SOLUTION BRIEF

FDM Pro with ULTEM™ 9085 CG

Improved performance, added repeatability and reliability for Additive Manufacturing

THE CHALLENGE FOR PEAK PRODUCTION PERFORMANCE

Additive manufacturing (AM) processes and materials pose real benefits through manufacturing, performance and supply chain improvements. It is used by industries, like aerospace and automotive, to streamline product development, provide greater design freedom and improve the supply chain with economical low-volume and on-demand production capability. While this technology provides suitable results, certain adopters require an additional level of consistency and improved material properties to meet specific design requirements, above what is typically achievable with standard additive manufacturing systems. Specifically, these high-requirement users demand high build repeatability for consistent production results and optimal material performance, job to job, part to part, regardless of the specific additive manufacturing system used.

THE SOLUTION

In response to this challenge, Stratasys Direct is proud to bring you FDM Pro with ULTEM™ 9085 CG. This solution delivers high-quality ULTEM 9085 parts produced with industry-leading Stratasys hardware and backed by material and process traceability for high-requirements production manufacturing.

FDM Pro consists of the following:

- Improved mechanical performance
- Proven low coefficient of variance (COV)
- Manufactured on proven Stratasys F900 PRO additive manufacturing system

FDM Pro provides you with the enhanced mechanical performance, repeatability, and reliability you need for production parts. You can rest assured that your production parts are manufactured with the highest degree of confidence and backed by over 30 years of manufacturing experience with AM technologies.

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FDM PRO WITH ULTEM™ 9085 CG

ULTEM 9085 CG for FDM Pro

FDM Pro uses ULTEM 9085 CG and leverages hardware and software changes coupled with process control. This results in optimal part characteristics, low production variability and higher yield. An added benefit is improved strength characteristics in the XY build orientation when compared to ULTEM 9085 manufactured on a standard production platform.

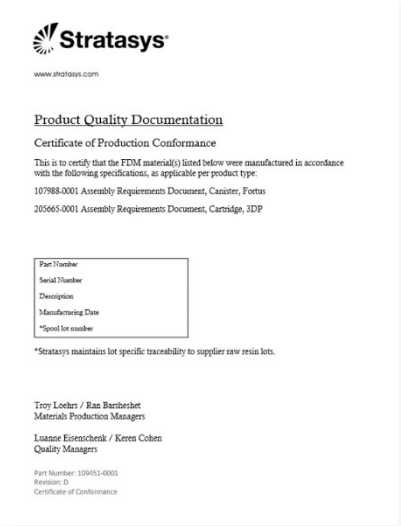
This high-performance thermoplastic possesses an ample strength-to-weight ratio and good high-temp operating characteristics compared with other resins. With the same chemical formulation as ULTEM 9085, ULTEM 9085 CG is also FAR 25.853 compliant for flame, smoke and toxicity characteristics.

Stratasys Direct can also provide complete documentation for ULTEM 9085 CG resin filament, to provide users with full traceability from the raw resin to the filament to the finished part. A certificate of analysis for the raw resin includes test results for a number of material properties. Test methods are in accordance with FAR 25.53 and ASTM standards. This document also identifies the material batch number.

Stratasys provides a Certificate of Analysis on the filament that's produced from the raw material. It identifies the test results for pull force, moisture content and melt flow. This document reflects the Sales Order Number, Stratasys manufacturing lot number and the SABIC (supplier) resin lot number.

A Stratasys Certificate of Production Conformance specifies that the filament is manufactured per established specifications and provides material identification information, including filament spool lot number.

The information contained in these documents form a complete chain of traceability from the raw ULTEM 9085 resin pellets to the manufactured FDM filament spool.



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Product Quality Documentation

Certificate of Production Conformance

This is to certify that the FDM material(s) listed below were manufactured in accordance with the following specifications, as applicable per product type:

107988-0001 Assembly Requirements Document, Canister, Fortus

205665-0001 Assembly Requirements Document, Cartridge, 3DP

Part Number
Serial Number
Description
Manufacturing Date
*Spool lot number

*Stratasys maintains lot specific traceability to supplier raw resin lots.

Troy Loehrs / Ran Barthelset
Materials Production Managers

Luanne Eisenschenk / Keren Cohen
Quality Managers

Part Number: 109451-0001
Revision: D
Certificate of Conformance

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CAGE code: 1GKB4

Product Quality Documentation

Stratasys Filament Lot Number	Customer Sales Order Number	Stratasys Part Number	Matl. Designation, Grade, and Class
MfgLot	SONum	PartNum	RawMatInfo
Sabic Raw Resin Lot Number	**Date Manufactured**	**Number of spools shipped (92.3cl ea.)**	**Shipped from**
RawLotNum	MFGDate	QtyShipped	Stratasys Eden Prairie

ULTEM™ is a registered trademark of SABIC or affiliates.

This is to certify that the FDM material(s) that belong to the Sales Order Number stated in the above table meet the requirements of the following specification(s), as applicable per product type:

300000-0001 | Aerospace Filament Specification

No changes in product formulation, raw materials, basic methods of manufacture, or plant site have occurred since the material was qualified.

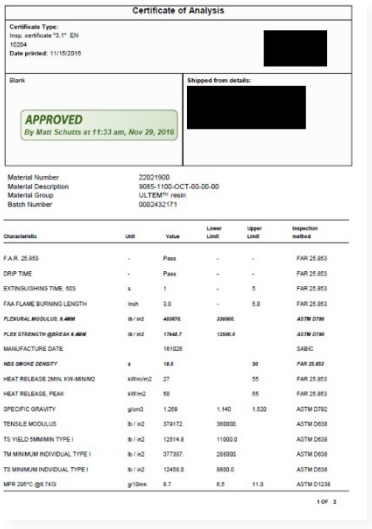
Properties	Test Method	Unit	Requirements	Stratasys Results		
Pull force	-	lbs.	Pull force spikes less than or equal to 1.75 lbs*	#.##		
Moisture	ASTM D 7191	%	< or = 0.04%	#.###		
Melt Flow	ASTM D 1238	G/10 min.	MFIReq	Beginning of Run #.##	Middle of Run #.##	End of Run #.##

*Pull force spikes up to 3.75 lbs are acceptable provided they meet the following criteria: Length of spike above 1.75 lbs does not exceed 3 feet; length of spike above 2.75 lbs does not exceed 1 foot.

Troy Loehrs – Materials Production Manager

Luanne Eisenschenk – Quality Manager

400337-0001 | Rev. C



Certificate of Analysis

Certificate Type:
Insp. certificate "3.1" EN 10204
Date printed: 11/15/2016

[redacted]

Blank

Shipped from details:

[redacted]

APPROVED
By Matt Schutts at 11:33 am, Nov 29, 2016

Material Number	22021900
Material Description	9085-1100-OCT-00-00-00
Material Group	ULTEM™ resin
Batch Number	0002432171

Characteristic	Unit	Value	Lower Limit	Upper Limit	Inspection method
F.A.R. 25.853	-	Pass	-	-	FAR 25.853
DRIP TIME	-	Pass	-	-	FAR 25.853
EXTINGUISHING TIME, 60S	s	1	-	5	FAR 25.853
FAA FLAME BURNING LENGTH	Inch	3.8	-	6.0	FAR 25.853
FLEXURAL MODULUS, 0.4MM	lb / in2	440676	330000		ASTM D790
FLEX STRENGTH @BREAK 0.4MM	lb / in2	17948.7	12500.0		ASTM D790
MANUFACTURE DATE		161026			SABIC
NBS SMOKE DENSITY	s	18.5		30	FAR 25.853
HEAT RELEASE 2MIN, KW-MIN/M2	kW/m/m2	27		65	FAR 25.853
HEAT RELEASE, PEAK	kW/m2	50		65	FAR 25.853
SPECIFIC GRAVITY	g/cm3	1.269	1.140	1.520	ASTM D792
TENSILE MODULUS	lb / in2	379172.	360000.		ASTM D638
TS YIELD 5MM/MIN TYPE I	lb / in2	12514.8	11000.0		ASTM D638
TM MINIMUM INDIVIDUAL TYPE I	lb / in2	377307.	288000.		ASTM D638
TS MINIMUM INDIVIDUAL TYPE I	lb / in2	12458.0	8800.0		ASTM D638
MFR 295°C @5.7KG	g/10min	8.7	6.5	11.0	ASTM D1238

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Examples of Certificates of Analysis and Conformance

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FDM PRO WITH ULTEM™ 9085 CG

MANUFACTURING PRODUCTION PARTS WITH STRATASYS DIRECT

FDM Pro at Stratasys Direct is a robust production solution that results in strong, lightweight, customizable 3D printed parts. From build to build, and part to part, we deliver consistent production results.

The Stratasys Material Specification governs the production of raw ULTEM 9085 resin and its conversion to filament. It focuses on the critical characteristics of upstream raw stock to ensure a high-quality material is provided to customers. A combination of in-line and post-processing inspection techniques, following quality standards set by the extrusion industry, are used to convert incoming material into reliable, high-performing feedstock for Stratasys 3D printers.

Stratasys Direct controls the entire workflow from material handling through part removal, inspection and delivery. The processes for FDM Pro are the result of several years of parameter isolation and validation to strike a balance between unlimited design freedom and stable, repeatable part production. By using Stratasys Direct, companies can outsource the manufacturing and inspection of parts to a service provider with experience delivering tens of thousands of production components every year. Our team of engineers, intimate knowledge of additive manufacturing, and superior production processes ensure your project stays on time and on budget.

FAQS

What is the difference between regular ULTEM 9085 and ULTEM 9085 CG?

Standard ULTEM 9085 filament canisters include a Certificate of Conformance that documents the material has been manufactured to established specifications.

ULTEM 9085 CG filaments are produced in smaller batches, receive more frequent testing and are accompanied by additional documentation. Resin lot changes require complete cleaning of extrusion equipment to provide absolute lot identification and eliminate the possibility of cross-contamination between material lots. Choosing ULTEM 9085 CG also ensures that your parts are produced with this enhanced material on a FDM 900 PRO platform.

How are variations in part design accounted for?

Basic material properties do not address the infinite variations of build strategies, design shapes and features. Each part design would need to be evaluated for items like environment, loading and criticality. Some companies develop a design handbook that provides guidance on standard design features and techniques. This is common practice for metallics and composites and will be similar with additively manufactured parts.

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