SAFETY DATA SHEET

1. Identification

Product identifier **MALEIC ANHYDRIDE**

Other means of identification

SDS number 9437

Recommended use This material is used in unsaturated polyester resins, paper sizing, lubricating oil additives, flavor enhancers, personal care products and other consumer products.

Recommended restrictions Other uses are not recommended unless an assessment is completed, prior to commencement of that use, which demonstrates that the use will be controlled.

Manufacturer Information

INEOS Joliet, LLC
23425 Amoco Road
Channahon, IL
60410
United States

Telephone numbers - 24 hour emergency assistance

Chemtrec (US) 800-424-9300

Telephone numbers - general assistance

24 HR (7 DAYS) (8-5 M-F, CST) SDS Assistance: 866-400-4343
815-467-3360

Recommended use and limitations on use This material is used in unsaturated polyester resins, paper sizing, lubricating oil additives, flavor enhancers, personal care products and other consumer products.

2. Hazard(s) identification

Physical hazards Not classified.

Health hazards

Acute toxicity, oral	Category 4
Skin corrosion/irritation	Category 1B
Serious eye damage/eye irritation	Category 1
Sensitization, respiratory	Category 1
Sensitization, skin	Category 1
Specific target organ toxicity, repeated exposure (inhalation)	Category 1 (respiratory system)
Specific target organ toxicity, repeated exposure (oral)	Category 2 (kidney)

Environmental hazards Hazardous to the aquatic environment, acute hazard Category 3

OSHA defined hazards Combustible dust

Label elements

Signal word Danger

Hazard statement Harmful if swallowed. Causes severe skin burns and eye damage. May cause allergy or asthma symptoms or breathing difficulties if inhaled. May cause an allergic skin reaction. Causes damage to organs (respiratory system) through prolonged or repeated exposure by inhalation. May cause damage to organs (kidneys) through prolonged or repeated exposure by ingestion.

Precautionary statement

Prevention Do not breathe dust. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. In case of inadequate ventilation wear respiratory protection. Wear protective gloves/protective clothing/eye protection/face protection. Contaminated work clothing should not be allowed out of the workplace.

Response If swallowed: Rinse mouth. Do NOT induce vomiting. Call a poison center/ doctor if you feel unwell.

If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.

If inhaled: Remove person to fresh air and keep comfortable for breathing. Immediately call a poison center/doctor.

If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

Wash contaminated clothing before reuse. Specific treatment (see first aid instructions on this label).

Storage Store locked up.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information None.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
MALEIC ANHYDRIDE		108-31-6	100

Composition comments This Safety Data Sheet is intended to communicate potential health hazards and potential physical hazards associated with the product(s) covered by this sheet and is not intended to communicate product specification information. For product specification information, contact your INEOS Joliet, LLC representative.

4. First-aid measures

Inhalation Remove to fresh air. If not breathing, institute rescue breathing. If breathing is difficult, ensure airway is clear and give oxygen. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR).

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Skin contact

For cold material, immediately flush skin with plenty of water, for at least 15 minutes, after removing contaminated clothing and shoes. In case of chemical burns, cover area with sterile dry dressing, bandage securely but not too tightly. GET IMMEDIATE MEDICAL ATTENTION.

If hot material gets on skin, immediately flush affected area with large amounts of cool water. Do not attempt to remove the material from the skin, or to remove contaminated clothing. Get immediate medical attention.

Contaminated clothing should be vacuumed with a HEPA-type filter or sprayed with water to prevent the spread of dust. Launder clothing before re-use.

Eye contact

Flush immediately with large amounts of water for at least 30 minutes. Eyelids should be held away from the eyeball to ensure thorough rinsing. GET IMMEDIATE MEDICAL ATTENTION.

Ingestion

If spontaneous vomiting occurs, keep head below hips to prevent aspiration and monitor for breathing difficulty.

Never give anything by mouth to an unconscious person.

Keep affected person warm and at rest. GET IMMEDIATE MEDICAL ATTENTION.

Most important symptoms/effects, acute and delayed

INHALATION:
Breathing vapor or dust may be severely irritating. Symptoms may include throat burns, constriction of the windpipe (bronchospasms), severe pulmonary edema and death, depending on the concentration and duration of exposure.

Maleic anhydride is a respiratory sensitizer. In susceptible individuals repeated inhalation of dust or vapor may result in an immediate onset of asthma-like symptoms (coughing, sneezing, tightness in the chest, and wheezing).

SKIN:
Material is corrosive on contact with water or moisture. Causes severe skin irritation with redness, itching or burning feeling, and/or swelling of the skin. May cause skin damage. May cause an allergic reaction in some individuals.

Skin contact may cause harmful effects in other parts of the body.

EYES:
Material is corrosive on contact with water or moisture.

INGESTION:
Swallowing this material may be harmful. May cause painful irritation and burning of the mouth and throat, painful swallowing, labored breathing, burns or perforation of the gastrointestinal tract leading to ulceration and secondary infection.

Indication of immediate medical attention and special treatment needed

INHALATION: Treat as corrosive material. Monitor for possible pharyngeal and pulmonary edema. Onset may be delayed up to 24 hours from the time of exposure. Administer supplemental oxygen with assisted ventilation, as required.

Acute asthmatic reactions to maleic anhydride/acid should be treated like acute asthma from any cause.

INGESTION: This product is primarily an irritant and corrosive. As a corrosive, give attention to potential complication of esophagus or stomach perforations if ingested. Use of emetics and lavage are contraindicated. Necrosis and associated inflammatory processes peak at about 48 hours, but may extend up to four days. Initial healing processes occur during the period 4 to 14 days, but the esophageal wall is weakest during this period.

SKIN: Hot material may cause skin burns.

EYES: Hot material may cause burns to the eyes. Early ophthalmologic evaluation is recommended.

5. Fire-fighting measures

Suitable extinguishing media

Small Fires: CO2, dry chemical, dry sand, alcohol-resistant foam.

Large Fires: Water spray, fog or alcohol resistant foam.

Unsuitable extinguishing media

Do not use a straight stream.

Specific hazards arising from the chemical	Combustion may produce COx, reactive hydrocarbons, irritating vapors, and other decomposition products in the case of incomplete combustion. Material will burn in a fire. Airborne dust in sufficient concentrations when confined and exposed to a sufficient ignition source can explode.
Special protective equipment and precautions for firefighters	Do not add water to anhydride. Water applied directly results in evolution of heat and conversion to acid. Acid can react with metals to liberate flammable hydrogen gas, especially when diluted with water. Always stay away from tanks engulfed in flame. Evacuate area and fight fire from a safe distance. Use water spray to cool adjacent structures and to protect personnel. Do not get water inside containers. Shut off source of flow, if possible. Firefighters must wear NIOSH approved positive pressure breathing apparatus (SCBA) with full face mask and full protective equipment.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures	Keep unnecessary people away; isolate hazard area and deny entry. For spills in confined areas, ensure adequate ventilation. For spills outdoors, stay upwind. IF TANK, RAILCAR OR TANK TRUCK IS INVOLVED IN A FIRE, isolate for 800 meters (1/2 mile) in all directions. Evacuate area endangered by release as required. Wear appropriate personal protective equipment. See Exposure Controls/Personal Protection (Section 8).
Methods and materials for containment and cleaning up	Keep unnecessary people away. Isolate area for at least 50 meters (164 feet) in all directions to preserve public safety. For large spills, if downwind consider initial evacuation for at least 300 meters (1000 feet). Keep ignition sources out of area and shut off all ignition sources. Use non-sparking tools and grounded equipment for clean-up. Small Spills: Shovel into a container for later disposal. Avoid cleanup procedures that may result in water pollution. Large spills: Wet down with water and dike for later disposal. Do not touch or walk through spilled material. Stop spill when safe to do so. See Exposure Controls/Personal Protection (Section 8).
Environmental precautions	Prevent entry into water ways, sewers, basements or confined areas. Notify local authorities and National Response Center, if required.

7. Handling and storage

Precautions for safe handling

Avoid contact with strong oxidizers and alkalis. Extremely reactive or incompatible with alkali metal ions, alkaline earth ions, and alkylamines. Any stream, water or condensate that comes in contact with this material should not contain more than 100 ppm of these metals. Prevent small spills to minimize slip hazard or release to the environment. Materials should be handled, stored and shipped in a manner to prevent dust evolution. Heated material can cause thermal burns. Do not cut, grind, drill, weld or reuse empty containers unless adequate precautions are taken.

If dusts are generated at your facility during the handling and processing of this material, then this material, in its finely divided form, may present an explosion hazard when dispersed in an unconfined or confined area such as a building or vessel in a sufficient concentration and in the presence of oxygen and heat (spark). Ignition of a dust cloud in an unconfined area may result in a fireball. Ignition of a dust cloud in a confined space may result in a pressure buildup in equipment. In addition, if dusts are generated at your facility, determine the explosibility parameters of the dust formed within your facility. Bond and ground lines and equipment (tank, transfer lines, pump, floats, etc.) used during transfer to reduce the possibility of static spark-initiated fire or explosion. Use non-sparking tools.

For additional safety information, consult the current editions of the National Fire Protection Association (NFPA) 654 Standard for the Prevention of Fire and Dust Explosions from the Manufacturing, Processing, and Handling of Combustible Particulate Solids, NFPA 499, Recommended Practice for the Classification of Combustible Dusts and of Hazardous (Classified) Locations for Electrical Installations in Chemical Process Areas, NFPA 77, Recommended Practice on Static Electricity, and NFPA 68, Standard on Explosion Protection by Deflagration Venting.

Avoid personal contact with this material. Always observe good personal hygiene measures, such as removing contaminated clothing and protective equipment, washing after handling the material and before entering public areas. Restrict eating, drinking and smoking to designated areas to prevent personal chemical contamination. Routinely wash work clothing and protective equipment to remove contaminants. Do not breathe dust.

Conditions for safe storage, including any incompatibilities

Store in tightly closed containers in a cool, dry, isolated, well-ventilated area away from heat, sources of ignition and incompatibles. Ground/bond container and equipment. Avoid contact with strong oxidizers and alkalis. Extremely reactive or incompatible with alkali metal ions, alkaline earth ions, and alkylamines. Any stream, water or condensate that comes in contact with this material should not contain more than 100 ppm of these metals.

Empty containers may contain material residue. Do not reuse without adequate precautions.

8. Exposure controls/personal protection

Occupational exposure limits

U.S. - OSHA

Material	Type	Value
MALEIC ANHYDRIDE	TWA	0.25 ppm

ACGIH

Material	Type	Value	Form
MALEIC ANHYDRIDE	TWA	0.0025 ppm	Inhalable Fraction and Vapor; Sensitizer

U.S. - NIOSH

Material	Type	Value
MALEIC ANHYDRIDE	TWA	0.25 ppm

Biological limit values

No biological exposure limits noted for the ingredient(s).

Appropriate engineering controls	Consider the following when employing engineering controls and selecting personal protective equipment: potential hazards of the material, applicable exposure limits, job activities, and other substances in the work place. Ventilation and other forms of engineering controls are the preferred means for controlling exposures below occupational exposure limits and guidelines. These engineering controls are not necessary for this material if it remains in the molten form. However, if the material is allowed to solidify and then ground into dust, follow the guidance below. Use explosion-proof equipment if high dust/air concentrations are possible. Use only appropriately classified electrical equipment and powered industrial trucks. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit. It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment. Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).

Individual protection measures, such as personal protective equipment

Eye/face protection	Keep away from eyes. Eye contact can be avoided by using chemical safety glasses, goggles and/or face shield. Have eye washing facilities readily available where eye contact can occur.
Skin protection	
Hand protection	Prevent any skin contact with this material. Use appropriate chemical resistant gloves. Glove suitability for a job must be determined by the user for specific use conditions. Contact the glove manufacturer for specific advice on glove selection regarding permeability and breakthrough times for your use conditions. Gloves should be discarded and replaced if there is any indication of degradation or chemical breakthrough. When handling hot material, use heat resistant gloves.
Other	Prevent any skin contact with this material. Use appropriate chemical resistant gloves, clothing and eye/face protection.
Respiratory protection	A NIOSH approved dust respirator may be appropriate under certain circumstances where airborne concentrations are expected to exceed exposure limits. Protection provided by air purifying respirators is limited. Use a positive pressure air supplied respirator if there is any potential for an uncontrolled release, exposure levels are not known, or any other circumstances where air purifying respirators may not provide adequate protection. See OSHA 29 CFR 1910.134 for more information regarding respiratory protection and Assigned Protection Factors (APFs).
Thermal hazards	Contact with hot material can cause thermal burns which may result in permanent damage. Wear appropriate thermal protective clothing. Additional protection may be necessary to prevent skin contact including use of apron, arm covers, face shield, or boots.

9. Physical and chemical properties

Appearance

Physical state	Solid.
Form	Transported as molten liquid
Color	Colorless
Odor	Strong, acid
Odor threshold	Not available.
pH	Not applicable
Melting point/freezing point	127 °F (52.78 °C) / Not available
Initial boiling point and boiling range	396 °F (202.2 °C) at 760 mm Hg
Flash point	216 °F (102.22 °C) Tag Closed Clup (ASTM D56)
Evaporation rate	Not applicable
Flammability (solid, gas)	Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)	1.4 %
Flammability limit - upper (%)	7.1 %
Explosive limit - lower (%)	See flammability limit

Explosive limit - upper (%)	See flammability limit
Vapor pressure	0.16 mm Hg at 68 °F (20 °C)
Vapor density	3.38 (Air=1 at boiling point of maleic anhydride)
Relative density	1.31 Liquid; 1.48 (Solid) at 60/60 °F (15.6/15.6 °C)
Solubility(ies)	
Solubility (water)	407 g/L, 20 °C (68 °F), pH 7 Buffer Solution
Partition coefficient (n-octanol/water)	-2.61 (Assuming Hydrolysis to Acid)
Auto-ignition temperature	891 °F (477.22 °C)
Decomposition temperature	Not available.
Viscosity	Not applicable
Solubility (organic solvent)	Not available.
Other information	
Density	1.48 g/ml
Molecular formula	C4H2O3
Molecular weight	98.06
VOC (Weight %)	100 % EPA estimated

10. Stability and reactivity

Reactivity	See statements below.
Chemical stability	This material is stable except when in contact with water. Reacts with water to form maleic acid. Avoid exposure to water or moisture; will evolve heat. Readily sublimes. Decomposes slowly with atmospheric moisture to form maleic acid. See precautions under Handling & Storage (Section 7).
Possibility of hazardous reactions	Not anticipated under normal conditions.
Conditions to avoid	Avoid unventilated areas, heat, open flames, sparks and ungrounded electrical equipment.
Incompatible materials	Keep away from the following materials to prevent strong exothermic reactions: Strong oxidizers, Alkalis. Extremely reactive or incompatible with alkali metal ions, alkaline earth ions, and alkylamines. Any stream, water or condensate that comes in contact with this material should not contain more than 100 ppm of these metals. See precautions under Handling & Storage (Section 7).
Hazardous decomposition products	Not anticipated under normal conditions.

11. Toxicological information

Information on likely routes of exposure

Inhalation	Likely route of exposure
Skin contact	Likely route of exposure
Eye contact	Likely route of exposure
Ingestion	Likely route of exposure

Symptoms related to the physical, chemical and toxicological characteristics

INHALATION:
Breathing vapor or dust may be severely irritating. Symptoms may include throat burns, constriction of the windpipe (bronchospasms), severe pulmonary edema and death, depending on the concentration and duration of exposure.

Maleic anhydride is a respiratory sensitizer. In susceptible individuals repeated inhalation of dust or vapor may result in an immediate onset of asthma-like symptoms (coughing, sneezing, tightness in the chest, and wheezing).

SKIN:
Material is corrosive on contact with water or moisture. Causes severe skin irritation with redness, itching or burning feeling, and/or swelling of the skin. May cause skin damage.

Skin contact may cause harmful effects in other parts of the body.

EYES:
Material is corrosive on contact with water or moisture.

INGESTION:
Swallowing this material may be harmful. May cause painful irritation and burning of the mouth and throat, painful swallowing, labored breathing, burns or perforation of the gastrointestinal tract leading to ulceration and secondary infection.

Information on toxicological effects

Acute toxicity Harmful if swallowed.

Components	Species	Test Results
MALEIC ANHYDRIDE (CAS 108-31-6)		
Acute		
Dermal		
LD50	Rabbit	2620 mg/kg
Inhalation		
LC50	Rat	> 4.35 mg/l, 1 hr
Oral		
LD50	Rat	1090 mg/kg

Skin corrosion/irritation Causes severe skin burns and eye damage.

Serious eye damage/eye irritation Causes serious eye damage.

Respiratory or skin sensitization

Respiratory sensitization May cause allergy or asthma symptoms or breathing difficulties if inhaled.

Skin sensitization May cause an allergic skin reaction.

Germ cell mutagenicity Not classified.

Carcinogenicity Not classified.

Reproductive toxicity Not classified.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Causes damage to organs (respiratory system) through prolonged or repeated exposure by inhalation. May cause damage to organs (kidney) through prolonged or repeated exposure by ingestion.

Aspiration hazard Not classified.

Toxicological data

MALEIC ANHYDRIDE: Ingestion of maleic anhydride has been reported to cause systemic effects including kidney and liver damage. Workplace studies indicate that repeated over-exposure to maleic anhydride may result in sensitization in some workers and is associated with bronchitis, asthmatic symptoms, and dermatitis. Case reports of occupational asthma and autoimmune hemolytic anemia have also been reported in workers exposed to maleic anhydride. Studies in laboratory animals confirm a potential for dermal sensitization. Likewise, sensitization to other anhydrides may result in allergic reaction to maleic anhydride.

12. Ecological information

Ecotoxicity Harmful to aquatic organisms.

Components		Species	Test Results
MALEIC ANHYDRIDE (CAS 108-31-6)			
Acute			
Other	EC50	Pseudokirchnerella subcapitata	74.35 mg/l, 72 hr
Aquatic			
Acute			
Crustacea	EC50	Daphnia magna	42.81 mg/l, 48 hr
Fish	LC50	Oncorhynchus mykiss	75 mg/l, 96 hr
Chronic			
Crustacea	NOEC	Daphnia magna	10 mg/l

Persistence and degradability Readily biodegradable in the environment.

Bioaccumulative potential Not likely to bioaccumulate in aquatic organisms.

Partition coefficient n-octanol / water (log Kow)
MALEIC ANHYDRIDE -2.61, (Assuming Hydrolysis to Acid)

Mobility in soil The half-life of the hydrolysis of maleic anhydride to maleic acid in water at 25 °C is approximately 22 sec. The chemical and physical properties suggest that virtually all of the material will partition to water and soil.

Other adverse effects No other adverse effects expected.

13. Disposal considerations

Disposal instructions This material, as supplied, when discarded or disposed of, is a listed hazardous waste according to Federal Regulations 40 CFR 261.33(f) and a characteristic hazardous waste as defined in Subpart C of 40 CFR 261. Additionally, pursuant to 40 CFR 261.33(d) and (e), any residue remaining in a container that has held this material and any residue or contaminated soil, water or other debris resulting from the cleanup of a spill of this material is also a listed hazardous waste.

The transportation, storage, treatment and disposal of waste material must be conducted in compliance with federal, state, and local regulations. Under RCRA it is the responsibility of the user of the material to determine, at the time of disposal, whether this material meets RCRA criteria for hazardous waste. For additional handling information and protection of employees, see Section 7 (Handling and Storage) and Section 8 (Exposure Controls/Personal Protection).

Hazardous waste code See below. The proper waste code must be evaluated at the time of disposal and should be determined by the user and waste disposal company.

Waste from residues / unused products Dispose of this material in accordance with all applicable local and national regulations.

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal in accordance with government regulations. Packaging may contain residue that can be hazardous.

14. Transport information

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code This product is being transported in bulk according to Annex II of MARPOL 73/78 and the IBC Code.

General information INTERNATIONAL TRANSPORTATION REQUIREMENTS: Not determined

BILL OF LADING - BULK (U. S. DOT): UN2215, Maleic Anhydride, Molten, 8, PG III, RQ

See Bill of Lading for proper shipping description.

The above description may not cover shipping in all cases, please consult 49 CFR 100-185 for specific shipping information or Transport Compliance Specialist (CSO).

15. Regulatory information

US federal regulations

All ingredients are on the TSCA inventory, or are not required to be listed on the TSCA inventory.

This material contains toxic chemical(s) in excess of the applicable de minimis concentration that are subject to the annual toxic chemical release reporting requirements of the Superfund Amendments and Reauthorization Act (SARA) Section 313 (40 CFR 372). This information must be included in all SDSs that are copied and distributed for this material.

Check local, regional or state/provincial regulations for any additional requirements as these may be more restrictive than federal laws and regulations. Failure to comply may result in substantial civil and criminal penalties.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories

Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical

Yes

SARA 313 (TRI reporting)

Chemical name	CAS number	% by wt.
MALEIC ANHYDRIDE	108-31-6	100

Other federal regulations

Clean Water Act (CWA) Section 112(r) (40 CFR 68.130)

Hazardous substance

Safe Drinking Water Act (SDWA)

Not regulated.

US state regulations

US. California Proposition 65

Based on available information this product does not contain any components or chemicals curren California to cause cancer, birth defects or reproductive harm at levels which would be subject to P use or processing of this material may affect its composition and require re-evaluation.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 12-01-2018

Revision date 12-01-2018

Version # 01

HMIS® ratings

Health: 3*
Flammability: 1
Physical hazard: 1
* Indicates chronic health hazard

NFPA ratings

Health: 3
Flammability: 2
Instability: 0

Disclaimer	THIS SDS HAS BEEN PREPARED TO COMPLY WITH FEDERAL REGULATIONS THAT ARE INTENDED TO QUICKLY PROVIDE USEFUL INFORMATION TO THE USER(S) OF THIS MATERIAL OR PRODUCT - IT IS NOT INTENDED TO SERVE AS A COMPREHENSIVE DISCUSSION OF ALL POSSIBLE RISKS OF HAZARDS, BUT RATHER PROVIDES INFORMATION GENERALLY ACCEPTED IN THE SCIENTIFIC COMMUNITY AS RELEVANT REGARDING THE POTENTIAL HAZARDS OF THIS PRODUCT. ADEQUATE TRAINING, INSTRUCTION, WARNINGS AND SAFE HANDLING PROCEDURES SHOULD BE PROVIDED TO HANDLERS AND USERS. USERS SHOULD REVIEW THE INFORMATION IN THE SDS, AND SATISFY THEMSELVES AS TO ITS SUITABILITY AND COMPLETENESS, INCLUDING ENSURING THAT THIS IS THE MOST CURRENT SDS.
Revision information	N/A