Technical Datasheet

Rigid UVFR

UV Resin

Photocentric

Rigid UVFR

UL 94 V-0 (2mm) certification

100%

HDT (Low – High)

100%

Compatible Printers

UV LCD 3D Printers

Liquid Crystal

OPUS

Colour

Black

Available in

1kg bottles

Industrial IEC 3phase plug housing

Rigid UVFR is Photocentric's first UV Flame Retardant resin with UL 94 V-0 certification, even showing self-extinguishing properties in the green state. Combined with an exceptionally high HDT and high tensile modulus, it is ideal for 3D parts in industries such as aerospace, automotive and railway. Rigid UVFR is halogen free, has an excellent smoke gas toxicity rating and it is easy to print and process due to its low viscosity. Printed parts exhibit a high level of detail and dimensional accuracy, making it the perfect choice for connectors and fittings for both consumer and industrial applications.

Optimised for:

- Electrical and electronic enclosures and connectors
- Battery housings
- High power electrical applications
- Suitable for interior parts in industries like automotive, aerospace, railway, appliances, medical and furniture.

Revision 4
01/10/2024

Unique features:

UL 94 V-0 (2mm)
V-1 (1.5mm)

Incredible heat resistance
HDT >250°C

Low viscosity

Printed parts exhibit a superior level of detail and dimensional accuracy

TPO Free

Halogen free with an excellent smoke and toxicity rating

Rigid UVFR Properties

Tensile Properties	**Green**	**UV***	**Standard**
Tensile Modulus	1090 MPa	4170 MPa	ASTM D638
Ultimate Tensile Strength	32.1 MPa	74.7 MPa	ASTM D638
Elongation at break	16%	2.3%	ASTM D638

Flexural Properties	**Typical Values (UV*)**	**Standard**
Flexural Modulus	3400 MPa	
Flexural Strength	115 MPa	

Impact Properties	**Typical Values (UV*)**	**Standard**
Impact Strength Notched Izod	22 J/m	ASTM D256

Thermal Properties	**UV***	**UV + Anneal****	**Standard**
Heat Deflection Temperature (@ 0.45 MPa)	260°C	-	ASTM D648
Heat Deflection Temperature (@ 1.82 MPa)	94°C	>120°C	ASTM D648

Fire Properties	**Typical Values (UV*)**	**Standard**
Flammability	V-0 (3.0 mm) V-0 (2.5 mm) V-0 (2.0 mm) V-1 (1.5 mm)	UL 94

Advanced Thermal Properties	**Typical Values (UV*)**	**Standard**
C.T.E (20°C to 60 °C)	74 µm/(m·K)	ASTM E831
C.T.E (60 °C to 120 °C)	112 µm/(m·K)	ASTM E831

Other	**Typical Values (UV*)**	**Standard**
Shore Hardness	92 Shore D	ASTM D2240
Water Absorption, Short Term (24 hours)	0.43 %	ASTM D570
Water Absorption, Medium Term (72 hours)	0.75 %	ASTM D570
Water Absorption, Long Term (168 hours)	1.22%	ASTM D570
Viscosity	580 cPs	At 25°C Brookfield spindle 3
Liquid Density	1.21 g/cm3	Internal
Printed Part Density	1.32 g/cm3	Internal
Storage	10<T>50°C	

* Post cured for 2 hrs at 60 °C in Photocentric Cure L2.
**Some mechanical and thermal properties can be improved by thermal annealing. Post cured for 2 hrs at 60 °C in Photocentric Cure L2, thermally annealed for 3h at 150 °C.

We are constantly reviewing and improving our range of high-performance materials.
For the very latest information, please visit the Photocentric website

Test Report

ATLaS-Analytical Testing Lab Service

Job number: ATLaS-2024-6393	Test method: Flammability / UL94-V / 3mm	Receipt date: 05.07.2024 13:47
Responsible processor: Giulia Knopf	Material name: Photocentric Rigid UVFR	Shipment to testing bodies: 27.06.2024
Testing bodies: ATLaS – Analytical Testing Lab Service	Customer: Photocentric Ltd; Titan House, 20 Titan Drive; Peterborough, PE1 5XN; +44 1733 349937	Batch number: TN#334.1

Flame testing
Flammability V acc. to UL 94 : 2024

Information about test procedure and test specimens

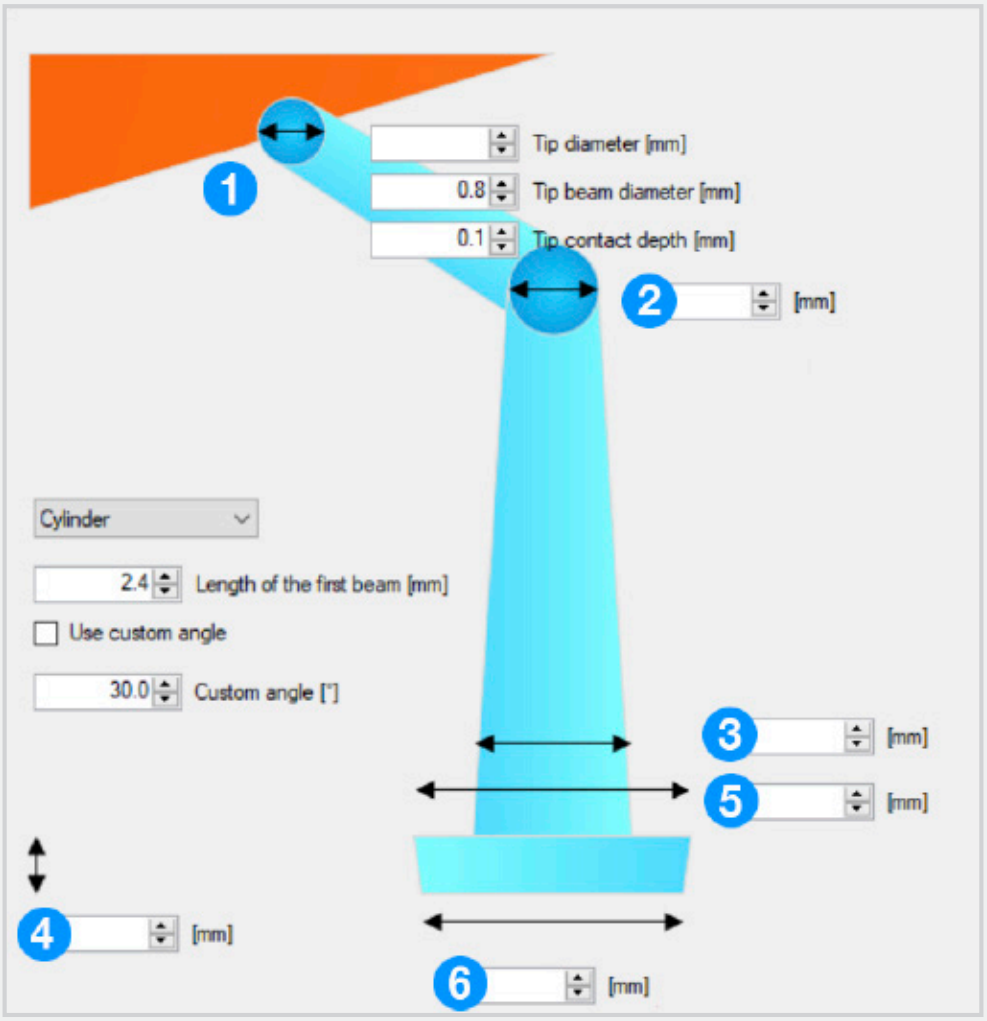
M 0 0324			Measurements & observations										
			1st flame application, 10 s				2nd flame application, 10 s						Classification
Dimensions of test specimens 127 * 12,7 * d mm³			After flame time t1s	Cotton indicator ignited	Burning up to holding clamp?	Obser-vations	After flame time t2(s)	Cotton indicator ignited	Burning up to holding clamp?	Obser-vations	Afterflame & Afterglow time t2 + t3 (s)	Total Afterflame time t1 + t2 (s)	
Requirements			≤ 10 ≤ 30 ≤ 30	no no yes	no no no	- - -	≤ 10 ≤ 30 ≤ 30	no no yes	no no no	- - -	≤ 30 ≤ 60 ≤ 60	≤ 50 ≤ 250 ≤ 250	= V-0 = V-1 = V-2
Pre-conditioning	Spec n°.	Thickn (mm)	Abbrev.: A=dripping parts, K=edge-burning, T=dripping parts, R=rolls up										
Conditioning chamber (2d / 23° / 50%)	1 2 3 4 5	2.93 3.09 2.94 2.95 2.89	2 2 2 2 2	No No No No No	No No No No No		2 2 2 2 2	No No No No No	No No No No No		2 2 2 2 2	20	V-0
			First test: 2024-07-02 13:45 16:07 - 2024-07-02 13:53										
Drying oven (7d / 70°C)	1 2 3 4 5	2.96 2.99 2.93 2.97 2.96	1 1 2 2 2	No No No No No	No No No No No		2 1 2 2 2	No No No No No	No No No No No		2 1 2 2 2	17	V-0
			First test: 2024-07-05 10:05 - 2024-07-05 10:11										
			Repeated test										V-0 @ 3.0 mm

Design & Print Orientation Consideration Parameters

Printed on Photocentric LC Opus (100 µm layer height)

Properties	Parameters
Minimum feature size (pins)	0.5 mm
Minimum hole diameter	0.8 mm
Minimum slot thickness	0.6 mm
Minimum wall thickness	0.4 mm
Overhangs	Successful for overhangs < 60°
Delamination (unsupported)	Not visible for overhangs ≤ 2 mm
Delamination (between walls)	Not visible for overhangs ≤ 4 mm

Recommended Support Parameters & Orientation



These are recommended support settings in relation to a UV LCD printer with 81µm XY resolution.

	Large Models		Small Models	
Diagram Ref. Nr	Parameters	Values	Parameters	Values
-	Density (%)	70	Density (%)	70
1	Tip Diameter (mm)	0.8	Tip Diameter (mm)	0.8
-	Critical Build Angle (°)	47	Critical Build Angle (°)	47
2	Pole Diameter (mm)	2	Pole Diameter (mm)	2
3	Pole Widening Factor	1.5	Pole Widening Factor	1.5
-	Model Height from Base (mm)	10	Model Height from Base (mm)	10
4	Height of Support Foot (mm)	2	Height of Support Foot (mm)	2
5	Top of Foot Diameter (mm)	7	Top of Foot Diameter (mm)	7
6	Bottom of Foot Diameter (mm)	5	Bottom of Foot Diameter (mm)	5

Recommended orientation around all axes is 45 °.

Printer and Resin Profilling

Photocentric UV Printers

To print with Photocentric UV printers, choose Rigid UVFR (Black) and the desired layer thickness when preparing your print file in Photocentric Studio.

3rd Party UV Printers

- Photocentric UV high-performance resins have been formulated to be compatible with a wide range of 3rd Party Printers. This list is continually updated, for the most up-to-date information, please visit our UV Resin Compatibility Page. All resins are functional at a wavelength of 385-405 nm.
- Please see below instruction on how to calculate appropriate exposure time with regards to your 3rd party UV printer and purchased resin.

Layer Exposure Guidelines

This guide will assist you in establishing a layer exposure time for a desired resin and layer thickness based on the characteristics of Photocentric's UV Resin range and your UV 3D printer.
Each resin requires a specific energy (Ec) to cure a certain layer thickness (Dp). 'Energy' is defined by multiplying 'light output intensity' of your printer and a 'given time of exposure'. The equation below simply explains the matter.

Energy [mJ/cm²]= Light Output Intensity [mW/cm²] x Exposure Time [s]

Your UV 3D printer manufacturer will provide you with light output intensity value.

Layer Thickness (µm)	25	50	100
A UV 3D printer with 5mW/cm2 light output intensity	-	-	4 sec
Ec (mJ/cm2)	19		
Dp (µm)	140		

Bear in mind the exposure time vs energy is not a linear trend, and this data is intended strictly as a guideline. Settings may need to be further optimised to suit each printer.

Pre-Print Instructions

1. To print on Photocentric LC Opus, choose Rigid UVFR (Black) and the desired layer thickness when preparing the print file in Photocentric Studio.
2. Warm the resin to 60 °C for 5 hours, or until the resin is fully liquified in the bottle. Failure to do so prior to printing may lead to the resin crystalising, resulting in print failures.
3. Shake the resin bottle for up to 2 minutes before pouring into the printer vat. Allow to cool to 30°C prior to printing.

Post-Print Instructions

1. It is recommended to drain and clean the vat after printing if ambient temperatures are below 23 °C.
2. Place the platform into the Photocentric Wash 15 unit, and wash printed parts for up to 10 minutes in Photocentric Resin Cleaner 30.
3. Rinse printed parts thoroughly in warm water for up to 2 minutes.
4. Dry well with compressed air to remove any remaining water. Alternatively, leave to dry naturally until no water is present.
5. Cure for 2 hours at 60 °C in Cure M+.
6. Parts can be thermally shocked from the platform using very cold water when the platform is still warm from the curing process.

Thermal Annealing

To thermally anneal printed parts, place them on a suitable tray in a thermal oven using the following procedure:

		Thermal Oven
Ramp-up Phase	2 hours	30°C to 150°C (1°C/min)
Holding Phase	3 hours	150°C
Ramp-down Phase	2 hours	150°C to 30°C (1°C/min)

Photocentric

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