HYDRAZINE	ICSC: 0281

Date of Peer Review:
March 1995

Diamide
Diamine
Nitrogen hydride
(anhydrous)

CAS #	302-01-2	N_2H_4 / H_2N-NH_2
RTECS #	MU7175000	Molecular mass: 32.1
UN #	2029	
EC Index #	007-008-00-3	

TYPES OF HAZARD / EXPOSURE	ACUTE HAZARDS / SYMPTOMS	PREVENTION	FIRST AID / FIRE FIGHTING
FIRE	Flammable.	NO open flames, NO sparks, and NO smoking.	Powder, alcohol-resistant foam, water spray, carbon dioxide.
EXPLOSION	Above 38℃ explosive vapour/air mixtures may be formed. Risk of fire and explosion on contact with many materials.	Above 38℃ use a closed system, ventilation, and explosion-proof electrical equipment.	In case of fire: keep drums, etc., cool by spraying with water. Combat fire from a sheltered position.
EXPOSURE		**STRICT HYGIENE!**	**IN ALL CASES CONSULT A DOCTOR!**
Inhalation	Corrosive. Burning sensation. Cough. Headache. Nausea. Shortness of breath. Sore throat. Convulsions.	Ventilation, local exhaust, or breathing protection.	Fresh air, rest. Half-upright position. Refer for medical attention.
Skin	Corrosive. MAY BE ABSORBED! Redness. Skin burns. Pain.	Protective gloves. Protective clothing.	First rinse with plenty of water, then remove contaminated clothes and rinse again. Refer for medical attention. Wear protective gloves when administering first aid.
Eyes	Corrosive. Redness. Pain. Severe deep burns.	Eye protection in combination with breathing protection.	First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then take to a doctor.
Ingestion	Corrosive. Abdominal	Do not eat, drink, or	Rinse mouth. Do NOT

	cramps. Confusion. Convulsions. Unconsciousness. Vomiting. Weakness.	smoke during work. Wash hands before eating.	induce vomiting. Refer for medical attention.

SPILLAGE DISPOSAL	PACKAGING & LABELLING
Evacuate danger area! Consult an expert! Collect leaking liquid in sealable containers. Absorb remaining liquid in sand or inert absorbent and remove to safe place. Do NOT absorb in saw-dust or other combustible absorbents. Do NOT let this chemical enter the environment. Personal protection: complete protective clothing including self-contained breathing apparatus.	Special material. Unbreakable packaging; put breakable packaging into closed unbreakable container. Do not transport with food and feedstuffs. **EU Classification** Symbol: T, N R: 45-10-23/24/25-34-43-50/53 S: 53-45-60-61 Note: [E] **UN Classification** UN Hazard Class: 8 UN Subsidiary Risks: 3 and 6.1 UN Pack Group: I
EMERGENCY RESPONSE	**STORAGE**
Transport Emergency Card: TEC (R)-80S2029 NFPA Code: H3; F3; R2	Fireproof. Separated from food and feedstuffs. See Chemical Dangers.

IPCS
International Programme on Chemical Safety

Prepared in the context of cooperation between the International Programme on Chemical Safety and the Commission of the European Communities © IPCS, CEC 2005

SEE IMPORTANT INFORMATION ON BACK

HYDRAZINE ICSC: 0281

IMPORTANT DATA

PHYSICAL STATE; APPEARANCE:
COLOURLESS FUMING AND HYGROSCOPIC LIQUID, WITH PUNGENT ODOUR.

CHEMICAL DANGERS:
The substance decomposes producing ammonia fumes, hydrogen and nitrogen oxides , causing fire and explosion hazard. The substance is a strong reducing agent and reacts violently with oxidants. The substance is a medium strong base. Reacts violently with many metals, metal oxides and porous materials causing fire and explosion hazard. Air or oxygen is not required for decomposition.

OCCUPATIONAL EXPOSURE LIMITS:
TLV: 0.01 ppm as TWA; (skin); A3 (confirmed animal carcinogen with unknown relevance to humans); (ACGIH 2004).
MAK: skin absorption (H); sensitization of skin

ROUTES OF EXPOSURE:
The substance can be absorbed into the body by inhalation of its vapour, through the skin and by ingestion.

INHALATION RISK:
A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20℃.

EFFECTS OF SHORT-TERM EXPOSURE:
The substance is corrosive to the eyes and the skin. The vapour of this substance is corrosive to the respiratory tract. Inhalation of the vapour may cause lung oedema (see Notes). The substance may cause effects on the liver kidneys and central nervous system. Exposure may result in death. The effects may be delayed. Medical observation is indicated.

(Sh); Carcinogen category: 2; (DFG 2004).	**EFFECTS OF LONG-TERM OR REPEATED EXPOSURE:** Repeated or prolonged contact may cause skin sensitization. The substance may have effects on the liver, kidneys and central nervous system. This substance is possibly carcinogenic to humans.
PHYSICAL PROPERTIES	
Boiling point: 114℃ Melting point: 2℃ Relative density (water = 1): 1.01 Solubility in water: very good Vapour pressure, kPa at 20℃: 1.4 Relative vapour density (air = 1): 1.1	Relative density of the vapour/air-mixture at 20℃ (air = 1): 1.00 Flash point: 38℃ c.c. Auto-ignition temperature: see Notes Explosive limits, vol% in air: 1.8-100 Octanol/water partition coefficient as log Pow: -3.1
ENVIRONMENTAL DATA	
The substance is very toxic to aquatic organisms.	
NOTES	
Auto-ignition temperature varies from 24℃ on a rus ty iron surface to 270℃ on glass surface. Depending on the degree of exposure, periodic medical examination is suggested. The symptoms of lung oedema often do not become manifest until a few hours have passed and they are aggravated by physical effort. Rest and medical observation are therefore essential. Immediate administration of an appropriate inhalation therapy by a doctor or a person authorized by him/her, should be considered. The odour warning when the exposure limit value is exceeded is insufficient. Rinse contaminated clothes (fire hazard) with plenty of water. Other UN numbers are: UN 2030 Hydrazine hydrate or Hydrazine, aqueous solutions with 37-64% of hydrazine; UN 3293 Hydrazine, aqueous solutions with not more than 37% of hydrazine. Card has been partly updated in October 2005. See sections Occupational Exposure Limits, EU classification, Emergency Response.	
ADDITIONAL INFORMATION	
LEGAL NOTICE	Neither the CEC nor the IPCS nor any person acting on behalf of the CEC or the IPCS is responsible for the use which might be made of this information

IPCS INTERNATIONAL PROGRAMME ON CHEMICAL SAFETY
Health and Safety Guide No. 56

HYDRAZINE
HEALTH AND SAFETY GUIDE

UNITED NATIONS ENVIRONMENT PROGRAMME

INTERNATIONAL LABOUR ORGANISATION

WORLD HEALTH ORGANIZATION

WORLD HEALTH ORGANIZATION, GENEVA 1991

This is a companion volume to Environmental Health Criteria 68: Hydrazine

Published by the World Health Organization for the International Programme on Chemical Safety (a collaborative programme of the United Nations Environment Programme, the International Labour Organisation, and the World Health Organization)

This report contains the collective views of an international group of experts and does not necessarily represent the decisions or the stated policy of the United Nations Environment Programme, the International Labour Organisation, or the World Health Organization

WHO Library Cataloguing in Publication Data

Hydrazine : health and safety guide.

(Health and safety guide ; no. 56)

1. Hydrazines - standards I. Series

ISBN 92 4 151056 0 (NLM Classification: QU 60)
ISSN 0259-7268

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INTRODUCTION

The Environmental Health Criteria (EHC) documents produced by the International Programme on Chemical Safety include an assessment of the effects on the environment and on human health of exposure to a chemical or combination of chemicals, or physical or biological

agents. They also provide guidelines for setting exposure limits.

The purpose of a Health and Safety Guide is to facilitate the application of these guidelines in national chemical safety programmes. The first three sections of a Health and Safety Guide highlight the relevant technical information in the corresponding EHC. Section 4 includes advice on preventive and protective measures and emergency action; health workers should be thoroughly familiar with the medical information to ensure that they can act efficiently in an emergency. Within the Guide is a Summary of Chemical Safety Information which should be readily available, and should be clearly explained, to all who could come into contact with the chemical. The section on regulatory information has been extracted from the legal file of the International Register of Potentially Toxic Chemicals (IRPTC) and from other United Nations sources.

The target readership includes occupational health services, those in ministries, governmental agencies, industry, and trade unions who are involved in the safe use of chemicals and the avoidance of environmental health hazards, and those wanting more information on this topic. An attempt has been made to use only terms that will be familiar to the intended user. However, sections 1 and 2 inevitably contain some technical terms. A bibliography has been included for readers who require further background information.

Revision of the information in this Guide will take place in due course, and the eventual aim is to use standardized terminology. Comments on any difficulties encountered in using the Guide would be very helpful and should be addressed to:

The Manager
International Programme on Chemical Safety
Division of Environmental Health
World Health Organization
1211 Geneva 27
Switzerland

1. PRODUCT IDENTITY AND USES

1.1 Identity

Common name:	hydrazine
Chemical formula:	N_2H_4
Chemical structure:	$H_2N - NH_2$
Common synonyms:	diamide, diamine, anhydrous hydrazine, hydrazine base
Common trade names (of mixtures):	Aerozine-50 (a 1:1 w/w fuel mixture of anhydrous hydrazine and 1,1-dimethylhydrazine); Hydrazine hydrate ($N_2H_4.H2_0$) (a 1:1 molar mixture of anhydrous hydrazine and water); Levoxin (a 15-64% aqueous solution); SCAV-OX (a 35-64% aqueous solution); Zerox (a 15-64% aqueous solution)

CAS registry number:	302-01-2
RTECS registry number:	MU7175000
UN number:	2029 (2030 for hydrazine monohydrate $N_2H_4.H2_O$)
Conversion factors:	1 ppm = 1.31 mg/m^3 at 25 °C and 101.3 kPa (760 mmHg) 1 mg/m^3 = 0.76 ppm

1.2 Physical and Chemical Properties

Anhydrous hydrazine, and aqueous solutions, are colourless liquids. Anhydrous hydrazine is a caustic, fuming, hygroscopic liquid at normal temperature and pressure. It has an ammoniacal, fishy, and pungent odour. The odour perception threshold is 4-9 mg/m^3. A 1:1 mixture of anhydrous hydrazine in water (hydrazine monohydrate) containing 64% by weight of hydrazine, fumes slightly in air and has an ammoniacal odour. Hydrazine is infinitely soluble in water and may be flammable and explosive up to a concentration of 400 g/litre (40%). Hydrazine is basic, and is a strong reducing agent. Some physical and chemical properties of hydrazine are given in the Summary of Chemical Safety Information (section 6).

1.3 Composition

Hydrazine is often sold as aqueous hydrazine (15-64% solutions of anhydrous hydrazine in water) or as hydrazine hydrate.

1.4 Production and Uses

The total world production capacity for hydrazine was estimated to be in excess of 35 000 tonnes in 1981. Significant production capacities are reported for the Federal Republic of Germany, France, Japan, the United Kingdom, and the USA. Hydrazine is mainly used as a raw material in the manufacture of agricultural chemicals, blowing agents, polymerization catalysts, and pharmaceutical products, and as a corrosion inhibitor in boiler water. Both the hydrate and anhydrous hydrazine are used as propellant fuels for aircraft and spacecraft.

2. SUMMARY AND EVALUATION

2.1 Human Exposure to Hydrazine

Hydrazine is not known to occur naturally, except, perhaps, in tobacco. It can be released into the atmosphere during venting operations, storage, or transfer. The total emission is estimated to represent nearly 0.01% of the hydrazine produced. Accidental discharges into water, air, and soil can result from bulk storage, handling, transport, or improper waste disposal.

Exposure of human beings to hydrazine may occur occupationally or accidentally, from hydrazine-based drugs, or from the use of tobacco. It has been shown that concentrations of up to 0.35 mg/m^3 can occur during production under normal conditions, and that, exceptionally, concentrations of up to 1.18 mg/m^3 may occur. During the handling of the fuel, concentrations of up to 0.25 mg/m^3 have been measured under normal conditions and, exceptionally, up to 2.59 mg/m^3. Because the compound is degraded so rapidly in the environment (section 2.2), measurable levels are not normally encountered, and,

therefore, hydrazine does not pose a significant hazard for the general population. However, the general population may be exposed to hydrazine vapour through accidental discharge. Evaporation of hydrazine from a liquid spill can be sufficient to generate an atmospheric concentration as high as 4 mg/m^3.

2.2 Fate of Hydrazine

Hydrazine is degraded rapidly in the air, through reactions with ozone, hydroxyl radicals, or nitrogen dioxide. In polluted air, the life-time will be approximately 1 h. In soil, aqueous hydrazine is adsorbed and decomposed on clay surfaces, under aerobic conditions. However, available data are inadequate to describe the behaviour of hydrazine in the soil. The degradation rate of hydrazine in water is highly dependent on various factors, such as pH, temperature, oxygen content, alkalinity, hardness, and the presence of organic material and metallic ions. Hydrazine is degraded rapidly under aerobic conditions in the presence of organic material, and/or in alkaline or hard water. It is more persistent in soft, metal-free water. Hydrazine is biodegradable by microorganisms in activated sludge. However, at concentrations above 1 mg/litre, hydrazine is also toxic for these microorganisms, especially for nitrifying bacteria. Hydrazine does not bioaccumulate.

2.3 Effects on Organisms in the Environment

The concentration of hydrazine that is lethal for half the number of fish in a population (LC_{50}) exposed for 1-4 days, ranged from 0.54 to 5.98 mg/litre. The lowest-observed-effect level, found in a fathead minnow embryo-larvae test, was 0.1 mg/litre. Nitrifying

bacteria in activated sludge are inhibited at levels higher than 1 mg/litre. Many microorganisms are more sensitive, and show threshold levels as low as 0.00008 mg/litre, reported for the blue alga *Microcystis aeroginosa.*

Hydrazine can inhibit germination in plants, and is toxic for plants in both air and water.

On the basis of these data, it can be concluded that hydrazine may present a hazard for aquatic organisms and plant life.

2.4 Effects on Animals

Hydrazine is rapidly absorbed through the skin or via other routes of exposure. It is also rapidly distributed to, and eliminated from, most tissues. In mice and rats, the absorbed hydrazine is excreted via the urine, partly unchanged, and partly as labile conjugates or as acid-hydrolysable derivatives. Metabolism of hydrazine produces a significant amount of nitrogen, which is excreted via the lungs.

Single oral doses of 55-64 mg/kg body weight and vapour concentrations of 750 mg/m^3 for 4 h were lethal for half the number of exposed rats in a population (LD_{50}, LC_{50}). Thus, the compound is moderately toxic according to the scale of Hodge & Sterner.

Most of the effects on human beings (section 2.5) exposed to hydrazine have also been observed in experimental animals. In addition, loss of body weight, anaemia, hypoglycaemia, fatty liver, and convulsions have been frequently reported. Fatty liver was reported in mice, and body weight loss in rats, when they were exposed continuously for 6 months

to 0.26 mg/m^3, the lowest of three exposure levels; monkeys and dogs were not affected at this concentration. There are no data on which to establish a no-observed-effect level for the inhalation route, but, in a 7-month drinking-water study, a no-observed-effect level of 3 µg/kg body weight was reported.

Studies on rats and mice have indicated that hydrazine produces adverse effects on embryos and fetuses, when administered at doses that are toxic for the mother. The adverse effects include increased resorptions, reduced fetal weight, increased perinatal mortality, and increased incidences of litters and fetuses with abnormalities. The abnormalities include primarily supernumerary and fused ribs, delayed ossification, moderate hydronephrosis, and moderate dilation of the brain ventricle.

Hydrazine induced gene mutations and chromosome aberrations in a variety of test systems, including plants, phages, bacteria, fungi, *Drosophila,* and mammalian cells *in vitro.* Indirect alkylation was introduced in liver DNA of rodents after *in vivo* exposure to toxic doses. Hydrazine also caused DNA damage *in vitro.* It transformed hamster and human cells *in vitro,* but did not increase unscheduled DNA synthesis in the germ cells of mice *in vivo,* or induce

chromosome aberrations, micro-nuclei, or dominant lethals in mice *in vivo.* In rats, it was reported that hydrazine induced chromosome aberrations *in vivo.*

Hydrazine vapour induced nasal tumours, most of which were benign, in F-344 rats and Syrian golden hamsters, but not in C57BL/6 mice, after 12 months of treatment and life-time observation. In several limited gavage and drinking-water studies, hydrazine induced an increased incidence, in some cases dose-related, of multiple pulmonary tumours in various mouse strains and Cb/Se rats. In two strains of mice, an increased incidence of hepatocarcinomas was also induced. A very low, but increased, incidence of hepatocarcinomas was observed in male Cb/Se rats. No tumours were observed in orally-exposed hamsters.

On the basis of the carcinogenicity studies on experimental animals, there is evidence that hydrazine is an animal carcinogen.

2.5 Effects on Human Beings

In cases of acute human poisoning, vomiting, severe irritation of the respiratory tract with pulmonary oedema, central nervous system depression, and hepatic and renal damage have been reported. No data are available from which to make an estimate of the level of hydrazine inhaled in cases of acute poisoning by the respiratory route. However, from reports of poisoning by the oral route, it would appear that ingestion of amounts of the order of 20-50 ml would cause severe intoxication and may be lethal. From the available human data, it is not possible to estimate a no-observed-effect dose. Pyridoxine treatment of poisoned human beings has been reported to be successful on several occasions.

Skin and eye irritation have been observed in human beings who had come into contact with hydrazine, but the data are insufficient to establish a no-observed-effect level. Hydrazine is a strong skin sensitizer in human beings. Once sensitized to hydrazine, a person may also become sensitive to hydrazine derivatives (cross-sensitization).

Data are lacking concerning the effects of hydrazine on the human embryo or fetus. In the absence of human data, and on the basis of the animals studies, it is prudent to assume that hydrazine would have adverse effects on the human embryo or fetus at exposure levels near to those producing toxic effects in the mother. Such levels may occur from accidental spillages.

Data are inadequate to assess the carcinogenicity of hydrazine in human beings. However, taking into account the mutagenicity data, as well as the carcinogenicity data in animals, it would be prudent to consider hydrazine as a possible human carcinogen. Thus, exposure of human beings should be kept as low as feasible.

3. CONCLUSIONS AND RECOMMENDATIONS

Hydrazine can be regarded as posing little hazard for the general population, under normal conditions. However, in the workplace, and under conditions of accidental exposure, hydrazine can present a significant health hazard. Human data are limited, but show that hydrazine may affect the central nervous system, liver, and kidneys. In addition, it may produce skin and eye irritation and skin sensitization. The results of animal studies suggest that effects on human beings may also include embryotoxicity, at levels near those producing toxic effects in the mother, and adverse effects on the respiratory system. On the basis of the evidence of carcinogenicity in animals, it would be prudent to consider hydrazine as a possible human carcinogen. Regarding the effects on the environment, it can be concluded that hydrazine may present a hazard for both aquatic organisms and plant life.

4. HUMAN HEALTH HAZARDS, PREVENTION AND PROTECTION, EMERGENCY ACTION

4.1 Main Human Health Hazards, Prevention and Protection, First Aid

The main human health hazards associated with certain types of exposure to hydrazine, together with preventive and protective measures and first-aid recommendations, are listed in the Summary of Chemical Safety Information (section 6).

4.2 Advice to Physicians

Pyridoxine treatment has been claimed to be successful on several occasions and may be considered. However, one case report mentions a reversible peripheral neuropathy resulting from treatment with a very large dose of pyridoxine. Otherwise, treat symptomatically. Pay attention to the possible development of pulmonary oedema and of damage to the liver. Skin burns should to be treated as for alkali or thermal burns.

4.3 Health Surveillance Advice

Human beings handling hydrazine, or hydrazine solutions, should undergo medical examination once a year, with emphasis on the functioning of the central nervous system, liver, and kidneys, and on disorders of the skin, eyes, and blood. It should be kept in mind that hydrazine is a possible human carcinogen and a strong skin sensitizer, and that cross-sensitization to hydrazine derivatives may occur.

4.4 Explosion and Fire Hazards

4.4.1 Explosion hazards

Anhydrous hydrazine-air mixtures, containing 4.7% or more (by volume) of hydrazine, may be explosive at temperatures higher than 38°C, and can be ignited by sources of heat or ignition, or by ultraviolet radiation. The flash-point of hydrazine hydrate is 75°C. The flammability of aqueous hydrazine decreases, and the flash-point increases, with increasing dilution, a 40% solution being just ignitable. Contact with metals, metal oxides, oxidizing substances, acids, and porous materials, such as earth, wood, asbestos, paper, or cloth, may cause fire and explosions. Contaminated clothing and equipment are fire hazards. Toxic decomposition products include nitrogen oxides and ammonia.

4.4.2 Fire hazards

Anhydrous hydrazine and aqueous hydrazine containing more than 40% of the compound are flammable liquids.

4.4.3 Prevention

For anhydrous hydrazine, use a closed system, where feasible, and explosion-proof electrical equipment. Do not use hydrazine in the vicinity of flames, sparks, and other sources of ignition. Do not smoke. Keep containers out of direct sunlight. Avoid contact between the compound and metals, metal oxides, acids, oxidizing agents, and porous materials. Prevent contamination of hydrazine. In case of fire, keep drums cool by spraying with water. Do not extinguish a fire caused by hydrazine, unless its release can be stopped. Fire-fighters need self-contained breathing apparatus, eye protection, and full protective clothing.

4.4.4 Fire-extinguishing agents

Water sprays, dry chemical, or carbon dioxide can be used on small fires. For large fires, alcohol foam, or water spraying to flood levels, can be used.

4.5 Storage

Hydrazine should be stored in tightly closed, well-labelled containers in an inert atmosphere, in a clean, well-ventilated area with controlled drainage. Store away from oxidizing agents, acids, metals, metal oxides, porous materials, direct sunlight, or other sources of heat or ignition. The containers should be connected to earth to prevent static sparks.

4.6 Transport

Current international regulations require that hydrazine hydrate, and aqueous solutions of it, should be transported in metal containers with polyethylene liners, in plastic canisters, or in stainless steel containers.

4.7 Spillage and Disposal

4.7.1 Spillage

Remove all ignition sources and evacuate the danger area. Collect leaking liquid in sealable containers. Keep spills from entering water sources and sewers. Promptly dilute spilled hydrazine with

water spray, to produce at least a 40% solution. Construct barriers to contain the spill, or flush it into a container. Foam can be applied to retard vaporization. Use sand to collect small spills. Ensure personal protection, by using a self-contained breathing apparatus, eye protection, and full protective clothing.

4.7.2 Disposal (based on the IRPTC waste disposal file)

Hydrazine can be disposed of by dilution with water to produce at least a 40% solution and subsequent neutralization with dilute sulfuric acid. The resulting solution can be drained into the sewer, with abundant water.

Alternatively, hydrazine waste can be burnt in a chemical incinerator equipped with an after-burner and scrubber, after dilution with alcohol or another hydrocarbon fuel.

5. HAZARDS FOR THE ENVIRONMENT AND THEIR PREVENTION

Degradation of hydrazine in water may be slow, depending on conditions. Hydrazine may present a hazard for aquatic organisms and plant life.

Contamination of soil, water, and the atmosphere can be avoided by proper methods of storage, transport, and waste disposal. In case of spillage, apply methods recommended in section 4.7.1. When using exhaust ventilation, an exhaust scrubber may be needed. Use closed systems where feasible. Use dilute solutions of hydrazine rather than concentrated solutions, where possible.

6. SUMMARY OF CHEMICAL SAFETY INFORMATION

This summary should be easily available to all health workers concerned with, and users of, hydrazine. It should be displayed at, or near, entrances to areas where there is potential exposure to hydrazine, and on processing equipment and containers. The summary should be translated into the appropriate language(s). All persons potentially exposed to the chemical should also have the instructions in the summary clearly explained.

Space is available for insertion of the National Occupational Exposure Limit, the address and telephone number of the National Poison Control Centre, and for local trade names.

HYDRAZINE

(diamide, diamine, hydrazine anhydrous, hydrazine base)

(H_2N - NH_2)

PHYSICAL PROPERTIES	ANHYDROUS HYDRAZINE (100%)	HYDRAZINE HYDRATE (64%)
Relative molecular mass	32.05	

Colourless liquid, fuming in air, with an

Melting point (°C)	2	-51.9
Boiling point (°C)	113.5	120.1
Water solubility	infinite	infinite
Density (20°C)	1.008 g/ml	1.032 g/ml
Relative vapour density	1.1	
Vapour pressure (20°C)	1.39 kPa	1 kPa
Log *n*-octanol/water partition coefficient	-3.08	
Flammability (explosive) limits (%)	4.7-100	3.4-100

ammoniacal, pungent, fishy odour; aqueous solutions are colourless liquids; a 64% solution fumes slightly in air and has an ammoniacal odour; both hydrazine and an aqueous solution of hydrazine react strongly with acids and oxidizing agents; decomposition is accelerated by porous materials and some metals; toxic decomposition products are nitrogen oxides and ammonia; can have adverse effects well below the odour threshold

HAZARDS/SYMPTOMS	PREVENTION AND PROTECTION	FIRST AID
SKIN: corrosion by liquid; burns; irritation by vapour; may enter body through skin	Wear clean, body-covering, impervious clothing and gloves; wear leather garments	Remove contaminated clothing under shower; rinse with plenty of water do not
EYES: corrosion by liquid; burns; irritation by vapour	Wear safety face-shield, or eye protection, in combination with breathing protection	Flush with plenty of water for at least 15 minutes
INHALATION: irritation of nose and respiratory tract; effects on central nervous system, liver, and kidneys	Apply explosion-proof ventilation and local exhaust, and, for routine activities, self-contained breathing apparatus	Remove victims to fresh air, and keep quiet; if breathing has stopped, apply artificial respiration; transport to hospital
INGESTION: corrosive effects; effects on central nervous system, liver, and kidneys	Do not eat, drink, or smoke during work	Rinse mouth; give plenty of water, milk, or lemon juice to drink; induce vomiting in conscious patients; transport to hospital
GENERAL: the compound should be considered as a possible human		

carcinogen

ENVIRONMENT: may be hazardous for aquatic and plant life

Apply proper methods of storage, transport, waste disposal, and handling of spills; when using exhaust ventilation, an exhaust scrubber may be needed; use closed systems and dilute solutions where feasible

SPILLAGE FIRE AND EXPLOSION

Remove ignition sources; evacuate area; collect leaking liquid in sealable container; promptly dilute spilled hydrazine with water spray; contain spills; ensure personal protection (use self-contained clothing and equipment are a fire hazard; in case of fire, keep drums cool by spraying with water; extinguish fires with spray or alcohol foam

STORAGE

Store in tightly-closed, well-labelled containers in an inert atmosphere, in a clean, well-ventilated area; store away from oxidizing agents, acids, metals, metal oxides, porous materials, and direct sunlight; connect containers to earth

Flammable; no open flames or other sources of ignition; vapour-air mixtures are explosive above 38°C; use closed-system ventilation and explosion-proof electrical equipment; contaminated

WASTE DISPOSAL

Dilution with water and neutralization with dilute sulfuric acid; burning in a chemical incinerator equipped with an after-burner and scrubber

UN 2029 (100% hydrazine)

UN 2030 (hydrazine monohydrate)

NATIONAL INFORMATION

National Occupational Exposure Limit:

National Poison Control Centre:

7. CURRENT REGULATIONS, GUIDELINES, AND STANDARDS

The information given in this section has been extracted from the International Register of Potentially Toxic Chemicals (IRPTC) legal file. A full reference to the original national document from which the information was extracted can be obtained from IRPTC. When no effective date appears in the IRPTC legal file, the year of the reference from which the data are taken is indicated by (r).

The reader should be aware that regulatory decisions about chemicals taken in a certain country can only be fully understood in the

framework of the legislation of that country. The regulations and guidelines of all countries are subject to change and should always be verified with appropriate regulatory authorities before application.

7.1 Exposure Limit Values

Some exposure limit values are given in the table on pp. 26-27.

7.2 Specific Restrictions

The Joint FAO/WHO Meeting on Pesticide Residues has established an Acceptable Daily Intake (ADI) of 0-5 mg/kg body weight for maleic hydrazine containing not more than 1 mg hydrazine/kg maleic hydrazine (effective date: 1984).

In the USA, those registering technical maleic hydrazide under the pesticide registration regulations must submit a confidential statement of the formula to certify that the hydrazine level in their products does not exceed 15 mg/kg (effective date: 1983).

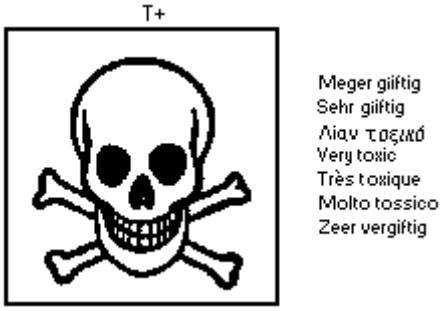
In the Federal Republic of Germany, the handling of hydrazine is prohibited or restricted for pre-adults and pregnant or nursing women (effective date: 1980).

7.3 Labelling, Packaging, and Transport

The European Economic Community regulations state that the label for >64% solutions of hydrazine should read as follows (effective date: 1982 (r)):

> *Very toxic by inhalation, in contact with skin and if swallowed; causes burns; possible risks of irreversible effects; wear suitable protective clothing, gloves and eye/face protection; in case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).*

The label is:



For 15-64% solutions of hydrazine, the label should read (effective date: 1982 (r)):

> *Toxic in contact with skin and if swallowed; causes burns; in case of contact with eyes, rinse immediately with plenty of water and seek medical attention).*

The percentage concentration must be stated on the label. The label is:

C

* ES: Corrosivo
DA: Ætsende
DE: Ätzend
EL: Διαβρωτικό
EN: Corrosive
FR: Corrosif
IT: Corrosivo
NL: Corrosief
* PT: Corrosivo

EXPOSURE LIMIT VALUES

Medium	Specification	Value	Country/ organization	Exposure limit description[a]	Effective date
AIR	Occupational		Australia	Threshold limit value (TLV)	1985 (r)
		0.1 mg/m^{3b}		- Time-weighted average (TWA)	
			Czechoslovakia	Maximum allowable concentration (MAC)	1985
		0.05 mg/m^{3}		- Time-weighted average (TWA)	
		0.1 mg/m^{3}	1985	- Ceiling value	
			Germany, Federal Republic of	Technical reference concentration	1986 (r)
		0.13 mg/m^{3b,c,d}		- 1-year time-weighted average	
			Italy	Threshold limit value (TLV)	1985 (r)
		0.13 mg/m^{3b,c}		- Time-weighted average (TWA)	
			Sweden	Threshold limit value (TLV)	1985
		0.1 mg/m^{3b,c,d}		- Time-weighted average (TWA)	
		0.4 mg/m^{3}		- Short-term exposure limit (STEL)	(15-min TWA)
			USA (ACGIH)	Threshold limit value (TLV)	1985 (r)

				- Time-weighted average (TWA)
			0.1 mg/m^{3b,c}	
		USA (OSHA)		Threshold limit value (TLV)
				- Time-weighted average (TWA)
			1 mg/m^3	
		USA (NIOSH)		Threshold limit value (TLV)
				- Time-weighted average (TWA)
			1 mg/m^3	
				- Ceiling value 2 mg/m^3

Medium description	Specification	Country/ organization	Value	Exposure limit	Effective date
AIR (including derivatives)	Occupational	USSR	0.1 mg/m^3	Ceiling value	1977
WATER	Surface	USSR	0.01 mg/litre	Maximum allowable concentration	1983

[a] TWA = time-weighted average over one working day (usually 8 h).
[b] Skin absorption.
[c] (Suspected of) carcinogenic (potential).
[d] Sensitization.

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