

Material Safety Data Sheet



Piperazine anhydrous, PIP

1. Product and company identification

Product name	: Piperazine anhydrous, PIP
Material uses	: Industrial applications: Intermediate. Chemical synthesis. Pharmaceuticals.
CAS number	: 110-85-0
Supplier	: DELAMINE B.V. Barchman Wuytierslaan 10 3818 LH Amersfoort The Netherlands Tel.:31-334676897
Validation date	: 07/09/2012.
In case of emergency	: GBK/Infotrac ID 104075 : (USA domestic) 1 800 535 5053 or international (001) 352 323 3500 (24 hours per day)

2. Hazards identification

Physical state	: Solid. [Deliquescent crystals.]
Color	: Colorless.
Odor	: Amine-like.
Emergency overview	
Signal word	: DANGER!
Hazard statements	: CAUSES EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. POSSIBLE DEVELOPMENTAL HAZARD - MAY CAUSE ADVERSE DEVELOPMENTAL EFFECTS, BASED ON ANIMAL DATA. POSSIBLE REPRODUCTIVE HAZARD - MAY CAUSE ADVERSE REPRODUCTIVE EFFECTS IN MALES, BASED ON ANIMAL DATA. POSSIBLE REPRODUCTIVE HAZARD - MAY CAUSE ADVERSE REPRODUCTIVE EFFECTS IN FEMALES, BASED ON ANIMAL DATA.
Precautions	: Avoid exposure - obtain special instructions before use. Do not breathe dust. Do not get in eyes or on skin or clothing. Avoid exposure during pregnancy. 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).
Routes of entry	: Ingestion.
Potential acute health effects	
Inhalation	: Irritating to respiratory system. May cause sensitization by inhalation. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
Ingestion	: May cause burns to mouth, throat and stomach.
Skin	: Corrosive to the skin. Causes burns. 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.

2. Hazards identification

- Mutagenicity** : No known significant effects or critical hazards.
- Teratogenicity** : No known significant effects or critical hazards.
- Developmental effects** : May cause developmental abnormalities, based on animal data.
- Fertility effects** : May impair male fertility, based on animal data. May impair female fertility, based on animal data.
- Target organs** : May cause damage to the following organs: upper respiratory tract, skin, eyes.

Over-exposure signs/symptoms

- Inhalation** : Adverse symptoms may include the following:
respiratory tract irritation
coughing
wheezing and breathing difficulties
asthma
reduced fetal weight
increase in fetal deaths
skeletal malformations
- Ingestion** : Adverse symptoms may include the following:
stomach pains
reduced fetal weight
increase in fetal deaths
skeletal malformations
- Skin** : Adverse symptoms may include the following:
pain or irritation
redness
blistering may occur
reduced fetal weight
increase in fetal deaths
skeletal malformations
- Eyes** : Adverse symptoms may include the following:
pain
watering
redness
reduced fetal weight
increase in fetal deaths
skeletal malformations
- 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	%
Piperazine	110-85-0	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** : No specific fire or explosion hazard.
- Extinguishing media**
- Suitable** : Use an extinguishing agent suitable for the surrounding fire. Dry sand or other suitable absorbent. Use dry chemical, CO₂, water spray (fog) or foam.
- Not suitable** : 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.
- 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. 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**

6. Accidental release measures

- Small spill** : Move containers from spill area. Avoid allowing the spilled material to get wet or using water to clean up spillages or residues, unless the quantity remaining is very small. Absorb with an inert material and place in an appropriate waste disposal container. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Vacuum or sweep up material and place in a designated, labeled waste container. Dispose of via a licensed waste disposal contractor. 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. Avoid exposure - obtain special instructions before use. Avoid exposure during pregnancy. Do not get in eyes or on skin or clothing. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.
- Storage** : Store in accordance with local regulations. 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. 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

No exposure limit value known.

Consult local authorities for acceptable exposure limits.

- 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. Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.
- Engineering measures** : Use only with adequate ventilation. If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.
- 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.

8. Exposure controls/personal protection

Personal protection

- Respiratory** : Use a properly fitted, particulate filter 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
- 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. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated. > 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. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.
- 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** : Solid. [Deliquescent crystals.]
- Auto-ignition temperature** : 320°C (608°F)
- Flammable limits** : Lower: 4%
Upper: 14%
- Color** : Colorless.
- Odor** : Amine-like.
- Molecular formula** : C₄H₁₀N₂
- pH** : 12 [Conc. (% w/w): 1%]
- Boiling/condensation point** : 147°C (296.6°F)
- Melting/freezing point** : 106°C (222.8°F)
- Relative density** : 1.1
- Vapor pressure** : 0.039 kPa (0.29252 mm Hg) [room temperature]
- Vapor density** : 3 [Air = 1]
- VOC content** : 9.18 lbs/gal (1100 g/l)
- Viscosity** : Not applicable.
- Solubility** :
150 g/l
- LogK_{ow}** : -1.24

10. Stability and reactivity

- Chemical stability** : The product is stable.
- Conditions to avoid** : Keep away from sources of ignition - No smoking. 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.
- 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
Piperazine	LD50 Dermal	Rat	8000 mg/kg	-
	LD50 Oral	Rat	2600 mg/kg	-

- Conclusion/Summary** : Dermal Not classified as dangerous
Oral No additional remark.
Inhalation Not classified as dangerous

Chronic toxicity

Product/ingredient name	Result	Species	Dose	Exposure
Piperazine	Sub-chronic NOAEL Oral	Rat	627 mg/kg	-

- Conclusion/Summary** : Neurotoxic effects and dermatitis.

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
Piperazine	skin	Guinea pig	Sensitizing

- Conclusion/Summary** : Not available.
- Skin** : May cause skin sensitization.
- Respiratory** : May cause sensitization by inhalation.

Carcinogenicity

- Conclusion/Summary** : No data available for this end-point, hence this classification is not considered to be applicable.

Classification

Not available.

Mutagenicity

11. Toxicological information

Product/ingredient name	Test	Experiment	Result
Piperazine	-	Experiment: In vivo Subject: Mammalian-Animal Cell: Germ	Negative

Conclusion/Summary : No mutagenic effect.

Teratogenicity

Not available.

Conclusion/Summary : No known significant effects or critical hazards.

Reproductive toxicity

Product/ingredient name	Maternal toxicity	Fertility	Development toxin	Species	Dose	Exposure
Piperazine	- -	Positive -	- Positive	Rat - Male, Female Rabbit	Oral Oral	- -

Conclusion/Summary : Fertility NOAEL= 125 mg/kg bw/day
Developmental Toxicity: NOAEL= 42 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
Piperazine	NOEC 540 mg/l Fresh water Acute EC50 21 mg/l Fresh water Acute LC50 1800 mg/l Fresh water Chronic NOEC 12.5 mg/l Fresh water	Micro-organism Daphnia Fish Daphnia	- 48 hours 96 hours 21 days

Conclusion/Summary : Not classified as dangerous
PNEC Intermittent release.= 1.25 mg/l

Persistence/degradability

Product/ingredient name	Test	Result	Dose	Inoculum
Piperazine	OECD 301A Ready Biodegradability - DOC Die-Away Test	96 % - Readily - 52 days	-	-

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

Partition coefficient: n-octanol/water : -1.24

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. 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. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. 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. 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.

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	UN2579	Piperazine	8	III		Limited quantity Yes. Packaging instruction Passenger aircraft Quantity limitation: 25 kg Cargo aircraft Quantity limitation: 100 kg Special provisions IB8, IP3, T4, TP1, TP30, T1
IMDG Class	UN2579	PIPERAZINE	8	III		Emergency schedules (EmS) F-A, S-B
IATA-DGR Class	UN2579	Piperazine	8	III		Passenger and Cargo Aircraft Quantity limitation: 25 kg Packaging instructions: 860 Cargo Aircraft Only Quantity limitation: 100 kg Packaging instructions: 864 Limited Quantities - Passenger Aircraft Quantity limitation: 5 kg Packaging instructions: Y845

PG* : Packing group

15. Regulatory information

HCS Classification	: Corrosive material Sensitizing material Target organ effects
U.S. Federal regulations	: TSCA 8(a) IUR Exempt/Partial exemption: Not determined United States inventory (TSCA 8b): All components are listed or exempted. SARA 302/304/311/312 extremely hazardous substances: No products were found. SARA 302/304 emergency planning and notification: No products were found. SARA 302/304/311/312 hazardous chemicals: Piperazine SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Piperazine: Fire hazard, Immediate (acute) health hazard, Delayed (chronic) health hazard Clean Air Act (CAA) 112 accidental release prevention: No products were found.
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
<u>SARA 313</u>	
Form R - Reporting requirements	Not applicable.
Supplier notification	Not applicable.
<u>State regulations</u>	
Massachusetts	: The following components are listed: PIPERAZINE
New York	: None of the components are listed.
New Jersey	: The following components are listed: PIPERAZINE
Pennsylvania	: The following components are listed: PIPERAZINE
<u>California Prop. 65</u>	
Not available.	
United States inventory (TSCA 8b)	: All components are listed or exempted.
Canada inventory	: All components are listed or exempted.
<u>International regulations</u>	
International lists	: Australia inventory (AICS): All components are listed or exempted. China inventory (IECSC): All components are listed or exempted. Japan inventory: All components are listed or exempted. Korea inventory: All components are listed or exempted. Malaysia Inventory (EHS Register): Not determined. New Zealand Inventory of Chemicals (NZIoC): All components are listed or exempted. Philippines inventory (PICCS): All components are listed or exempted.

15. Regulatory information

Taiwan inventory (CSNN): Not determined.

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 : CAUSES EYE AND SKIN BURNS. CAUSES RESPIRATORY TRACT IRRITATION. MAY CAUSE ALLERGIC RESPIRATORY AND SKIN REACTION. MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA. POSSIBLE DEVELOPMENTAL HAZARD - MAY CAUSE ADVERSE DEVELOPMENTAL EFFECTS, BASED ON ANIMAL DATA. POSSIBLE REPRODUCTIVE HAZARD - MAY CAUSE ADVERSE REPRODUCTIVE EFFECTS IN MALES, BASED ON ANIMAL DATA. POSSIBLE REPRODUCTIVE HAZARD - MAY CAUSE ADVERSE REPRODUCTIVE EFFECTS IN FEMALES, BASED ON ANIMAL DATA.

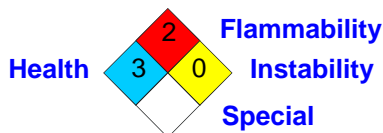
**Hazardous Material
Information System (U.S.A.)** :

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.

16. Other information

Date of issue : 07/09/2012.

Date of previous issue : 23/03/2011.

Version : 6

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.