Technical Datasheet

Rigid DLFR

Daylight Resin

Photocentric

Rigid DLFR

UL 94 V-0 (2mm) certification

HDT (Low – High)

100%

Compatible Printers

Liquid Crystal MAGNA

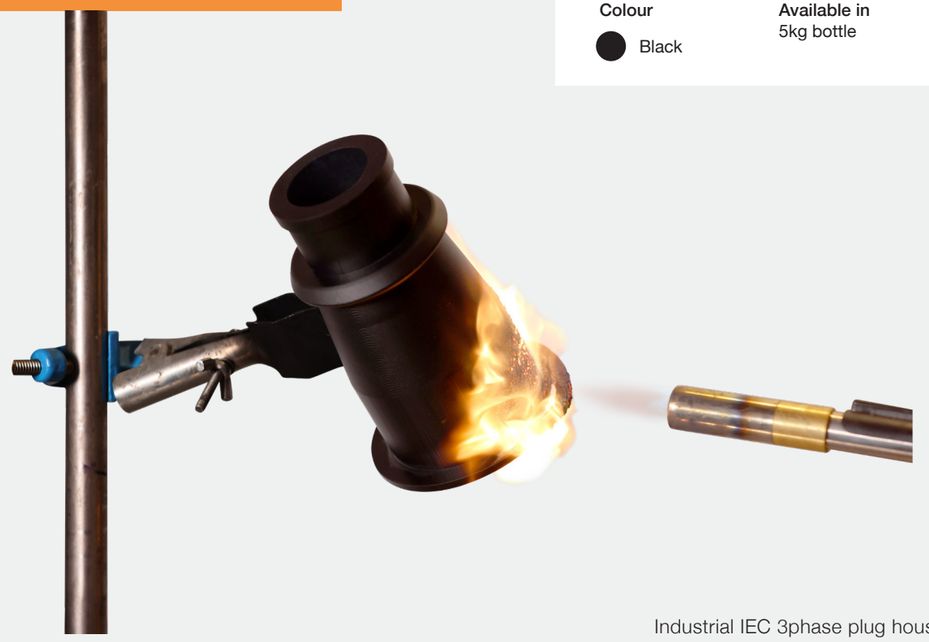
Liquid Crystal TITAN

Colour

Black

Available in

5kg bottle



Industrial IEC 3phase plug housing

Rigid DLFR is Photocentric's first Daylight 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. Easy to print and process due to its low viscosity. Printed parts exhibit a superior 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 parts in industries like automotive, aerospace, railway, appliances, medical and furniture.

Revision 1
19/03/2024

Unique features:

- UL 94 V-0 (2mm) V-1 (1.5mm)
- Incredible heat resistance HDT >250°C
- Low viscosity
- Superior level of detail and dimensional accuracy
- TPO Free

Rigid DLFR Properties

Tensile Properties	**Green**	**UV***	**Standard**
Tensile Modulus	1302 MPa	2848 MPa	ASTM D638
Ultimate Tensile Strength	39.5 MPa	66 MPa	ASTM D638
Elongation at break	12.3%	3.5%	ASTM D638
Flexural Properties		**Typical Values (UV*)**	**Standard**
Flexural Modulus		3400 MPa	ASTM D790
Flexural Strength		115 MPa	ASTM D790
Impact Properties		**Typical Values (UV*)**	**Standard**
Impact Strength Notched Izod		19.1 J/m	ASTM D256
Unnotched Izod (23°C)		176 J/m	ASTM D256
Notched Charpy (Machined, 23°C)		0.9 kJ/m2	ISO 179-1
Thermal Properties		**UV***	**Standard**
Heat Deflection Temperature (@ 0.45 MPa)		255°C	ASTM D648
Heat Deflection Temperature (@ 1.82 MPa)		86°C	ASTM D648
Glass Transition Temperature (DMA, tan(d))		175°C	ASTM D4065
Degradation Temperature (TGA, 5% mass loss, air)		330°C	ISO 11358
Fire Properties		**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
Limiting Oxygen Index		LOI ≥ 28.0	ISO 4589-2
Glow-wire Test		GWIT: 825 °C GWIF: 960 °C	IEC 60695-2-12/-13 (2.1mm)
Advanced Thermal Properties		**UV***	**Standard**
C.T.E (-40 °C to 0 °C)		49 µm/(m·K)	ASTM E831
C.T.E (0 °C to 50 °C)		81 µm/(m·K)	ASTM E831
C.T.E (50 °C to 100 °C)		137 µm/(m·K)	ASTM E831
C.T.E (100 °C to 150 °C)		111 µm/(m·K)	ASTM E831

* Post cured for 2 hrs at 60 °C in Photocentric Cure L2.

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

Dielectric/Electric Properties	Typical Values (UV*)	Standard
Electrical Strength	31 kV/mm	DIN EN 60243-1
Volume Resistivity	2.20E+13 Ωcm	DIN EN 62631-3-1
Surface Resistivity	4.50E+13 Ω	DIN EN 62631-3-2
Comparative Tracking Index, CTI)	600 V	DIN EN 60112
Other	**Typical Values (UV*)**	**Standard**
Shore Hardness	92 Shore D	ASTM D2240
Water Absorption, Short Term (24 hours)	0.46 %	ASTM D570
Water Absorption, Medium Term (72 hours)	0.87 %	ASTM D570
Water Absorption, Long Term (168 hours)	1.23%	ASTM D570
Viscosity	680 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.

Design & Print Orientation Consideration Parameters

Printed on Photocentric LC Magna (100 µm layer height)

Properties	Parameters
Minimum feature size (pins)	0.4 mm
Minimum hole diameter	0.7 mm
Minimum slot thickness	0.5 mm
Minimum wall thickness	0.2 mm
Overhangs	Successful for overhangs < 60°
Delamination (unsupported)	Not visible for overhangs ≤ 2 mm
Delamination (between walls)	Not visible for overhangs ≤ 4 mm

Test Results

Vertical Burning Test for Classifying Materials V–0, V–1, or V–2

Tester: **Warringtonfire**	Phone: +44 1925-64-5116	Date of Test: 02-11-2023
Adress: Holmesfield Road. Warrington. UK	Document Reference: 537704	Date of Report: 22-11-2023
Customer: **Photocentric**	Adress: Titan House, 20 Titan Drive, Peterborough, PE1 5XN. UK	Phone: +44 1733-34-9937
Product Reference: **Rigid DLFR**	Generic Description: (Meth)acrylate based 3D printable photocurable resin	Thickness: 3mm Density: 1.34g/cm^3 Colour: Black

Objective

To determine the performance of the following material when tested in accordance with Section 8 - “50W (20mm) Vertical Burning Test for Classifying Materials V–0, V–1 or V–2” of UL 94: 2013 ANSI/UL 94: 2018 - “Test for Flammability of Plastics Materials for Parts in Devices and Appliances”.

Results

When the test results are assessed using the test criteria specified in the Standard, the material, when tested at a nominal thinkness of 3mm, is classified as ‘V-0’.

An uncertainty of measurement estimation has been conducted in relation to the duration of flaming and glowing. The findings are as detailed in Test Results section of this report.

Test Procedure

Each specimen was tested in accordance with the test method specified in the Standard and the following points were observed and recorded for each specimen.

A- Duration of flaming after first falme application (±0.6 seconds)

B- Duration of flaming after second flame application (±0.8 seconds)

C- Duration of glowing after second flame application (±0.8 seconds)

D- Whether or not the specimens burn up to holding clamp.

E- Whether or not the specimens drip flaming particles with ignites cotton swatch.

Results

The following results were recorded for the ten specimens tested. The letters correspond with those listed under ‘Test Procedure’ .

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

Specimens conditioned at a temperature of 23 ± 2°C and a relative humidity of 50 ± 5%

Specimen N°.	A	B	C	D	E
1	Nil	1	Nil	No	No
2	Nil	Nil	Nil	No	No
3	Nil	1	Nil	No	No
4	1	Nil	Nil	No	No
5	Nil	Nil	Nil	No	No

Specimens conditioned at a temperature of 70 ± 1°C for 168 hours.

Specimen N°.	A	B	C	D	E
1	Nil	1	Nil	No	No
2	Nil	Nil	Nil	No	No
3	Nil	Nil	Nil	No	No
4	Nil	Nil	Nil	No	No
5	Nil	Nil	Nil	No	No

Pre-Print Instructions

Printing on LC Magna

1. To print on Photocentric LC Magna, choose ‘Rigid DLFR’ 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. Allow the resin to cool to 30°C before use.
4. Shake the resin bottle for up to 2 minutes before pouring into the printer vat.

Printing on LC Titan

1. To print with Photocentric Liquid Crystal Titan, choose ‘Rigid DLFR’ and the desired layer thickness when preparing your print file in Photocentric Studio.
2. Heat 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 result in the resin crystalising, leading to print failures.

Post-Print Instructions

Printing on LC Magna

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 Air Wash L 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 5 hours at 60°C in Cure L2.
6. Parts can be thermally shocked from the platform using very cold water when the platform is still warm from the curing process.

Printing on LC Titan

1. Place the platform into the Photocentric Wash XL.
2. Parts can be washed in 10 minutes using Photocentric Resin Cleaner 30.
3. Once washed, rinse with warm water for up to 10 minutes. Pay extra attention to fine details and any internal features.
4. Dry with compressed air to remove any remaining water.
5. Place the platform into the Photocentric Cure XL, start ‘Dry’ cycle for 1 hour at 60°C (WITH NO UV LIGHT) to ensure parts are fully dry.
6. Start ‘Cure’ cycle, and leave to cure for 5 hours at 60°C.
7. Remove the platform from the Cure XL, allow to cool down and remove parts from the platform. Parts printed in Rigid DLFR can be thermally shocked for easier removal.

Photocentric

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