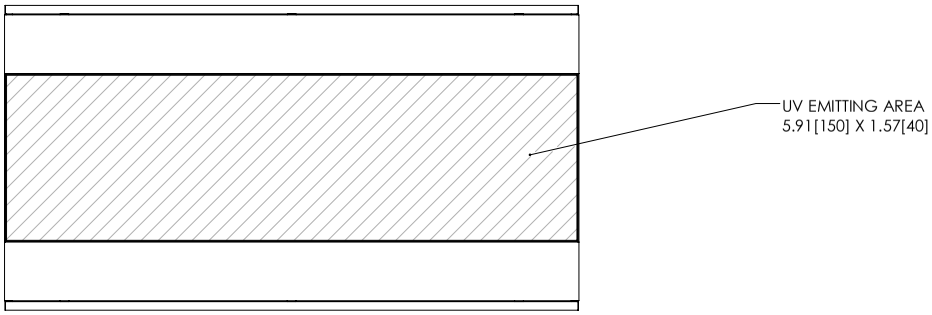

NOTES:

1. REFERENCE DOCUMENTS:
   28384 WATER COOLING REQUIREMENTS
   35704 FIRELINE FL440 SPEC SHEET

2. WINDOW FRAME WILL ALWAYS BE PROUD OF END CAPS AND ENCLOSURE

3RD ANGLE VIEW | MATERIAL: N/A | FINISH: N/A | TITLE: CONTROL DRAWING, FL440 150

DIM UNITS: IN [mm]
TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X: ±0.020 [0.5]
X.XX: ±0.010 [0.25]
X.XXX: ±0.005 [0.13]
ANGLE: ±1°

Phoseon TECHNOLOGY

PART NUMBER: 36778 | REV. 1
ISSUED BY: ALEX FARIAS | ISSUE DATE: 9/13/2018
3D DATABASE: 36778 - Control Drawing, FL440 150.STEP
ASME/ANSI Y14.X | EGF-44275-01 | SCALE: 1:2 | SIZE: C | SHEET 1 OF 1

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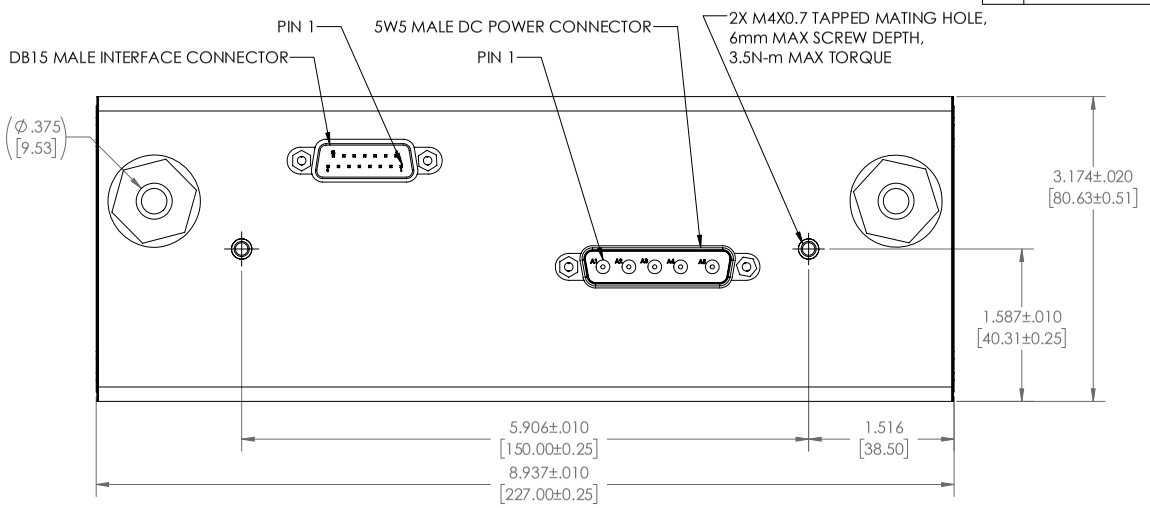
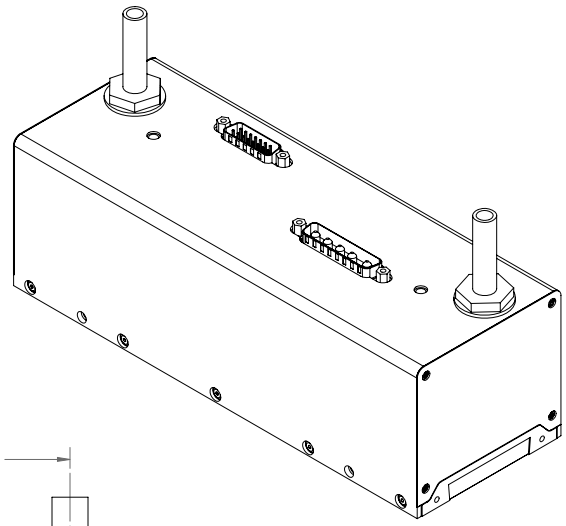
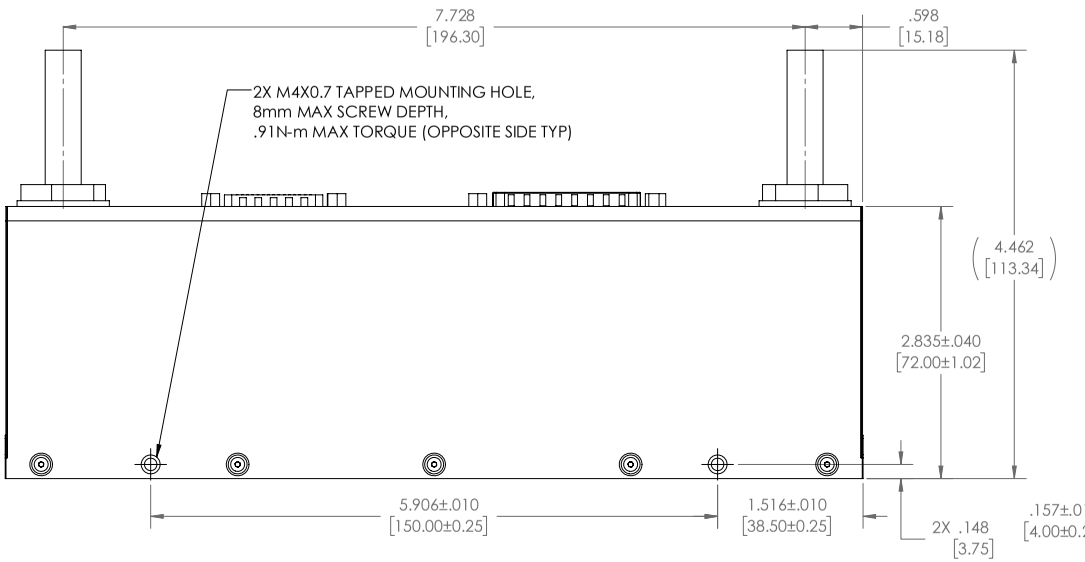
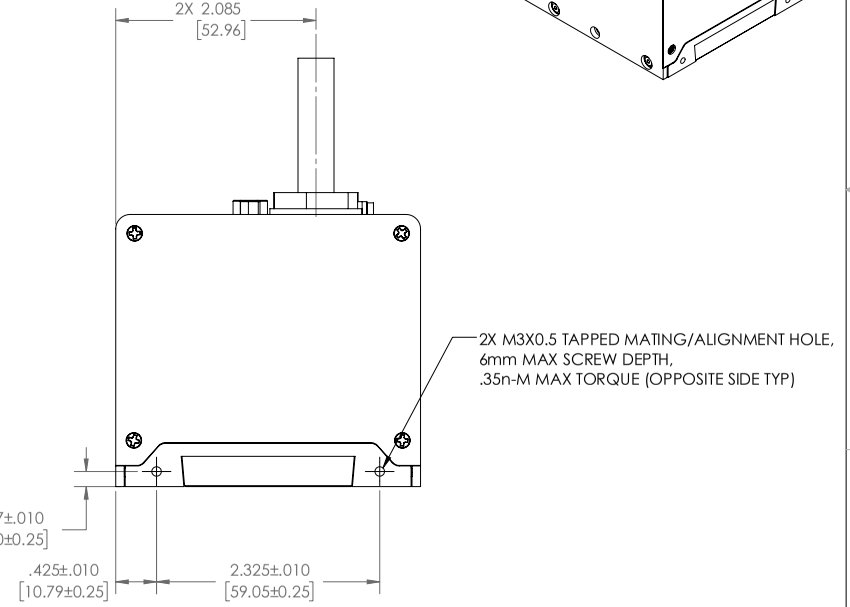
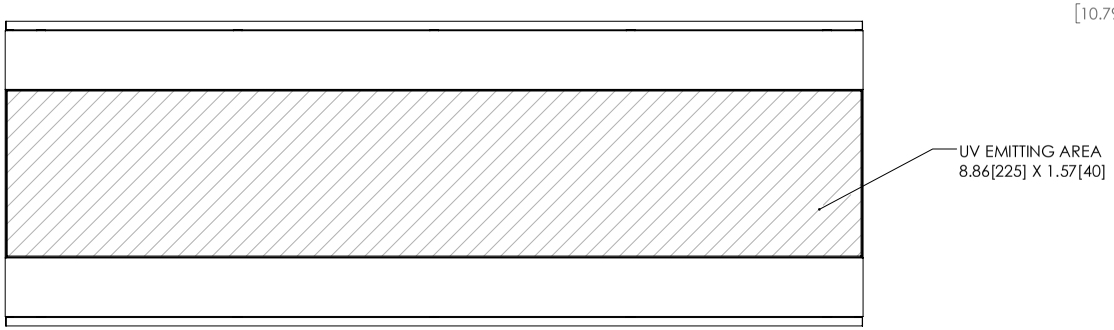










NOTES:

1. REFERENCE DOCUMENTS:
   28384 WATER COOLING REQUIREMENTS
   35704 FIRELINE FL440 SPEC SHEET

2. WINDOW FRAME WILL ALWAYS BE PROUD OF END CAPS AND ENCLOSURE

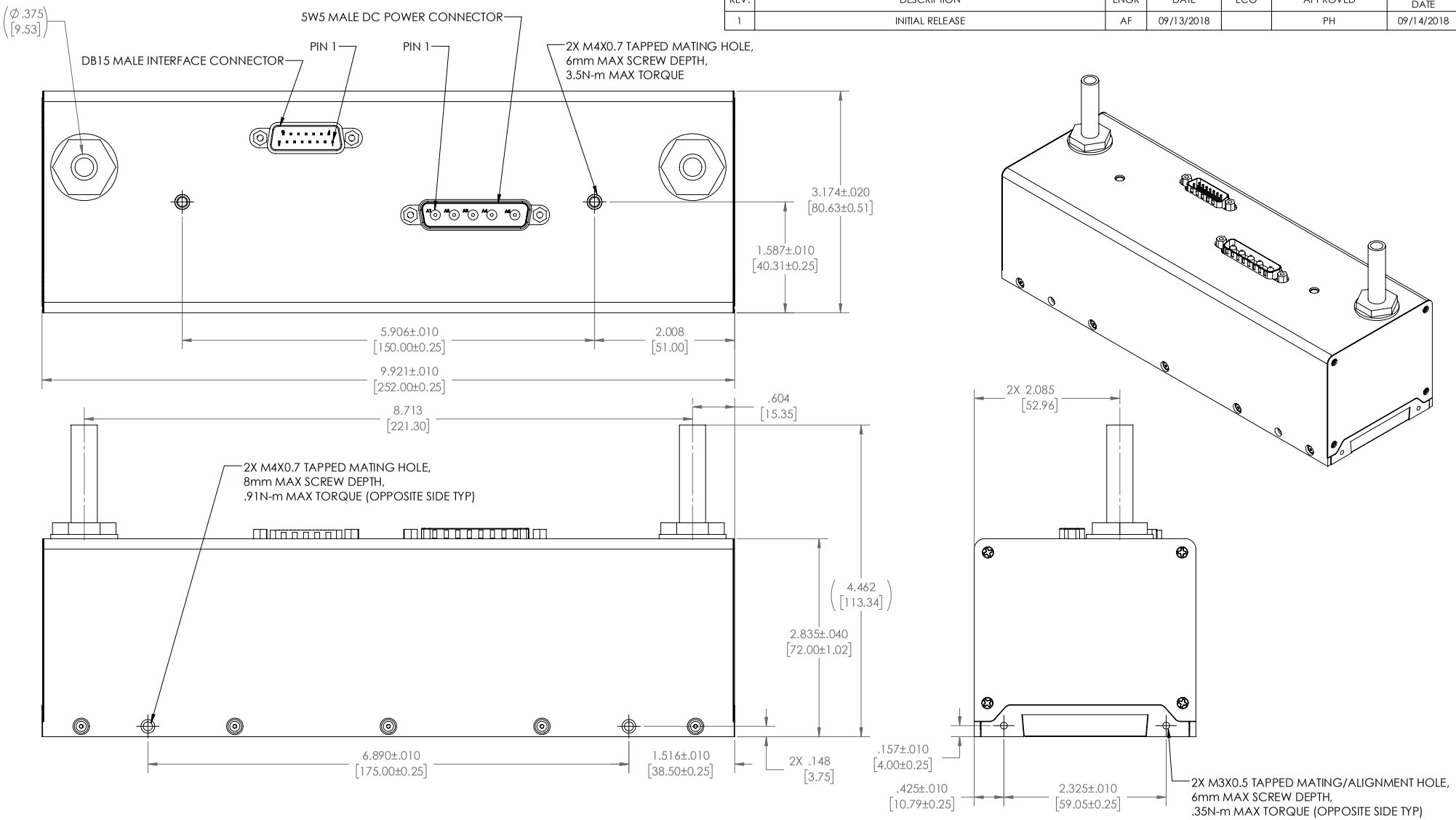
3RD ANGLE VIEW | MATERIAL: N/A | FINISH: N/A | TITLE: CONTROL DRAWING, FL440 225

DIM UNITS: IN [mm]
TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X: ±0.020 [0.5]
X.XX: ±0.010 [0.25]
X.XXX: ±0.005 [0.13]
ANGLE: ±1°

Phoseon TECHNOLOGY

PART NUMBER: 36779 | REV. 1
ISSUED BY: ALEX FARIAS | ISSUE DATE: 9/13/2018
3D DATABASE: 36779 - Control Drawing, FL440 225.STEP
ASME/ANSI Y14.X | EGF-44275-01 | SCALE: 1:2 | SIZE: C | SHEET 1 OF 1

REVISIONS						
REV.	DESCRIPTION	ENGR	DATE	ECO	APPROVED	APPROVED DATE
1	INITIAL RELEASE	AF	09/13/2018		PH	09/14/2018



NOTES:

1. REFERENCE DOCUMENTS:
   28384 WATER COOLING REQUIREMENTS
   35704 FIRELINE FL440 SPEC SHEET

2. WINDOW FRAME WILL ALWAYS BE PROUD OF END CAPS AND ENCLOSURE

3RD ANGLE VIEW | MATERIAL: N/A | FINISH: N/A | TITLE: CONTROL DRAWING, FL440 250

DIM UNITS: IN [mm]
TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X: ±0.020 [0.5]
X.XX: ±0.010 [0.25]
X.XXX: ±0.005 [0.13]
ANGLE: ±1°

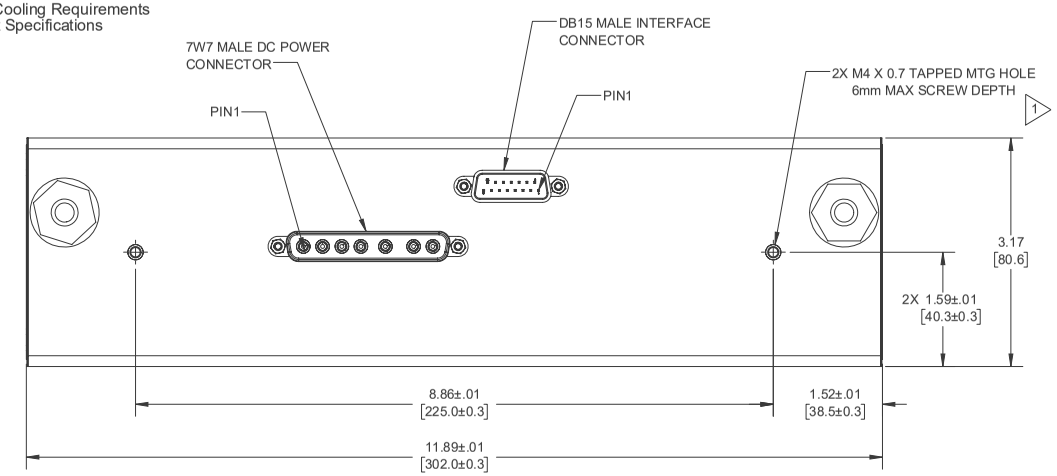
Phoseon TECHNOLOGY

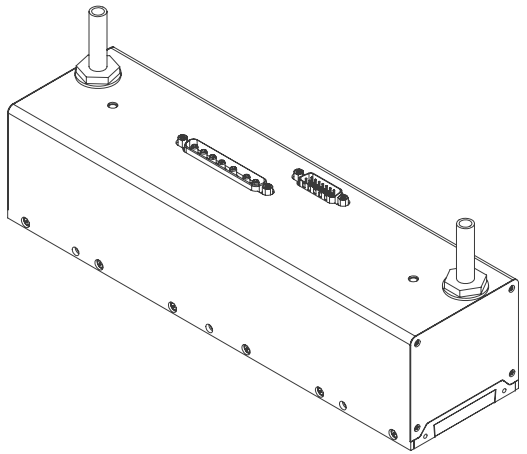
PART NUMBER: 36780 | REV. 1
ISSUED BY: ALEX FARIAS | ISSUE DATE: 9/13/2018
3D DATABASE: 36780 - Control Drawing, FL440 250.STEP
ASME/ANSI Y14.X | EGF-44275-01 | SCALE: 1:2 | SIZE: C | SHEET 1 OF 1

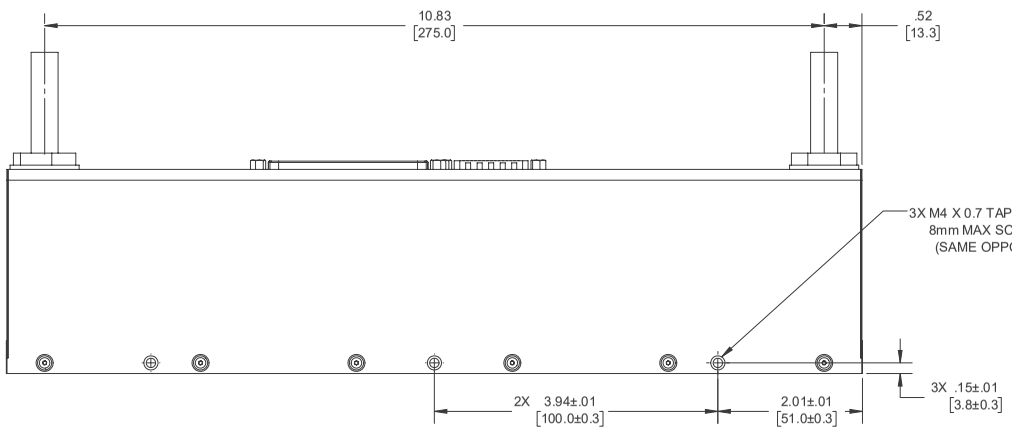
NOTES: UNLESS OTHERWISE SPECIFIED.

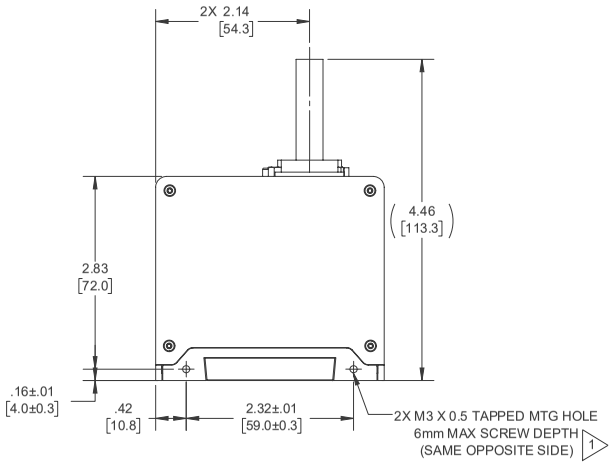
1. Maximum screw tightening torque: 8 in-lbs [0.9 N·m]
2. Reference Documents:
   2.1. 28384 Water Cooling Requirements
   2.2. 35704 Product Specifications

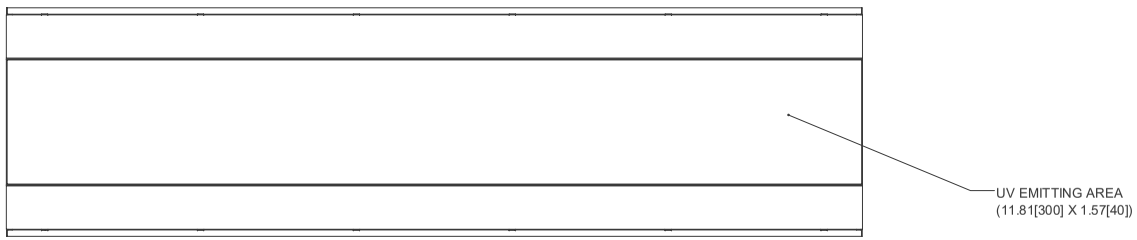
REVISIONS						
REV	DESCRIPTION	ENGR	DATE	ECN	APVD	APVD DATE
1	INITIAL RELEASE	CL	11/08/2022	-----	PH	11/11/2022
2	UPDATE 7W7 POSITION	CL	05/25/2023	-----	PH	05/25/2023









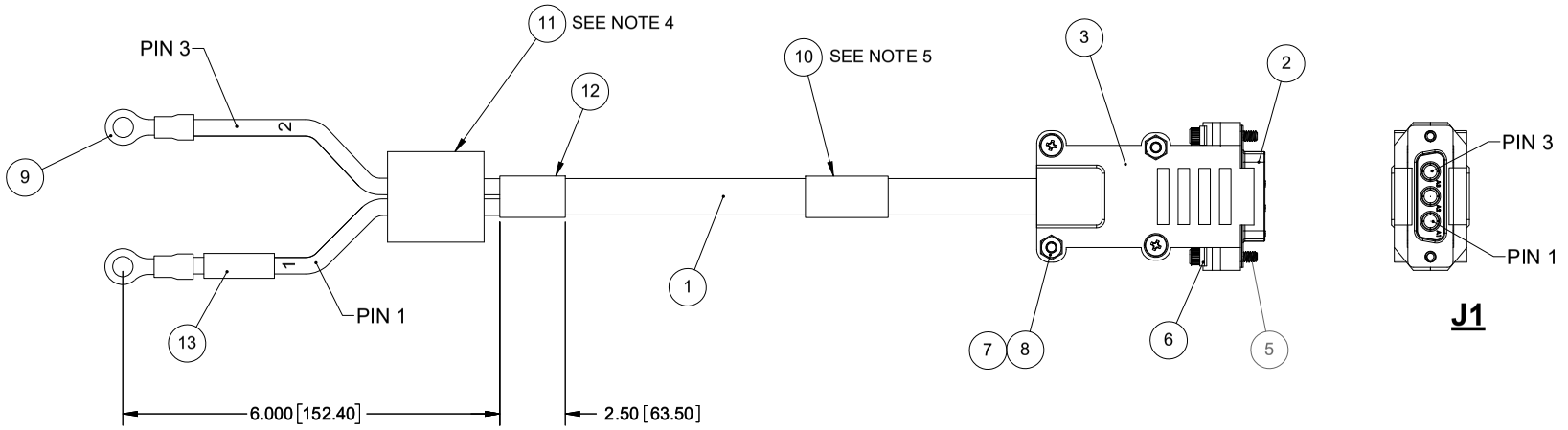


THIRD ANGLE PROJECTION:	MATERIAL: NONE	FINISH: NONE	TITLE: CONTROL DRAWING, FL440 300
DIM UNITS: IN [mm] TOLERANCES UNLESS OTHERWISE SPECIFIED X.X: ± .04 [1] X.XX: ± .02 [0.5] ANGLE: ± 1°	PROPRIETARY AND CONFIDENTIAL THE INFORMATION CONTAINED IN THIS DRAWING IS THE SOLE PROPERTY OF PHOSEON TECHNOLOGY. ANY REPRODUCTION IN PART OR AS A WHOLE WITHOUT THE WRITTEN PERMISSION OF PHOSEON TECHNOLOGY IS PROHIBITED.	Phoseon TECHNOLOGY	PART NUMBER: 35925 REV. 2 ISSUED BY: C. LUTH ISSUE DATE: 5/25/2023 CAD FILE: 35925 - Control Drawing, FL440 300.STEP ASME/ANSI Y14.X EGF-44275-01 SCALE 3:4 SIZE C SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED.

1. CABLE ASSEMBLY SHALL BE ASSEMBLED PER COMPONENT MANUFACTURER'S RECOMMENDED PROCEDURES. ALL CRIMPED WIRE TERMINATIONS SHALL PASS MANUFACTURER'S CRIMP HEIGHT AND PULL TEST REQUIREMENTS.
2. TOLERANCE:
   DIMENSIONS LESS THAN 3.00 [76.2mm] SHALL BE: .XX = +/- .10 [2.5mm]
   DIMENSIONS BETWEEN 3.00 [76.2mm] AND 12.00 [304.8mm] SHALL BE: .XX = +/- .25 [6.4mm].
   DIMENSIONS BETWEEN 12.01 [304.8mm] AND 36.00 [914.4mm] SHALL BE: .XX = +/- .50 [12.8mm] .
   ALL DIMENSIONS GREATER THAN 36.00 [914.4mm] SHALL BE +/- 1% OF SPECIFICED LENGTH.
3. TEST CABLE ASSEMBLY CONTINUITY FROM PIN TO PIN.
4. THE CLAMP-ON-FERRITE MUST FIT FIRMLY AROUND THE CABLE ASSEMBLY. A TIE WRAP OR HEAT SHRINK TUBING OR A NYLON SPACER CAN BE USED UNDER THE CLAMP-ON-FERRITE.
5. PART MARKING: LABEL WITH PHOSEON PART NUMBER AND REVISION WHERE SHOWN.

REVISIONS				
REV.	DESCRIPTION	DATE	ENG	ECN/APP'D
1	INITIAL RELEASE	12/2/16	GT	2177/ PH
2	DESIGN CHANGE: BOM ITEM 11 NOW 28A5776-0A2, ITEM 3 BACKSHELL UPDATES AND ITEM 7 NOW FHP.	12/5/17	GT	2570/ PH
3	UPDATE CAPTIVE SCREW	6/27/19	DVF	3212/JB



Item	Qty	UseAs	Title	Manufacturer	Mfr PN	Phoseon PN	
1	2	meter	Cable, 2-conductor, 8AWG, Shielded	Helukabel	16432	34180	
2	1	each	Conn,3W3,Fem,IP67	NORCOMP	680S3W3203L401	34161	
3	2	each	Custom Connector Back Shell	Any per spec		34085	
5	2	each	4-40 x 5/8 Captive Screw	RAF	0823-SS	35755	3
6	2	each	Saddle Washer	Tyco	5206473-3	34160	
7	4	each	Screw, Flat Head Phillips, M3-0.5 x 16, 18-8	McMaster Carr	92010A126	35663	
8	4	each	Nut, M3, 5.5W x 2.4 Tall, 18-8	McMaster Carr	91828A211	33190	
9	2	each	Ring Terminal, 8 awg, 5/16" stud, Insulated	Molex	19067-0025	26901	
10	1	each	Label, self laminating, 1 x 3/4	Hellermann Tyton	TAG9L-105	10568	
11	1	each	Ferrite Tube Box Clampon .75" BLK	Steward	28A5776-0A2	35662	
12	1	inch	Tubing, heatshrink, 3/4", black, adhevsive	3M	EPS-300 3/4"	15821	
13	1	inch	Tubing, heatshrink, 3/16", red	3M	FP-301 3/16" RD 250'	20056	

3RD ANGLE VIEW

MATERIAL: N/A

FINISH: N/A

TITLE: CABLE,DC,3W3,2M

DIM UNITS: IN [mm]
TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X: ±0.020 [0.5]
X.XX: ±0.010 [0.25]
X.XXX: ±0.005 [0.13]
ANGLE: ±1°

Phoseon TECHNOLOGY

PART NUMBER: 32932 REV. 3

ISSUED BY: G.TILL ISSUE DATE: 12/2/16

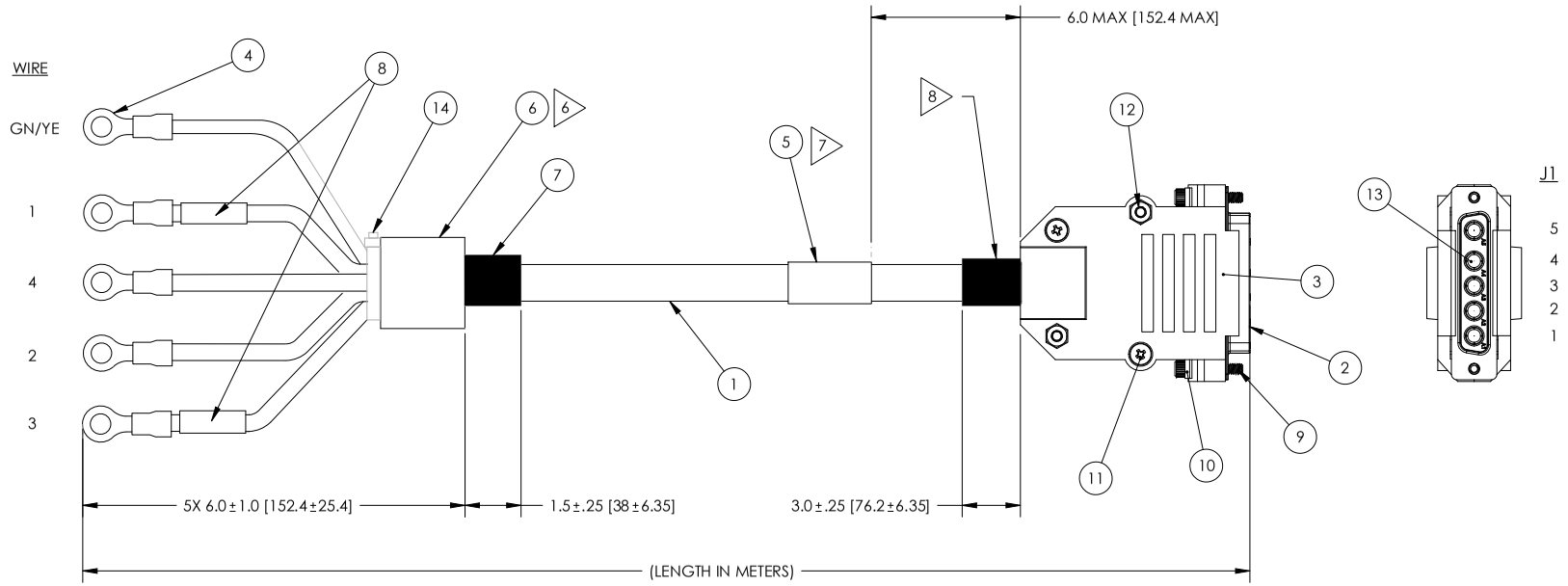
3D DATABASE:

ASME/ANSI Y14.X | EGF-44273-01 | SCALE: 1:1 | SIZE C | SHEET 1 OF 1

NOTES: UNLESS OTHERWISE SPECIFIED.

1. DRAWING NOT TO SCALE.
2. ASSEMBLE EACH COMPONENT PER COMPONENT MFR'S PROCEDURES.
3. ASSEMBLE PER IPC/WHMA-A-620C STANDARD.
4. TEST CONTINUITY OF EACH NET PIN TO PIN AND BETWEEN GROUND POINTS (SEE NETLIST TABLE).
5. USE PREFERRED COMPONENT MFR LISTED IN BOM OR PHOSEON ENGINEER APPROVED EQUIVALENT.
6. CLAMP-ON FERRITE (ITEM 6) MUST FIT FIRMLY AROUND THE CABLE ASSEMBLY.
7. LABEL WITH PHOSEON PART NUMBER, CURRENT REV AND ASSIGNED VENDOR CODE APPROX. WHERE SHOWN.
8. STRIP CABLE JACKET 2.25[57] ON CONNECTOR END. PLACE 4.0 [102] HEATSHRINK (ITEM 7) OVER JACKET AND WIRES.
9. RAW CABLE LENGTH TOLERANCE:
   LENGTH ≤ 295[7500] = +2%/-0
   LENGTH > 295[7500] = +5%/-0

REVISIONS						
REV.	DESCRIPTION	DATE	ENG	ECN	APPROVED	APPROVED DATE
8	COMBINED TABLE DRAWING PN 32649	12/30/19	DVF	3460	DW	12/30/19
9	UPDATE TO 5 WIRE CABLE, REMOVE BLK HEATSHRINK, ADD RING TERMINAL, UPDATE NETLIST	7/27/2020	DVF	3682	CS	7/27/2020
10	CHANGE PART NUMBER SCHEME, UPDATE CABLE LENGTH TOLERANCE, ADD NETLIST, UPDATE BOM	03/16/2021	AF	PH3929	PH	04/09/2021



ITEM	PHOSEON PN	MANUFACTURER ⟨5⟩	MFG PN	DESCRIPTION	QTY.
1	(50006)	HELUKABEL	62979	5 COND. TRAY CONTROL, OIL RESISTANT, FLEXIBLE TRAY CABLE 600V	A/R
2	(39002)	AMPHENOL	L77TWB5W5S	CONN D-SUB HOUSING RCPT 5POS	1
3	34084	ANY PER SPEC	-	BACKSHELL, 5W5, CUSTOM, SLS	2
4	(26901)	MOLEX	19067-0025	CONN RING CIRC 8AWG #5/16 CRIMP	5
5	(36263)	BRADY	PTL-33-427	LABEL 4"HX1.5" W WH/CLR	1
6	(34230)	LAIRD-SIGNAL INTEGRITY PRODUCTS	28A5776-0A2	FERRITE CORE 210 OHM HINGED	1
7	(36319)	ALPHA WIRE	F2213/4 BK105	HEAT SHRINK 3/4" BLACK	8IN
8	-	ALPHA WIRE	F221V1/2 RD105	HEATSHRINK 1/2" X 4' RED	2IN
9	(35755)	RAF	0823-SS	PANEL SCREW PAN SLOTTED #4-40	2
10	(34160)	TYCO	5206473-3	CONN SADDLE WASHER #4-40 AMPLMT	2
11	(33189)	MCMASTER CARR	92000A126	18-8 SS PAN HEAD SCREW, M3 x 16	4
12	(33190)	MCMASTER CARR	91828A211	18-8 SS HEX NUT, M3 X 0.5MM THREAD	4
13	(39119)	CONEC	132C11049X	CONN D-SUB SOCKET 8-10AWG CRIMP	5
14	(25022)	MCMASTER CARR	7130K52	CABLE TIE, 4" LONG, 7/8" BUNDLE DIAMETER	1

⟨10⟩

PART NUMBER FORMAT
33167 - _ _M
LENGTH, IN METERS

NETLIST	
J1	WIRE
1	3
2	2
3	GN-YE
4	4
5	1

3RD ANGLE VIEW

MATERIAL: N/A

FINISH: N/A

TITLE: CABLE,DC POWER,5W5

DIM UNITS: IN [mm]
TOLERANCES UNLESS OTHERWISE SPECIFIED
X.X: ±0.020 [0.5]
X.XX: ±0.010 [0.25]
X.XXX: ±0.005 [0.13]
ANGLE: ±1°

Phoseon TECHNOLOGY

PART NUMBER: SEE PN FORMAT REV. 10
ISSUED BY: G.TILL ISSUE DATE: 12/2/16
3D DATABASE: N/A
ASME/ANSI Y14.X EGF-44273-01 SCALE: 1:1 SIZE C SHEET 1 OF 1

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.

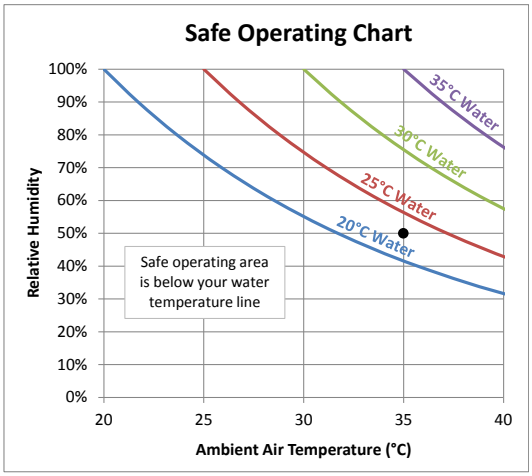
Understanding Condensation

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)

Water Tube Installation & Removal for Barb Fittings

Technical Note

Water-cooled UV LED light sources use water circulated through the light source to cool the LEDs. Improper connection of water tubes to the water pipes can result in water leaking onto the light source and causing damage. This technical note provides instructions on how to install and remove water tubes on to the water pipes as well as recommended specifications of water tubes and clamps.

Figure 1

Material Recommendation

Phoseon recommends that all water tubes inserted over the barbed water pipes be made of polyethylene, nylon, or polyurethane material with a durometer of D50-D70 (durometer is a measure of hardness of a material and can usually be found within the water tube specifications). Ensure the inside diameter of the water tube is equal the outside diameter of the water pipe.

The water tubes must be secured on the barbed water pipes with clamps. The clamp band must be at least 15mm wide but 18mm is recommended — dimension "a" in Figure 1. The use of T-Bolt or Worm Drive clamps is acceptable. See figure 2.

Water Tube Installation

When installing the water tubes onto the barbed water pipes, Phoseon recommends applying silicon spray to the water pipes for easy installation and removal of the water tubes. Install the water tubes so the ends are just past the last barb, as shown in Figure 3. Once the water tubes are in place, move the clamps over the barbs and ensure at least 3 barbs are covered by the clamp band. Tighten the clamps just enough to form a good seal — if the clamps are too tight removal of the water tubes becomes difficult. To test for leaks use clean (oil-less) compressed dry air to pressurize and leak check the system before running water through.


T-bolt Clamp


Worm Drive Clamp

Figure 2

Water Tube Removal

Before attempting to remove the water tubes, ensure the clamps are completely loose. Twist the water tube clockwise and counter-clockwise while pulling up on the water tube. If removal is difficult, use a hot air gun on the water tubes and try again to remove. **Do not use a knife or sharp object to cut the water tube from the water pipes.** The brass water pipes gouge easily and may cause a permanent leak between the water tube and water pipes.

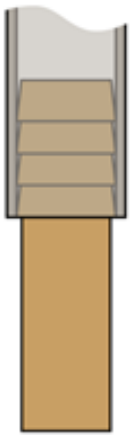


Figure 3

info@phoseon.com
www.phoseon.com
30741 Rev 4
August 2022

Compression Fitting

Installation Instructions

Notes:

- **Swagelok** type fittings are not necessarily recommended for Phoseon light source, but if Swagelok type fittings are required then the following steps must be followed.
- The Phoseon brass water-pipe is ***not*** designed to directly withstand the high-torque required to either tighten or loosen the Swagelok type fitting - ***Do not exceed a torque of 13.6Nm (10 ft·lb), as this will damage the brass water-pipe causing it to leak.***
- ***Two wrenches must be used – one to hold the fitting and one to loosen the fitting nut.***

Installation Tools Needed (from left-to-right):

- **Two** wrenches
- Marker
- **Swage** fitting set
- Gap inspection gauge

Installation Tools

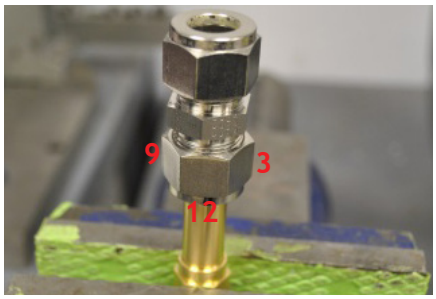
Instructions:

1. Pre-installing

- Disconnect DC Power from the light source.
- Inspect on the water tube to make sure it is free of burrs and scratches.

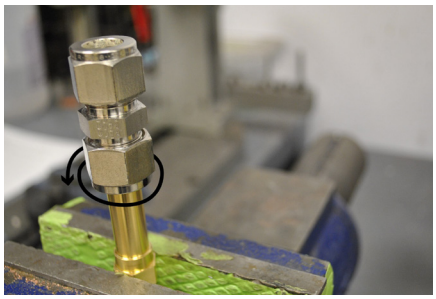
2. Initial installation

- Insert swage fitting, with the ferrule inside, onto the water pipe.
- Ensure the pipe is completely seated up against shoulder of the fitting.
- Rotate the nut finger tight by hand.
- Mark the nut at the 6 o'clock position.
- While holding the body of the fitting steady with one wrench, tighten the nut one and one quarter (1¼) turns clockwise with the second wrench until the marker reaches the 9 o'clock position.



Seat fitting on pipe and mark the 6 O'clock position on nut

Use two wrenches



Tighten the nut 1¼ turns

- On initial installation, use gap inspection gauge to ensure the tube fitting has been sufficiently tightened. Position the gauge between the nut and body. If the gauge will not enter the gap, the fitting is sufficiently tightened. If the gauge will enter the gap, additional tightening is required.

Improperly tightened

Properly tightened

3. Reinstallation

- To reassemble, insert the fitting body straightly onto the tubing with pre-swaged ferrules.
- Rotate the nut with to the previously pulled up position with a
- significant increase in resistance gradually. Finally, **while holding the body of the fitting steady with one wrench**, tighten the nut slightly with the second wrench.

Note: Do not use Swagelok gap inspection gauge with reassembled fittings.

Pre-swaged ferrules with swag fitting set

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.

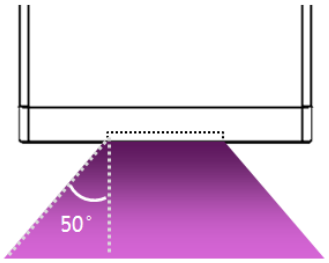
Note:

- 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 20mm wide emitting window is approximately 50° from the edge of the glass.

For products with a 10mm 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.



Half Angle for 20mm products ~50°

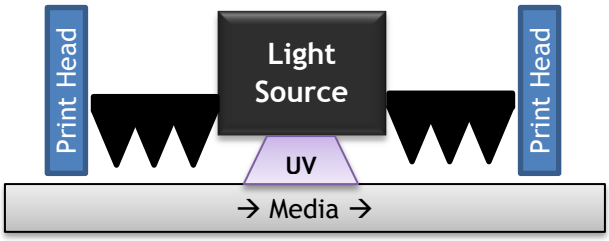
Reducing Light Reflection

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

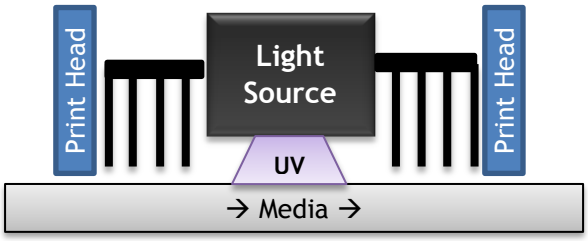
- Use materials around the light source that absorb or do not reflect UV (examples below) and avoid materials that are good UV reflectors such as bare Aluminum
  - Black anodized or black painted materials
  - Optical absorption and anti-reflective coatings
  - Thorlabs blackout materials, e.g. black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



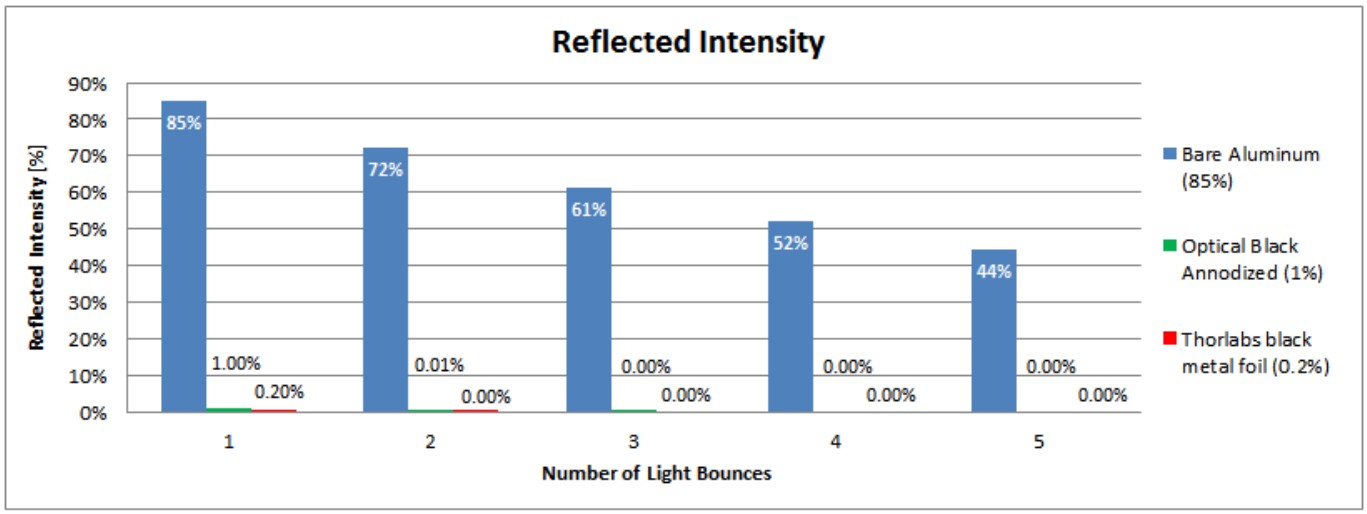
Saw-tooth form light baffle



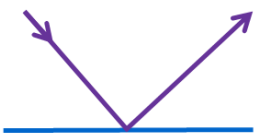
Straight-fin light baffle

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.



Specular Surface

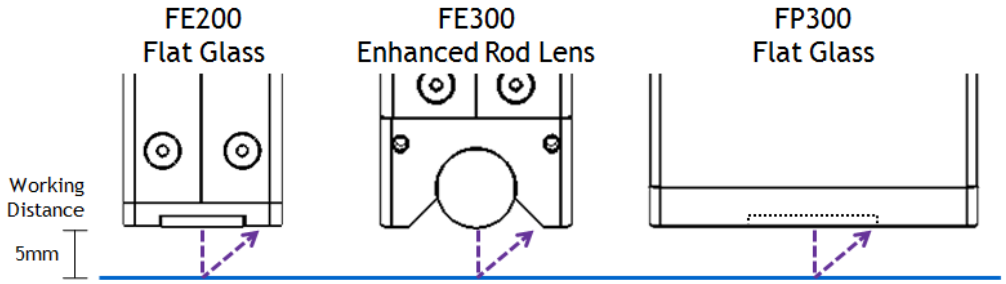
Diffuse Surface

Light Reflection Examples

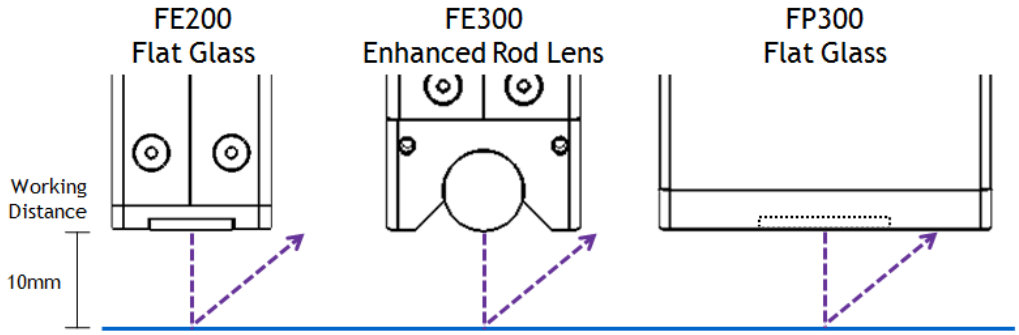
When curing with a reflective surface, like bare or polished aluminum, the size of the window frame and the working distance from the emitting window to the media, will affect how much light is allowed to reflect past the light source. Adding a light catch or shield that extends past the light source 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 5mm Working Distance

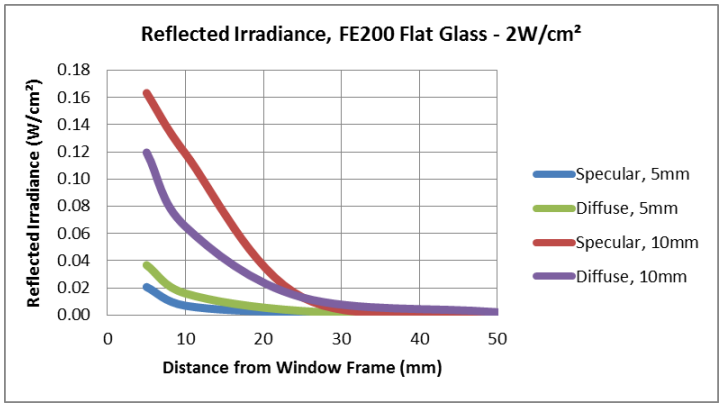


Phoseon Product Examples at 10mm Working Distance

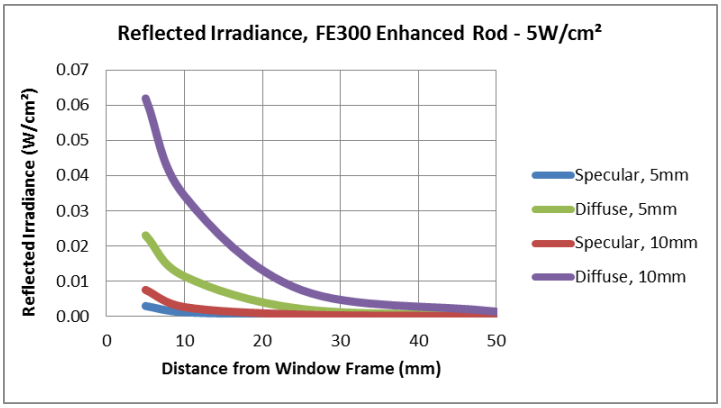
The charts below illustrate the irradiance values of reflected light with 3 different light sources; the FE200-2W/cm² with Flat Glass, the FE300-5W/cm² with Enhanced Rod Lens, and an FP300-20W/cm².

- 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

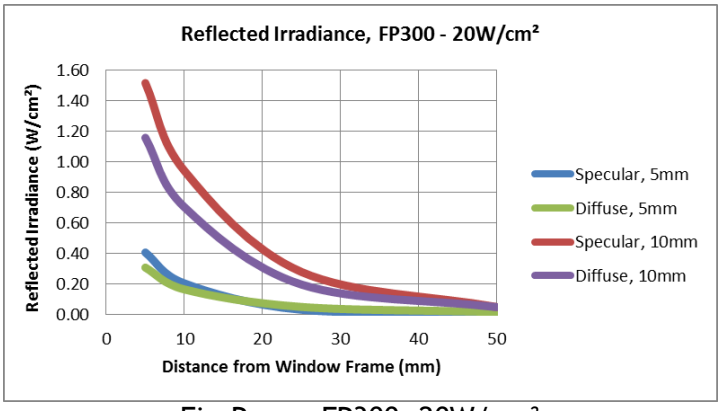
- Each media type is shown at two different working distances: 5mm and 10mm from the emitting window to the media
- The point of measurement for the reflected light is on the same plane as the emitting window at varying distances away from the edge of the light source (window frame, not the glass)



FireEdge FE200 Flat Glass, 2W/cm²



FireEdge FE300 Enhanced Rod, 5W/cm²



FirePower FP300, 20W/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 (2W/cm² versus 20W/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 20mm 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

PLC & RS485 Control

The light source can be controlled via a PLC (Programmable Logic Controller) using the DB-15 connection (see 35704 Product Specifications).

The light source can also be controlled via the RS485 interface on the DB-15 connector (see 31877, FL440 RS485 Communication).

Connecting an Override Circuit

The FireLine light source has the capability to support a customer-supplied override circuit. This is useful for situations where the function of the light source is tied to an enclosure or distance above a conveyor, where the UV emission should be stopped when a door is opened or if the light source is raised a specified distance above a conveyor. An external interlock circuit is not required for light source operation. If the light source is connected to an external customer-defined circuit, then this circuit should be tied to Pin 7. When 0V to +6V is applied to Pin 7, UV emission is stopped.

As an added safety measure, the use of a water flow switch is highly recommended. 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 is normally closed when no water is flowing, it can be connected to the Controller Ready/UV Override Pin (Pin 7) of the light source controller. The flow switch may be replaced by an equivalent function in an integrated control system. Phoseon recommends the Gems Sensor, NC (normally-closed), 0.5GPM (2LPM) flow switch: PN 129666.

Connecting Multiple Light Sources

If multiple light sources are used and controlled together, the following Pins can be "AND" tied together so that one DB-15 interface can be used to control all light sources in unison:

- Pin 2 (Intensity Control)
- Pin 3 (Enable)
- Pin 5 (Thermal Fault)
- Pin 7 (UV Override)
- Pins 8-10, 14 (Ground)
- Pin 11 (Fault)
- Pin 15 (Temperature Monitor)

CAUTION: DO NOT tie together the following Output signal Pins:

- Pin 1 (Do Not Use)
- Pin 6 (Do Not Use)

Operation

On/Off Control

The UV output of the light source is enabled and disabled through a simple PLC level voltage on the rear connector and is turned on and off electronically. The light source does not require external shutters and is enabled only when needed.

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

Intensity Control

The intensity of the UV output is controlled through an analog voltage (Pin 2 on the DB15 connector). The valid range of this voltage is 0.1 to 10Vdc. 10Vdc corresponds to 100% output irradiance and UV power and 0.1Vdc corresponds to 1% output irradiance and UV power.

The output of the FL440 varies linearly from 1% to 100% for intensity control voltages between 0.1Vdc and 10Vdc. If no UV output is desired at 0%, the enable line (Pin 3) should be pulled low. Performance of the FL440 below 0.1Vdc and above 10Vdc is not specified.

Fault Feedback Outputs

The status of the FL440 is given by the states of the Thermal Fault Feedback line (Pin 5 on the rear connector) and Fault Feedback line (Pin 11 on the rear connector). The lines are high when the FL440 is in the Ready state, meaning there are no faults detected and the UV output may be enabled through the Enable line. If either line is low, the FL440 is in the Not Ready state, indicating the UV output will not enable.

The Not Ready state is caused by one or more of the following conditions:

- The FL440 DC power supply is turned off.
- The FL440 DC power supply is providing a voltage too low or too high for proper operation.
- The FL440 is in thermal shutoff due to excessive internal temperatures. The Thermal Fault Feedback line will be low.
- An error has been detected in the current drive to the LED array. The Fault Feedback line will be low.
- Refer to the troubleshooting guide later in this manual for help identifying the cause of the Not Ready state.

Irradiance as a Function of Distance

The UV emission from the FL440 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.

Monitoring Temperature

The performance of the FireLine light source, which is a water-cooled system, will be directly impacted by the temperature of the cooling water and flow rate. Irradiance will increase slightly at cooler operating temperatures, for example at initial system start up.

Therefore, a temperature monitoring device has been integrated into the system to help monitor light source temperature during operation. The device inside the unit outputs a voltage signal of 0 to 7.5Vdc to Pin 15 which corresponds to 100mV per degree Celsius. For example, a reading of 2.55V equates to 25.5˚C.

Phoseon recommends that the customer monitor the temperature through the DB-15 connector (Pin 15). If the reported temperature changes by more than 10 to 15 degrees from steady state operating conditions, this could indicate a problem and the environmental conditions should be inspected. See Troubleshooting Guide later in this manual for more information.

In addition to monitoring the system temperature, a separate temperature switch has been integrated into the light source to shut down the emission of UV light when the light source has exceeded a safe operating temperature. The light source will shut off to prevent a thermal run away condition and a Thermal Fault signal will be output (Pin 5).

Note: When a temperature fault occurs, the light source will shut off automatically. The light source will turn back on automatically when the operating temperature has returned to an acceptable value.

Do not exceed the water temperature specifications as indicated in 28384 Water Cooling Requirements.

Service

For further details contact Phoseon Technology by phone at +1.503.439.6446 or email at customerservice@phoseon.com

Troubleshooting Guide

Table 4.1: Troubleshooting Guide

Symptom	Pin 5: Thermal Fault	Pin 7: UV Override	Pin 11: Fault Status	Pin 15: Temperature	Fault	Troubleshooting	RS485 Logging (If RS485 used)
Not Enabled No Active Faults	24V (no thermal fault)	Open (24V)	24V (no fault)	X	No Fault	Apply +24V on Pin 3 to enable. If control signals are in question, isolate the lamp from the control system, and connect Pin 3 directly to Pin 6. If lamp operates, then it is was not receiving the correct enable signal from the controller.	No FW log entry
UV OFF if Enabled No Active Faults UV Override Active (pulled low)	24V (no thermal fault)	Closed (pulled to 0V)	24V (no fault)	X	UV Override is Active	Disconnect Pin 7 from Ground (leave open; it is internally pulled high to 24VDC)	No FW log entry

Symptom	Pin 5: Thermal Fault	Pin 7: UV Override	Pin 11: Fault Status	Pin 15: Temperature	Fault	Troubleshooting	RS485 Logging (If RS485 used)
UV ON if Enabled Active Fault	24V (no thermal fault)	Open (24V)	0V (fault)	X	Over Voltage, Input Voltage >53V	"Adjust DC power input to lamp (48±1VDC) **Note:** fault is not logged for first 10 seconds when DC power is applied, fault response is within 1 second of detection after the initial 10 seconds.	Event Code 5: Flt-inputV_hi
	24V (no thermal fault)	Open (24V)	0V (fault)	X	Under Voltage, Input Voltage <43V	Adjust DC power input to lamp (48±1VDC) **Note:** fault is not logged for first 10 seconds when DC power is applied, fault response is within 1 second of detection after the initial 10 seconds.	Even Code 6: Flt-inputV_lo

Symptom	Pin 5: Thermal Fault	Pin 7: UV Override	Pin 11: Fault Status	Pin 15: Temperature	Fault	Troubleshooting	RS485 Logging (If RS485 used)
UV OFF if Enabled Active Thermal Fault Active Fault	0V (thermal fault)	Open (24V)	0V (fault)	>6.0V (60˚C)	LM35 Temperature Sensor, FW controlled: Over temperature >110˚C	Ensure minimum water flow requirement is met. Ensure cooling fluid is within specification: 20-35˚C. Fault status will clear and UV will turn on (if enabled) when the light source has cooled down to ≤4.0V on Pin 15.	Event Code 3: Flt-FW_overtemp FW set limit at the factory
	0V (thermal fault)	Open (24V)	0V (fault)	>6.0V (60˚C)	Airpax Temperature sensor, HW switch: Over temperature > 110˚C	DO NOT SHUT-OFF DC Power Ensure air inlet and exhaust have at least 50mm clearance. Ensure ambient air temperature is ≤ 50˚C, and filters are not clogged. Fault status will clear and UV will turn on (if enabled) when the light source has cooled down to ≤ 4.0V on Pin 15.	Event Code 2: Flt-temp_intrlck
UV Off or Only Partially On if Enabled Active Fault	24V (no thermal fault)	Open (24V)	0V (fault)	<6.0V (60˚C)	Blown Fuse	Shut off DC power Contact Phoseon	Event Code 1: Flt-blown_fuse
	Part or all of the lamp remains off when enabled						

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.

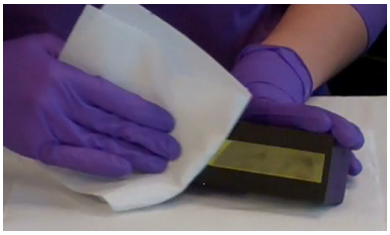
   CAUTION: Wearing vinyl gloves is recommended to avoid getting any uncured UV material on the skin.

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.

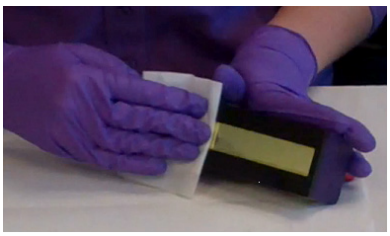
   Note: If the razor needs to be replaced, dispose of the razor blade in a properly marked sharps container.

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

Declaration of Conformity (CE)

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 FL440 125x40	150x20 450x20 FL200 125x10 FL400 150x20 FL400SLD 150x20 FL440 150x40	225x20 550x20 FL400 225x20 FL400SLD 225x20 FL440 225x40	300x20 675x20 FL400 250x20 FL400SLD 250x20 FL440 250x40	 FL400 300x20 FL400SLD 300x20 FL440 300x40		
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
KeyPro™ Explorer	25x10						
StarFire™	100x20	150x20					
StarFire MAX™	75x20	150x20	225x20	300x20			

Manufacturer

Name: Excelitas Technologies
Address: 7425 NE Evergreen Parkway, Hillsboro, Oregon 97124-5845
Country: United States of America

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 (RoHS2)

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): Rob Gomeau

Name: Rob Gomeau, Director of Operations

Place : Hillsboro, OR