



SAFETY DATA SHEET

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND THE COMPANY/UNDERTAKING

1.1 Product identifier

Product name	Engineering Series – Tough Resin
Product description	Photopolymer Resin for 3D-printing (SLA & DLP)
Alternative names	Engineering Tough Resin
Issue date	26-November-2019
Version number	01

1.2 Relevant identified uses of the substance or mixture and uses advised against

Identified use	Photopolymer is monomer based on acrylic esters for DLP and/or LCD 3D printers with UV-light systems.
Uses advised against	None known

1.3 Details of the supplier of the safety data sheet

Company name	Formfutura BV
Address	Groenestraat 215, 6531 HH Nijmegen, The Netherlands
Telephone	+31 (0)85 743 4000 (Office hours Mo. - Fr. 09:00 - 17:00 CET)
e-mail	product.compliance@formfutura.com
Contact person	Product compliance

1.4 Emergency telephone number +31 (0)30 274 8888, only for the doctor National Poison Information Center Utrecht, The Netherlands

SECTION 2: HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

According to Regulation (EG) No. 1272/2008 [CLP].

Skin irrit. Cat. 2	H315
Skin sens. Cat. 1	H317
Eye irrit. Cat. 1	H319
Aquatic chronic Cat. 4	H413

2.2 Label elements



Signal word	Warning
Hazard statement(s)	H315: Causes skin irritation. H317: May cause an allergic skin reaction. H319: Causes serious eye irritation. H413: May cause long-lasting harmful effects to aquatic life.
Precautionary statement(s)	P280: Wear protective gloves/protective clothing/eye protection/face protection. P261: Avoid breathing dust/fumes/gas/mist/vapours/spray. P264: Wash thoroughly after handling. P272: Contaminated work clothing should not be allowed out of the workplace. P273: Avoid release to the environment. P302+P352: IF ON SKIN: Wash with plenty of water. P302+P352: IF ON SKIN: Wash with plenty of water. P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing. P333+P313: If skin irritation or a rash occurs: Get medical advice/attention. P362+P364: Take off contaminated clothing and wash it before reuse. P501: Dispose of contents/container in accordance with local/regional/national/international regulation.





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2.3 Other hazards

Not classified as PBT or vPvB.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

This product is a mixture.

3.2 Mixtures

Substances in the product which may present a health or environmental hazard, or which have been assigned occupational exposure limits, are detailed below.

According to Regulation (EG) Nr. 1272/2008 [CLP].

Hazardous ingredient(s)	%W/W	EINECS No.	Hazard Class and Category Code(s)	Hazard statement Code(s)
Methacrylic Oligomer	40 - 60	Proprietary	Aquatic chronic Cat 4	H413
Glycol Methacrylate	10 - 30	212-782-2	Skin sens. Cat 1 Eye irrit. Cat 2	H317 H319
Urethane Acrylate Oligomer	20-45	Proprietary	Skin irrit. Cat 2 Skin sens. Cat 1 Eye irrit. Cat 2	H315 H317 H319
Benzoxazole	<0,5	230-426-4	Aquatic chronic Cat 4	H413
Phosphine Oxide	<2	278-355-8	Skin sens. Cat 1 Repr. Cat 2 (fer.) Aquatic chronic Cat 2	H317 H361f H411

For full text of H phrases see section 16.

SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Inhalation	IF INHALED: Move into fresh air and keep at rest. Get medical attention if any discomfort continues.
Skin Contact	IF ON SKIN (or hair): Remove contaminated clothing immediately and wash skin with soap and water. Get medical attention promptly if irritation or other symptoms occur after washing.
Eye Contact	IF IN EYES: Continue to rinse for at least 15 minutes under running water with eyelids held open. Get medical attention if any discomfort continues.
Ingestion	Do not induce vomiting. Never induce vomiting or give anything by mouth if the victim is unconscious or having convulsions. Immediately rinse mouth and drink plenty of water. Keep person under observation. If person becomes uncomfortable get medical attention.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2) and/or in section 11. Further important symptoms and effects are so far not known.

4.3 Indication of the immediate medical attention and special treatment needed

Note to physician

Treatment: Treat according to symptoms (decontamination, vital functions), no known specific antidote.

SECTION 5: FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable Extinguishing Media	Water spray, dry powder, CO ₂ .
Unsuitable Extinguishing Media	Water jet.

5.2 Special hazards arising from the substance or mixture

Hazards during fire-fighting	Harmful vapors
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Evolution of fumes/fog

High temperatures may cause spontaneous polymerizing reaction generating heat/pressure. Closed containers may rupture or explode during a runaway polymerization. Use a water spray or fog to reduce temperature of containers.

5.3 Advice for fire-fighters

Protective equipment

Wear a self-contained breathing apparatus and full protective clothing.

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use protective gloves, goggles and suitable protective clothing. In case of inadequate ventilation, use respiratory protection. Maximize ventilation after accidental release.

6.2 Environmental precautions

Contain contaminated water / firefighting water. Do not discharge into drains/surface waters/groundwater. Avoid release to the environment.

6.3 Methods and material for containment and cleaning up

Remove sources of ignition. Absorb with sand or other inert absorbent. Spillage may be stored as chemical waste in approved area.

6.4 Reference to other sections

See section 8, 13.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

Keep away from heat, sparks and open flame. Use mechanical ventilation in case of handling which causes formation of vapors. Handle and open container with care. Wear full protective clothing for prolonged exposure and/or high concentrations. Take precautionary measures against static discharges.

7.2 Conditions for safe storage, including any incompatibilities

Protect from light, including direct sunrays. Container may be filled for only 90%. Keep containers tightly closed, separate from oxidizing agents. Store in original container in a dry, cool and well-ventilated place. Store at temperatures between 5°C and 30°C. Do not expose to temperatures above 50°C for more than 24 hours. High temperatures may cause spontaneous polymerization.

7.3 Specific end use(s)

None.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Substance	EC No.
Methacrylic Oligomer (100%)	Proprietary

DNEL (100% component)	Oral	Inhalation	Dermal
Worker – Long Term – Systemic effects	1	3,52 mg/m ³	2 mg/kg

PNEC (100% component)	
Aquatic Compartment	Not applicable
Terrestrial Compartment	Not applicable

1 Toxicity: DNEL not established

Substance	EC No.	LTEL ppm (8 Hr TWA)	LTEL mg/m ³ (8 h TWA)
Glycol Methacrylate (100%)	212-782-2	0,05	0,24





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DNEL (100% component)	Oral	Inhalation	Dermal
Worker – Long Term – Systemic effects	1	4,9 mg/m ³	1,3 mg/kg

PNEC (100% component)	
Aquatic Compartment	10 mg/l (Fresh water) 0,482 mg/l (Sea water) 3,79 mg/kg dry weight (sediment)
Terrestrial Compartment	0,476 mg/kg dry weight

1 Toxicity: DNEL not established

Substance	EC No.
Urethane Acrylate Oligomer (100%)	Proprietary

DNEL (100% component)	Oral	Inhalation	Dermal
Worker – Long Term – Systemic effects	1	1	1

PNEC (100% component)	
Aquatic Compartment	Not applicable
Terrestrial Compartment	Not applicable

1 Toxicity: DNEL not established

Substance	EC No.
Phosphine Oxide (100%)	278-355-8

DNEL (100% component)	Oral	Inhalation	Dermal
Worker – Long Term – Systemic effects	1	3,5 mg/m ³	1,0 mg/kg

PNEC (100% component)	
Aquatic Compartment	0,00353 mg/l (Fresh water) 0,000353 mg/l (Sea water) 0,29 mg/kg dry weight (sediment)
Terrestrial Compartment	0,0557 mg/kg dry weight

1 Toxicity: DNEL not established

Substance	EC No.
Benzoxazole (100%)	230-426-4





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DNEL (100% component)	Oral	Inhalation	Dermal
Worker – Long Term – Systemic effects	1	1	1

PNEC (100% component)	
Aquatic Compartment	Not applicable
Terrestrial Compartment	Not applicable

1 Toxicity: DNEL not established

8.2 Exposure controls

Appropriate engineering controls

Do not eat, drink or smoke at the work place. Provide adequate ventilation, including appropriate local extraction, to ensure that the defined occupational exposure limit is not exceeded.

Individual protection measures, such as personal protective equipment (PPE)

Eye/face protection	Wear eye/face protection. Wear approved chemical safety goggles where eyes exposure must be provided. High-efficiency particulate respirator with full face-piece.
Skin protection	Wear suitable gloves. Butyl and nitrile rubber gloves offer short-term protection. Later surgical gloves offer little protection. Gloves should be stored correctly and changed regularly, especially if excessive exposure has occurred.
Respiratory protection	Wear suitable respiratory protective equipment if engineering controls are insufficient, or not present, and exposure to levels above the DNEL is likely. A suitable mask with filter type A (EN141 or EN405) may be appropriate.
Other	Keep working clothes separately. Take off contaminated clothing immediately. Wash soiled clothing before reuse. Keep away from food, drinks and animal feed. Wash hands thoroughly after handling.

Environmental exposure controls

Ensure effective control measures when working within the boundaries as specified in section 6.2 of each GES.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

Appearance	Viscous liquid - different colors possible
Odour	Ester like
pH	Not applicable
Melting point	Not applicable
Boiling point	> 200°C
Flash point	> 150°C
Flammable Limits (lower) (%v/v)	Not applicable
Vapour pressure	-
Solubility (Water)	Not soluble
Solubility	Good solubility with most organic solvents
Auto ignition temperature	380°C
Explosive properties	Not applicable
Oxidising properties	Not applicable
Relative density	1.1-1.2 (water = 1)





Viscosity 1-2 Pa•s

9.2 Other information

None.

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity

See part 10.2.

10.2 Chemical stability

Stable under normal temperature conditions. Stable if stored and handles as prescribed/indicated.

10.3 Possibility of hazardous reactions

Hazardous polymerization. May polymerize.

10.4 Conditions to avoid

Avoid heat, flames and other sources of ignition. Avoid contact with free radical initiators. Avoid contact with isocyanates and oxidizing agents. Avoid contact with vinyl polymerization initiators. Avoid exposure to high temperatures, direct sunlight or ultra violet (UV) radiation.

10.5 Incompatible materials

Avoid contact with radical forming initiators, peroxides, strong alkalies or reactive metals to prevent exothermic polymerization.

10.6 Hazardous Decomposition Product(s)

With regard to possible decomposition products refer to Section 5.Oxides of carbon.

SECTION 11: TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Stable Acute toxicity:

Methacrylic Oligomer (100%)

LD50 acute oral rat	>2000 mg/kg
LD50 acute dermal rabbit	>2000 mg/kg
Skin irritation (rabbit, 24 h, Draize)	No irritation
Eye irritation (rabbit, Draize)	No irritation
Inhalation/skin sensitisation (guinea pig, GPMT)	No sensitization
Aspiration Hazard	No aspiration hazard expected

Glycol Methacrylate (100%)

LD50 acute oral rat	>5000 mg/kg
LD50 acute dermal rabbit	>5000 mg/kg
Skin irritation (rabbit, 24 h, Draize)	No irritation
Eye irritation (rabbit, Draize)	Irritating
Inhalation/skin sensitisation (guinea pig, GPMT)	Sensitizing
Aspiration Hazard	No aspiration hazard expected
Chronic toxicity oral rat (OESO 422)	> 100 mg/kg
Reproductive toxicity (animal studies)	No suspicion of a toxic effect on reproduction

Urethane Acrylate Oligomer (100%)

Skin irritation	Irritating
Eye irritation	Irritating
Skin sensitization	May cause sensitization by skin contact
Aspiration Hazard	No aspiration hazard expected

Phosphine Oxide (100%)

LD50 acute oral rat	> 2000 mg/kg
Skin irritation (rabbit, 24 h, Draize)	No irritation
Eye irritation (rabbit, Draize)	No irritation
Skin sensitization mouse LLNA (OESO 429)	Sensitizing





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Aspiration Hazard	No aspiration hazard expected
Chronic toxicity (animal studies)	May cause damage after repeated ingestion of high doses
Reproductive toxicity (animal studies)	Suggest a fertility impairing effect

Benzoxale (100%)

Skin irritation	No irritation
Skin sensitisation	No sensitization

SECTION 12: ECOLOGICAL INFORMATION

12.1 Toxicity

Methacrylic Oligomer (100%)

Toxicity to fish (mg/l)	LL50 (96 h) (Oncorhynchus mykiss) (OESO 203)	>100
Aquatic invertebrates (mg/l)	EL50 (72 h) (Daphnia magna) (OESO 202)	>100
Aquatic plants (mg/l)	EL50 (72 h) (Pseudokirchneriella subcapitata) (OECD 201)	>100
	NOEC (72 h) (Selenastrum capricornutum) (OESO 201)	>100
Microorganisms (mg/l)	NOEC (28 d) (Activated sludge) (DEV L8)	14,3

Glycol Methacrylate(100%)

Toxicity to fish (mg/l)	LL50 (96 h) (Oncorhynchus mykiss) (OESO 203)	>100
Aquatic invertebrates (mg/l)	NOEC (21 d) (Daphnia magna) (OESO 202)	24,1
	EC50 (48 h) (Daphnia magna) (OESO 202)	380
Aquatic plants (mg/l)	EC50 (72 h) (Selenastrum capricornutum) (OESO 201)	836
	NOEC (72 h) (Selenastrum capricornutum) (OESO 201)	400
Microorganisms (mg/l)	EC50 (16 h) (Pseudomonas fluorescens) (DEV L8)	>3000

Urethane Acrylate Oligomer (100%)

No data available.

Phosphine Oxide (100%)

Toxicity to fish (mg/l)	LC50 (96 h) (Brachydanio rerio) (OESO 203)	>90
Aquatic invertebrates (mg/l)	EC50 (48 h) (Daphnia magna) (OECD 202)	>1175
Aquatic plants (mg/l)	EC50 (72 h) (Desmodesmus subspicatus) (OECD 201)	>260
Microorganisms (mg/l)	EC50 (3 h) (Activated sludge) (DEC L8)	>100

Benzoxazole (100%)

Toxicity to fish (mg/l)	LC50 (96 h) (Brachydanio rerio) (OESO 203)	>100
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12.2 Persistence and degradability

Methacrylic Oligomer (100%)

Poorly biodegradable.

Elimination information:

24% after 28 d (OESO 301D)

54% after 63 d (OESO 301D)

Glycol Methacrylate (100%)

Easy biodegradable.

Elimination information:

84% DOC reduction (28 d) (OESO 301 D)

Urethane Acrylate Oligomer (100%)

No data available.

Phosphine Oxide (100%)





Poorly biodegradable. Not readily biodegradable (by OECD criteria)

Elimination information:

< 20% BOD of the ThOD (28 d) (OECD 301 F) (activated sludge)

Benzoxazole (100%)

No data available.

12.3 Bioaccumulative potential

Methacrylic Oligomer (100%)

Possible bioaccumulative.

Glycol Methacrylate (100%)

Accumulation in organisms is not to be expected.

Urethane Acrylate Oligomer (100%)

No data available.

Phosphine Oxide (100%)

Does not significantly accumulate in organisms

Bioconcentration factor: 23 – 55 (56 d), *Cyprinus carpio* (measured): does not significantly accumulate in organisms.

Benzoxazole (100%)

No data available

12.4 Mobility in soil

Methacrylic Oligomer (100%)

Soluble in water. Adsorption: water – Log Koc: 3,88.

Glycol Methacrylate (100%)

The substance will not evaporate into the atmosphere from the water surface. Adsorption to solid soil phase is not expected.

Urethane Acrylate Oligomer (100%)

No data available.

Phosphine Oxide (100%)

The substance will not evaporate into the atmosphere from the water surface. Adsorption to solid soil phase is not expected.

Benzoxazole (100%)

No data available.

12.5 Results of PBT and vPvB assessment

Methacrylic Oligomer (100%)

PBT: no

vPvB: no

Glycol Methacrylate (100%)

PBT: no

vPvB: no





Urethane Acrylate Oligomer (100%)

PBT: no

vPvB: no

Phosphine Oxide (100%)

PBT: no

vPvB: no

Benzoxazole (100%)

PBT: no

vPvB: no

12.6 Other adverse effects

Methacrylic Oligomer (100%)

Not applicable.

Glycol Methacrylate (100%)

Do not allow to enter soil, waterways or waste water channels.

Urethane Acrylate Oligomer (100%)

Not applicable.

Phosphine Oxide (100%)

Not applicable.

Benzoxazole (100%)

No data available.

SECTION 13: DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Do not discharge into drains/surface waters/groundwater. Dispose of in accordance with national, state and local regulations. Incinerate under approved controlled conditions, using incinerators for the disposal for organic chemicals. Decontaminate empty drums before recycling.

SECTION 14: TRANSPORT INFORMATION

14.1 UN-Number

Not classified as a dangerous good under transport regulations.

14.2 UN Proper Shipping Name

Not applicable.

14.3 Transport hazard class(es)

Not applicable.

14.4 Packing group

Not applicable.

14.5 Environmental hazards

Toxic to aquatic life with long lasting effects.

14.6 Special precautions for user

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14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code

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SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture





If information other than the information in relation to safety, health and environmental regulations / legislation what is mentioned elsewhere in this Safety Data Sheet is required, please use the information listed in Section 1 to inquire whether that specific information is available. Related information about the separate components in the mixture can be accessed the same way.

15.2 Chemical Safety Assessment

A Chemical Safety Assessment has been carried out for the following individual component (100%): Glycol Methacrylate.

SECTION 16: OTHER INFORMATION

This Safety Data Sheet was prepared in accordance with EC Regulation (EC) No. 453/2010.

The information provided in this Material Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of publication. The information given is designed only as guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process unless specified in the text.

LEGEND

Note: Not all of the following are necessarily contained in this Safety Data Sheet:

IOELV:	Indicative Occupational Exposure Limit Value.
WEL:	Workplace Exposure Limit.
Sen:	Capable of causing respiratory sensitization.
Carc:	Capable of causing cancer and/or heritable genetic damage.
COM:	The company aims to control exposure in its workplace to this limit.
LTEL:	Long Term Exposure Limit.
STEL:	Short Term Exposure Limit.
TWA:	Time Weighted Average.
STOT SE:	Specific Target Organ Toxicity – Single Exposure.
Repr.:	Reproductive toxicity.
Aquatisch acute/chronic:	Hazardous to the aquatic environment.

Full text of H/P/R phrases

H317:	May cause an allergic skin reaction.
H319:	Causes serious eye irritation.
H361f:	Suspected of damaging fertility.
H411:	Toxic to aquatic life with long-lasting effects.
H412:	Harmful to aquatic life with long lasting effects.
H413:	May cause long-lasting harmful effects to aquatic life.
P261:	Avoid breathing vapors.
P272:	Contaminated work clothing should not be allowed out of the workplace.
P273:	Avoid release to the environment.
P280:	Wear protective gloves/protective clothing/eye protection/face protection.
P302 + P352:	IF ON SKIN: Wash with plenty of soap and water.
P333 + P313:	If skin irritation or rash occurs: Get medical advice/attention.
P362 + P364:	Take off contaminated clothing and wash it before reuse.
P501:	Dispose of contents/container to hazardous waste in accordance with local, state or national legislation. Incinerate under approved controlled conditions, using incinerators suitable for the disposal of flammable organics.

