ASA

A UV-STABLE, PRODUCTION-GRADE THERMOPLASTIC FOR FDM 3D PRINTERS

Now you can build consistently high-quality parts, with exceptional UV stability and the best aesthetics of any FDM® thermoplastic. ASA is poised to become the most popular all-purpose prototyping material for users of Fortus 360mc™, 380mc™, 400mc™, 450mc™ and 900mc™ 3D Printers, and the Stratasys F123 Series. Matching or exceeding the mechanical properties of ABS, ASA may be your new favorite general prototyping material. Its UV-resistance makes it especially suited in end-use parts for outdoor commercial and infrastructure use. And its wide selection of colors and matte finish makes it ideal for attractive prototypes in consumer sporting goods, tools and automotive components and accessories.

MECHANICAL PROPERTIES

TEST METHOD	STANDARD	ENGLISH		METRIC	
		XZ ORIENTATION	ZX ORIENTATION	XZ ORIENTATION	ZX ORIENTATION
Tensile Strength, Yield (Type 1, 0.125", 0.2"/min)	ASTM D638	4,200 psi	3,850 psi	29 MPa	27 MPa
Tensile Strength, Ultimate (Type 1, 0.125", 0.2"/min)	ASTM D638	4,750 psi	4,300 psi	33 MPa	30 MPa
Tensile Modulus (Type 1, 0.125", 0.2"/min)	ASTM D638	290,000 psi	280,000 psi	2,010 MPa	1,950 MPa
Elongation at Break (Type 1, 0.125", 0.2"/min)	ASTM D638	9%	3%	9%	3%
Elongation at Yield (Type 1, 0.125", 0.2"/min)	ASTM D638	2%	2%	2%	2%
Flexural Strength (Method 1, 0.05"/min)	ASTM D790	8,700 psi	6,900 psi	60 MPa	48 MPa
Flexural Modulus (Method 1, 0.05"/min)	ASTM D790	270,000 psi	240,000 psi	1,870 MPa	1,630 MPa
Flexural Strain at Break (Method 1, 0.05"/min)	ASTM D790	No Break	4%	No Break	4%

THERMAL PROPERTIES[2]	TEST METHOD	ENGLISH	METRIC
Heat Deflection (HDT) @ 66 psi	ASTM D648	208°F	98°C
Heat Deflection (HDT) @ 264 psi	ASTM D648	196°F	91°C
Vicat Softening Temperatre (Rate B/50)	ASTM D1525	217°F	103°C
Glass Transition Temperature (Tg)	DMA (SSYS)	226°F	108°C
Coefficient of Thermal Expansion (flow)	ASTM E831	4.90E-06 in/in/°F	8.79E-06 mm/mm/°C
Coefficient of Thermal Expansion (xflow)	ASTM E831	4.60E-06 in/in/°F	8.28E-06 mm/mm/°C

ELECTRICAL PROPERTIES	TEST METHOD	ORIENTATION	VALUE RANGE
Volume Resistivity	ASTM D257	XZ	1.0E14 - 1.0E15 ohm-cm
Dielectric Constant	ASTM D150-98	XZ	2.97 - 3.04
Dissipation Factor	ASTM D150-98	XZ	0.009
Dielectric Strength	ASTM D149-09, Method A	XZ	329 V/mil
Dielectric Strength	ASTM D149-09 Method A	ZX	414 V/mil

STRATASYS.COM

ASA

A UV-STABLE, PRODUCTION-GRADE THERMOPLASTIC FOR FDM 3D PRINTERS

At the core: Advanced FDM technology

Fortus systems and the Stratasys F123 Series are based on patented Stratasys FDM technology. FDM uses production-grade thermoplastics, enabling the most durable parts. These systems use a wide range of thermoplastics with advanced mechanical properties so your parts can endure high heat, caustic chemicals, sterilization and high-impact applications.

No special facilities needed

You can install a Fortus 3D Printer or Stratasys F123 Series 3D Printer just about anywhere. No special venting is required because these systems don't produce noxious fumes, chemicals or waste.

No special skills needed

Fortus 3D Printers and Stratasys F123 Series 3D Printers are easy to operate and maintain compared to other additive fabrication systems because there are no messy powders to handle and contain. They're so simple, an operator can be trained to operate one in less than 30 minutes.

Get your benchmark on the future of manufacturing

Fine details. Smooth surface finishes. Accuracy. Strength. The best way to see the advantages of a Fortus 3D Printer or Stratasys F123 Series 3D Printer is to have your own part built on one. Get your free part at: stratasys.com.

MECHANICAL PROPERTIES

TEST METHOD	STANDARD	ENGLISH	METRIC
Notched Impact, XZ orientation (Method A, 23˚C)	ASTM D256	1.2 ft-lb/n	64 J/m
Unnotched Impact, XZ orientation (Method A, 23˚C)	ASTM D256	6 ft-lb/in	321 J/m

OTHER	TEST METHOD	VALUE
Specific Gravity	ASTM D792	1.05
Flame Classification	UL94	HB
Rockwell Hardness	ASTM D785 (Scale R, 73°F)	82
UL File Number	- - - - - - - - -	345258

SYSTEM AVAILABILITY	LAYER THICKNESS CAPABILITY	SUPPORT STRUCTURE	AVAILABLE COLORS[2]	
Fortus 360mc	0.013 inch (0.330 mm)	Soluble Support	Black	Dark Blue
Fortus 380mc	0.010 inch (0.254 mm)		Dark Gray	Green
Fortus 400mc	0.007 inch (0.178 mm)		Light Gray	Yellow
Fortus 450mc	0.005 inch (0.127 mm)		White	Orange
Fortus 900mc[3]			Ivory	Red
Stratasys F123 Series				

Tests were conducted according to published Stratasys FDM material testing methods, in compliance with the relevant ASTM standards.

The information presented are typical values intended for reference and comparison purposes only. They should not be used for design specifications or quality control purposes. End-use material performance can be impacted (+/-) by, but not limited to, part design, end-use conditions, test conditions, etc. Actual values will vary with build conditions. Tested parts were built on Fortus 400mc at 0.010" (0.254 mm) slice. Product specifications are subject to change without notice.

The performance characteristics of these materials may vary according to application, operating conditions, or end use. Each user is responsible for determining that the Stratasys material is safe, lawful and technically suitable for the intended application, as well as for identifying the proper disposal (or recycling) method consistent with applicable environmental laws and regulations. Stratasys makes no warranties of any kind, express or implied, including, but not limited to, the warranties of merchantability, fitness for a particular use, or warranty against patent infringement.

[1] Literature value unless otherwise noted.

[2] The test data was collected using ASA (Natural) specimens. ASA colored material will have similar properties, but can vary by up to 10%.

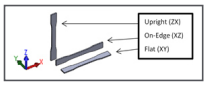
[3] Fortus 900mc does not have the 0.005 inch (0.127 mm) layer thickness capability.

Orientation: See Stratasys Testing white paper for more detailed description of build orientations.

XZ = X or "on edge"

XY = Y or "flat"

ZX = or "upright"



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SAFETY DATA SHEET

Issuing Date 03-Feb-2017 **Revision Date** 27-Jan-2017 **Revision** B

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

Product identifier

Product Name ASA Black

Other means of identification

Product Code(s) SDS-000011 EN A BLK

PN (Part Number) 311-21200 333-60501 333-90501 355-02142

Synonyms None

Recommended use of the chemical and restrictions on use

Recommended Use 3D Printing

Uses advised against No information available

Details of the supplier of the safety data sheet

Manufacturer Address
Stratasys Corporate headquarters United States
9600 West 76th Street Suite #108
Eden Prairie, MN 55344
United States
Local: +1 952-294-3900
Phone: +1 952-937-3000

Emergency telephone number

Emergency Telephone

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- +61 2 8011 4763 - Australia - Multi lingual response
- +86 15626070595 - China - Chinese response

E-mail address info@Stratasys.com

2. HAZARDS IDENTIFICATION

Classification

This chemical is not considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Carcinogenicity	Category 1B
Reproductive toxicity	Category 2

Label elements

Danger

Hazard statements

May cause cancer
Suspected of damaging fertility or the unborn child

The product contains no substances which at their given concentration, are considered to be hazardous to health.

Appearance Monofilament **Physical state** Solid **Odor** No information available

Precautionary Statements - Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Wear protective gloves/protective clothing/eye protection/face protection

Precautionary Statements - Response
IF exposed or concerned: Get medical advice/attention

Precautionary Statements - Storage
Store locked up

Precautionary Statements - Disposal
Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)
Not applicable

Other Information
If small particles are generated during further processing, handling, or by other means, combustible dust concentrations in air my form. See section 7 for more information. See section 8 for more information.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Mixture

Chemical name	CAS No.	Weight-%	Proprietary
Benzene, ethenyl	100-42-5	0.1 - 1	*
n-Hexane	110-54-3	0.1 - 1	*

*The exact percentage (concentration) of composition has been withheld as a trade secret.

Some of the chemicals have dust hazards. These hazards are not germane, as the chemicals are encapsulated in a fully reacted polymer

4. FIRST AID MEASURES

Description of first aid measures

General advice Show this safety data sheet to the doctor in attendance.

Inhalation Remove to fresh air.

Eye contact Rinse thoroughly with plenty of water for at least 15 minutes, lifting lower and upper eyelids.

Consult a physician.

Skin contact Wash skin with soap and water when in contact with molten residues.

Ingestion Drink plenty of water. Do not induce vomiting without medical advice. Call a physician immediately.

Most important symptoms and effects, both acute and delayed

Symptoms None known.

Indication of any immediate medical attention and special treatment needed

Note to physicians Treat symptomatically.

5. FIRE-FIGHTING MEASURES

Suitable Extinguishing Media Foam. Water. Carbon dioxide (CO2). Dry chemical. Alcohol resistant foam.

Unsuitable extinguishing media None known.

Specific hazards arising from the chemical None known.

Explosion data
Sensitivity to Mechanical Impact None.
Sensitivity to Static Discharge None.

Special protective equipment for fire-fighters Firefighters should wear self-contained breathing apparatus and full firefighting turnout gear. Use personal protection equipment.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures

Personal precautions Use personal protective equipment as required. Avoid contact with skin and eyes. Remove all sources of ignition. Sweep up to prevent slipping hazard.

Other Information Refer to protective measures listed in Sections 7 and 8.

Environmental precautions

Environmental precautions Do not flush into surface water or sanitary sewer system. Keep out of waterways.

Methods and material for containment and cleaning up

Methods for containment Prevent further leakage or spillage if safe to do so.

Methods for cleaning up Pick up and transfer to properly labeled containers.

Prevention of secondary hazards May form combustible dust concentrations in air if small particles are generated during further processing, handling or by other means. Avoid dust accumulation in enclosed space. Prevent dust cloud. Remove all sources of ignition.

7. HANDLING AND STORAGE

Precautions for safe handling

Advice on safe handling Use personal protection equipment. Avoid contact with skin and eyes, when handling melted filament. If small particles are generated during further processing, handling, or by other means, combustible dust concentrations in air my form. Use respirator.

Conditions for safe storage, including any incompatibilities

Storage Conditions Store locked up.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters

Exposure Limits .

Chemical name	ACGIH TLV	OSHA PEL	NIOSH IDLH
Benzene, ethenyl 100-42-5	STEL: 40 ppm TWA: 20 ppm	TWA: 100 ppm (vacated) TWA: 50 ppm (vacated) TWA: 215 mg/m³ (vacated) STEL: 100 ppm (vacated) STEL: 425 mg/m³ Ceiling: 200 ppm	IDLH: 700 ppm TWA: 50 ppm TWA: 215 mg/m³ STEL: 100 ppm STEL: 425 mg/m³
n-Hexane 110-54-3	TWA: 50 ppm S*	TWA: 500 ppm TWA: 1800 mg/m³ (vacated) TWA: 50 ppm (vacated) TWA: 180 mg/m³	IDLH: 1100 ppm TWA: 50 ppm TWA: 180 mg/m³

Appropriate engineering controls

Engineering controls If dust is generated during further processing provide exhaust ventilation.

Individual protection measures, such as personal protective equipment

Eye/face protection Goggles. Safety glasses with side-shields.

Hand Protection Wear suitable gloves.

Skin and body protection Impervious clothing.

Respiratory protection Minimize dust generation and accumulation. Wear respiratory protection.

General hygiene considerations Do not eat, drink or smoke when using this product. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Information on basic physical and chemical properties

Physical state Solid
Appearance Monofilament
Odor No information available
Color Characteristic
Odor threshold No information available

Property	Values	Remarks • Method
pH	No data available	None known
Melting point / freezing point	No data available	None known
Boiling point / boiling range	No data available	None known
Flash point	No data available	None known
Evaporation rate	No data available	None known

Flammability (solid, gas)	No data available	None known
Flammability Limit in Air		None known
Upper flammability limit:	No data available	
Lower flammability limit:	No data available	
Vapor pressure	No data available	None known
Vapor density	No data available	None known
Relative density	No data available	None known
Water solubility	Insoluble in water	
Solubility in other solvents	No data available	None known
Partition coefficient	No data available	None known
Autoignition temperature	No data available	None known
Decomposition temperature	No data available	
Kinematic viscosity	No data available	None known
Dynamic viscosity	No data available	None known
Explosive properties	No information available	
Oxidizing properties	No information available	

Other Information

Softening point	No information available
Molecular weight	No information available
VOC Content (%)	No information available
Density VALUE	No information available
Bulk density	No information available

10. STABILITY AND REACTIVITY

Reactivity None under normal use conditions.

Chemical stability Stable under normal conditions.

Possibility of hazardous reactions None under normal processing.

Conditions to avoid Excessive heat. To avoid thermal decomposition, do not overheat.

Incompatible materials Oxidizing agent. Strong bases.

Hazardous decomposition products Burning produces obnoxious and toxic fumes. Carbon monoxide. Carbon dioxide (CO2). Aldehydes.

11. TOXICOLOGICAL INFORMATION

Information on likely routes of exposure

Product Information

Inhalation Specific test data for the substance or mixture is not available.

Eye contact Specific test data for the substance or mixture is not available.

Skin contact Specific test data for the substance or mixture is not available.

Ingestion Specific test data for the substance or mixture is not available.

Information on toxicological effects

Symptoms None known.

Numerical measures of toxicity

Acute toxicity

The following values are calculated based on chapter 3.1 of the GHS document .

Unknown acute toxicity No information available

Component Information

Chemical name	Oral LD50	Dermal LD50	Inhalation LC50
Benzene, ethenyl 100-42-5	= 1000 mg/kg (Rat)	-	= 11.7 mg/L (Rat) 4 h
n-Hexane 110-54-3	= 25 g/kg (Rat)	= 3000 mg/kg (Rabbit)	= 48000 ppm (Rat) 4 h

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Skin corrosion/irritation No information available.

Serious eye damage/eye irritation No information available.

Respiratory or skin sensitization No information available.

Germ cell mutagenicity No information available.

Carcinogenicity No information available.

The table below indicates whether each agency has listed any ingredient as a carcinogen.

Chemical name	ACGIH	IARC	NTP	OSHA
Benzene, ethenyl 100-42-5	-	Group 2B	Reasonably Anticipated	X

Reproductive toxicity No information available.

STOT - single exposure No information available.

STOT - repeated exposure No information available.

Target organ effects Respiratory system, lungs.

Aspiration hazard No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity .

Chemical name	Algae/aquatic plants	Fish	Toxicity to microorganisms	Crustacea
Benzene, ethenyl 100-42-5	1.4: 72 h Pseudokirchneriella subcapitata mg/L EC50 0.72: 96 h Pseudokirchneriella subcapitata mg/L EC50 0.46 - 4.3: 72 h Pseudokirchneriella subcapitata mg/L EC50 static 0.15 - 3.2: 96 h Pseudokirchneriella subcapitata mg/L EC50 static	3.24 - 4.99: 96 h Pimephales promelas mg/L LC50 flow-through 19.03 - 33.53: 96 h Lepomis macrochirus mg/L LC50 static 6.75 - 14.5: 96 h Pimephales promelas mg/L LC50 static 58.75 - 95.32: 96 h Poecilia reticulata mg/L LC50 static	-	3.3 - 7.4: 48 h Daphnia magna mg/L EC50
n-Hexane 110-54-3	-	2.1 - 2.98: 96 h Pimephales promelas mg/L LC50 flow-through	-	1000: 24 h Daphnia magna mg/L EC50

Persistence and degradability No information available.

Bioaccumulation Not likely to bioaccumulate.

Component Information

Chemical name	Partition coefficient
Benzene, ethenyl 100-42-5	2.95

Other adverse effects No information available.

13. DISPOSAL CONSIDERATIONS

Waste treatment methods

Waste from residues/unused products Dispose of in accordance with local regulations. Dispose of waste in accordance with environmental legislation.

Contaminated packaging Do not reuse empty containers.

US EPA Waste Number U009 U080

California Hazardous Waste Status This product contains one or more substances that are listed with the State of California as a hazardous waste.

Chemical name	California Hazardous Waste Status
Benzene, ethenyl 100-42-5	Toxic Ignitable
n-Hexane 110-54-3	Toxic Ignitable

14. TRANSPORT INFORMATION

DOT Not regulated

TDG Not regulated

MEX Not regulated

ICAO (air) Not regulated

IATA Not regulated

IMDG Not regulated

RID Not regulated

ADR Not regulated

ADN Not regulated

15. REGULATORY INFORMATION

International Inventories

TSCA Listed

DSL/NDSL	Listed
EINECS/ELINCS	Listed
ENCS	Listed
IECSC	Listed
KECL	Listed
PICCS	Listed
AICS	Listed

Legend:
TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List
EINECS/ELINCS - European Inventory of Existing Chemical Substances/European List of Notified Chemical Substances
ENCS - Japan Existing and New Chemical Substances
IECSC - China Inventory of Existing Chemical Substances
KECL - Korean Existing and Evaluated Chemical Substances
PICCS - Philippines Inventory of Chemicals and Chemical Substances
AICS - Australian Inventory of Chemical Substances

US Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute health hazard	No
Chronic Health Hazard	Yes
Fire hazard	No
Sudden release of pressure hazard	No
Reactive Hazard	No

CWA (Clean Water Act)
This product contains the following substances which are regulated pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Chemical name	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants	CWA - Hazardous Substances
Benzene, ethenyl 100-42-5	1000 lb	-	-	X

CERCLA
This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302).

Chemical name	Hazardous Substances RQs	CERCLA/SARA RQ	Reportable Quantity (RQ)
Benzene, ethenyl 100-42-5	1000 lb	-	RQ 1000 lb final RQ RQ 454 kg final RQ
n-Hexane 110-54-3	5000 lb	-	RQ 5000 lb final RQ RQ 2270 kg final RQ

US State Regulations

California Proposition 65
This product contains carbon black which is classified as a possible carcinogen when present as respirable dust. This is not relevant for this product since it is not in a respirable form. This product contains the following Proposition 65 chemicals:.

Chemical name	California Proposition 65
Carbon mesoporous (Bound) - 1333-86-4	Carcinogen
Acrylonitrile - 107-13-1	Carcinogen
Methylene Chloride - 75-09-2	Carcinogen

U.S. State Right-to-Know Regulations

US State Regulations

Chemical name	New Jersey	Massachusetts	Pennsylvania
Carbon mesoporous (Bound) 1333-86-4	X	X	X
Benzene, ethenyl 100-42-5	X	X	X
n-Hexane 110-54-3	X	X	X
Acrylonitrile 107-13-1	X	X	X
2-Propenenitrile 9003-54-7	X	-	-

U.S. EPA Label Information

EPA Pesticide Registration Number Not applicable

16. OTHER INFORMATION, INCLUDING DATE OF PREPARATION OF THE LAST REVISION

NFPA	**Health hazards** 0	**Flammability** 0	**Instability** 0	**Physical and chemical properties** -
HMIS	**Health hazards** 1*	**Flammability** 0	**Physical hazards** 0	**Personal protection** X

Chronic Hazard Star Legend ** = Chronic Health Hazard*

Revision Date 27-Jan-2017

Revision Note No information available.

Disclaimer

The information provided in this Safety Data Sheet derives from a third party source. Whilst we believe that the information is correct as at the date of its publication, we do not make any representations or warranties regarding the accuracy or completeness of the information nor the quality or specification of any materials, substances or mixtures referred to herein (collectively, "Materials"). The information is being provided solely as a guideline for the safe handling, use, consumption, processing, storage, transportation, disposal and release of the Materials. The information may not be sufficient for such purposes and the user should not place any reliance on the information provided. The information may not be applicable to Materials that are combined with any materials or in any process other than as expressly stated herein. We shall not be liable for any kind of liability including, without limitation, damages, losses or expenses, arising out of or as a result of any reliance on the information contained in this Safety Data Sheet. This Safety Data Sheet remains our exclusive property and should not be reproduced, modified or distributed without our prior written consent.

End of Safety Data Sheet