Material Safety Data Sheet

Ethylenediamine, EDA

1. Product and company identification

Product name : Ethylenediamine, EDA

Synonym : Ethylenediamine; 1,2-Ethanediamine; Ethylenediamine, >25% in a non hazardous diluent; ETHYLENE DIAMINE; 1,2-Diaminoethane, hydrate

Material uses : Industrial applications: Intermediate. Chemical synthesis.

CAS number : 107-15-3

Supplier : DELAMINE B.V.
Barchman Wuytierslaan 10
3818 LH Amersfoort
The Netherlands
Tel.:31-334676897

Validation date : ***.

In case of emergency : CHEMTREC 1-800-424-9300 OR 1-703-527-3887 (24Hours/7Days)

2. Hazards identification

Physical state : Liquid. [Viscous liquid.]

Color : Colorless.

Odor : Mild. Ammoniacal.

Emergency overview

Signal word : DANGER!

Hazard statements : COMBUSTIBLE LIQUID AND VAPOR. CAUSES EYE AND SKIN BURNS. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

Precautions : Keep away from heat, sparks and flame. Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Potential acute health effects

Inhalation : Toxic by inhalation. May give off gas, vapor or dust that is very irritating or corrosive to the respiratory system. May cause sensitization by inhalation. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.

Ingestion : Harmful if swallowed. May cause burns to mouth, throat and stomach.

Skin : Corrosive to the skin. Causes burns. Toxic in contact with skin. May cause sensitization by skin contact.

Eyes : Corrosive to eyes. Causes burns.

Potential chronic health effects

Chronic effects : May cause target organ damage, based on animal data. Once sensitized, a severe allergic reaction may occur when subsequently exposed to very low levels.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

2. Hazards identification

Target organs : May cause damage to the following organs: kidneys, liver, upper respiratory tract, skin, eyes.

Over-exposure signs/symptoms

Inhalation : Adverse symptoms may include the following:
wheezing and breathing difficulties
asthma

Ingestion : Adverse symptoms may include the following:
stomach pains

Skin : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur

Eyes : Adverse symptoms may include the following:
pain
watering
redness

Medical conditions aggravated by over-exposure : Pre-existing respiratory and skin disorders and disorders involving any other target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

3. Composition/information on ingredients

Name	CAS number	%
1,2-Diaminoethane	107-15-3	60-100

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4. First aid measures

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

Notes to physician : In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

5. Fire-fighting measures

Flammability of the product : Combustible liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back.

Extinguishing media

Suitable : Use dry chemical, CO_2, water spray (fog) or foam.Dry sand or other suitable absorbent.

Not suitable : Do not use water jet.Halones

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
nitrogen oxides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Absorb with an inert material and place in an appropriate waste disposal container. Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Use spark-proof tools and explosion-proof equipment. Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal.

7. Handling and storage

Handling : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Persons with a history of skin sensitization problems or asthma, allergies or chronic or recurrent respiratory disease should not be employed in any process in which this product is used. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made

7. Handling and storage

from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Keep away from acids. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store between the following temperatures: 11 to 50°C (51.8 to 122°F). Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see section 10) and food and drink. Eliminate all ignition sources. Separate from acids. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. Exposure controls/personal protection

United States

Ingredient	Exposure limits
1,2-Diaminoethane	**ACGIH TLV (United States, 2/2010). Absorbed through skin.** TWA: 10 ppm 8 hour(s). TWA: 25 mg/m³ 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 10 ppm 8 hour(s). TWA: 25 mg/m³ 8 hour(s). **NIOSH REL (United States, 6/2009).** TWA: 10 ppm 10 hour(s). TWA: 25 mg/m³ 10 hour(s). **OSHA PEL (United States, 6/2010).** TWA: 10 ppm 8 hour(s). TWA: 25 mg/m³ 8 hour(s).

Recommended monitoring procedures : If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Contaminated work clothing should not be allowed out of the workplace. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator. Recommended: ammonia filter (Type K) ammonia (Type K) and particulate filter

8. Exposure controls/personal protection

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. >8 hours (breakthrough time): neoprene

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9. Physical and chemical properties

Physical state : Liquid. [Viscous liquid.]

Flash point : Closed cup: 38 to 42°C (100.4 to 107.6°F)

Auto-ignition temperature : 385 to 405°C (725 to 761°F)

Flammable limits : Lower: 2.7%
Upper: 16.6%

Color : Colorless.

Odor : Mild. Ammoniacal.

Molecular weight : 60.12 g/mole

Molecular formula : C2-H8-N2

pH : 12 [Conc. (% w/v): 1%]

Boiling/condensation point : 117°C (242.6°F)

Melting/freezing point : 10.8 to 11°C (51.4 to 51.8°F)

Relative density : 0.897

Vapor pressure : 1.3 kPa (9.7508 mm Hg) [20°C]

Vapor density : 2.07 [Air = 1]

VOC content : 7.49 lbs/gal (897 g/l)

Evaporation rate : 0.91 (butyl acetate = 1)

Viscosity : Dynamic: 1.265 mPa·s (1.265 cP)

Solubility :

1000 g/l

$LogK_{ow}$: -2 to -1.3

10. Stability and reactivity

Chemical stability : The product is stable.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.aerosol or mist formation

Incompatible materials : Reactive or incompatible with the following materials: oxidizing materials, metals and acids.
Chlorinated hydrocarbon.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

10. Stability and reactivity

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Under normal conditions of storage and use, hazardous polymerization will not occur.

11. Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
1,2-Diaminoethane	LC50 Inhalation Vapor LD50 Dermal LD50 Oral	Rat Rat Rat	9.2 mg/l 560 mg/kg 866 mg/kg	4 hours - -

Conclusion/Summary : No additional information.

Chronic toxicity

Product/ingredient name	Result	Species	Dose	Exposure
1,2-Diaminoethane	Sub-chronic NOAEL Oral Sub-acute NOAEL Inhalation Vapor	Rat Rat - Male, Female	22 mg/kg 144 mg/m³	- 6 weeks

Conclusion/Summary : Cannot be classified.

Irritation/Corrosion

Not available.

Conclusion/Summary : Not available.

Skin : Corrosive to the skin.

Eyes : Corrosive to eyes.

Respiratory : No additional information.

Sensitizer

Product/ingredient name	Route of exposure	Species	Result
1,2-Diaminoethane	skin	Guinea pig	Sensitizing

Conclusion/Summary : Not available.

Skin : May cause skin sensitization.

Respiratory : May cause sensitization by inhalation.

Carcinogenicity

Conclusion/Summary : Oral : Cannot be classified. NOAEL= 159 mg/kg bw/day
Dermal: Cannot be classified. NOAEL= 8 mg/kg bw/day

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
1,2-Diaminoethane	A4	-	-	-	-	-

Mutagenicity

Product/ingredient name	Test	Experiment	Result
1,2-Diaminoethane	-	Experiment: In vivo Subject: Mammalian-Animal Cell: Germ	Negative

Conclusion/Summary : No mutagenic effect.

Teratogenicity

Not available.

11. Toxicological information

Conclusion/Summary : Cannot be classified.

Reproductive toxicity

Not available.

Conclusion/Summary : Fertility Cannot be classified. NOAEL Oral= 500 mg/kg bw/day
Developmental Toxicity: Cannot be classified. NOAEL Oral= 250 mg/kg bw/day

12. Ecological information

Ecotoxicity : Readily biodegradable This product shows a high bioaccumulation potential.

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
1,2-Diaminoethane	EC50 3.2 mg/l NOEC 0.5 mg/l Acute EC50 645 mg/l Fresh water Acute EC50 16.7 mg/l Fresh water Acute LC50 640 mg/l Fresh water Chronic NOEC 0.16 mg/l Fresh water Chronic NOEC 10 mg/l Fresh water	Micro-organism Micro-organism Algae Daphnia Fish Daphnia Fish	2 hours 2 hours 72 hours 48 hours 96 hours 21 days 28 days

Conclusion/Summary : Not classified as dangerous
PNEC Intermittent release.= 0.167 mg/l

Persistence/degradability

Product/ingredient name	Test	Result	Dose	Inoculum
1,2-Diaminoethane	- - -	95 % - 28 days 88 % - 15 days 70 % - 5 days	- - -	- - -

Conclusion/Summary : This substance is not expected to bioaccumulate through food chains in the environment. Readily biodegradable not persistent. Not toxic.

Partition coefficient: n-octanol/water : -2 to -1.3

Bioconcentration factor : <2000

Mobility : No specific data.

Other adverse effects : No known significant effects or critical hazards.

13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Significant quantities of waste product residues should not be disposed of via the foul sewer but processed in a suitable effluent treatment plant. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

13. Disposal considerations

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	UN1604	Ethylenediamine	8 (3)	II		**Reportable quantity** 5000 lbs. (2270 kg) **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 1 L **Cargo aircraft** Quantity limitation: 30 L **Special provisions** IB2, T7, TP2, T3
IMDG Class	UN1604	ETHYLENEDIAMINE	8 (3)	II		**Emergency schedules (EmS)** F-E, S-C
IATA-DGR Class	UN1604	Ethylenediamine	8 (3)	II		**Passenger and Cargo Aircraft** Quantity limitation: 1 L Packaging instructions: 851 **Cargo Aircraft Only** Quantity limitation: 30 L Packaging instructions: 855 **Limited Quantities - Passenger Aircraft** Quantity limitation: 0.5 L Packaging instructions: Y840

PG* : Packing group

15. Regulatory information

HCS Classification : Combustible liquid
Toxic material
Corrosive material
Sensitizing material
Target organ effects

U.S. Federal regulations : **TSCA 8(a) IUR**: Partial exemption
United States inventory (TSCA 8b): This material is listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: 1,2-Diaminoethane
SARA 302/304 emergency planning and notification: 1,2-Diaminoethane
SARA 302/304/311/312 hazardous chemicals: 1,2-Diaminoethane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: 1,2-Diaminoethane: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 311: 1,2-Diaminoethane

15. Regulatory information

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: 1,2-Diaminoethane

Clean Air Act Section 112(b) Hazardous Air Pollutants (HAPs) : Not listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 313

Form R - Reporting requirements Not applicable.

Supplier notification Not applicable.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

Not available.

United States inventory (TSCA 8b) : This material is listed or exempted.

Canada inventory : This material is listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

16. Other information

Label requirements : COMBUSTIBLE LIQUID AND VAPOR. CAUSES EYE AND SKIN BURNS. HARMFUL IF INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY BE HARMFUL IF SWALLOWED. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.

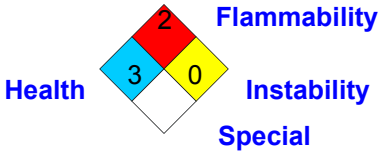
Hazardous Material Information System (U.S.A.) :

Health	*	3
Flammability		2
Physical hazards		0

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.) :



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Date of issue : ***.

Date of previous issue : 13/11/2010

Version : ***

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.