NIPPON NYUKAZAI CO., LTD.

SAFETY DATA SHEET

SDS: A6001-0100_E001
Date Prepared: 2019/05/09
Date Revised: 2023/01/10

Product Name: **MORPHOLINE**

1. Identification of the substance/mixture and of the company/undertaking

Product name:	MORPHOLINE
Identification of the supplier:	Nippon Nyukazai Co., Ltd.
Address:	No.4-1.Nihonbashi Kobuna-cho, Chuo-ku, Tokyo 103-0024, Japan
Charge section:	Business Operation Department (TEL:+81-3-5651-5640,FAX:+81-3-5651-5646)
Emergency telephone number:	Business Operation Department (TEL:+81-3-5651-5640,FAX:+81-3-5651-5646)
Recommend use:	anti-rust , Neutralizer , intermediate raw materials
Restrictions on use:	Seek expert judgment when using for purposes other than those recommended.

2. Hazards identification

Hazard category

Flammable liquids	Category 3
Acute toxicity（oral）	Category 4
Acute toxicity（dermal）	Category 3
Acute toxicity(vapour)	Category 3
Skin corrosion/irritation	Category 1
Serious eye damage/eye irritation	Category 1
Specific target organ systemic toxicity following single exposure	Category 1
Specific target organ systemic toxicity following repeated exposure	Category 1
Acute hazards to the aquatic environment	Category 3

Label elements

Hazard pictograms:

Signal word: Danger

Hazard statements:
H226 Flammable liquid and vapour.
H302 Harmful if swallowed.
H311 Toxic in contact with skin.
H331 Toxic if inhaled.
H314 Causes severe skin burns and eye damage.
H318 Causes serious eye damage.
H370 Causes damage to organs (respiratory apparatus).
H372 Causes damage to organs (respiratory apparatus) through prolonged or repeated exposure.
H402 Harmful to aquatic life

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Precautionary statements:

Prevention
P210 Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 Keep container tightly closed.
P240 Ground and bond container and receiving equipment.
P241 Use explosion-proof electrical/ventilating/lighting equipment.
P242 Use non-sparking tools.
P243 Take action to prevent static discharges.
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
P264 Wash hands and face thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P273 Avoid release to the environment.
P280 Wear protective gloves/protective clothing/eye protection/face protection.

Response
P310 Immediately call a POISON CENTER/doctor/healthcare professionals under the supervision of a doctor.
P311 Call a POISON CENTER/doctor/healthcare professionals under the supervision of a doctor.
P312 Call a POISON CENTRE/doctor/healthcare professionals under the supervision of a doctor if you feel unwell.
P314 Get medical advice/attention if you feel unwell.
P330 Rinse mouth.
P361+P364 Take off immediately all contaminated clothing and wash it before reuse.
P363 Wash contaminated clothing before reuse.
P301+P312 IF SWALLOWED: Call a POISON CENTRE/doctor/healthcare professionals under the supervision of a doctor if you feel unwell.
P301+P330+P331 IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P302+P352 IF ON SKIN: Wash with plenty of water/or shower.
P303+P361+P353 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water [or shower].
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308+P311 IF exposed or concerned: Call a POISON CENTER/doctor/healthcare professionals under the supervision of a doctor.
P370+P378 In case of fire : Use appropriate extinguishing media for extinction.

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Storage P405 Store locked up.
P403+P233 Store in a well ventilated place. Keep container tightly closed.
P403+P235 Store in a well ventilated place. Keep cool.
Disposal P501 Dispose of contents/container in accordance with local/regional/national/international regulation.

3. Composition/information on ingredients

3.1. Substances

Ingredients and Concentration

Ingredient Name	Concentration wt.%	CAS RN®	Existing and New Chemical Substances (JAPAN)	Industrial Safety and Health Law Substances (JAPAN)	Industrial Safety and Health Law (JAPAN)	Pollutant Release Transfer Register Law (JAPAN)	Poisonous and Deleterious Substances Control Act (JAPAN)
			Gazette notice reference number	Gazette notice reference number	Notifiable Substances	Specified Substances	Poisonous and Deleterious Substances
Morpholine	99-100	110-91-8	5-859	8-(7)-425	Applicable	Applicable	Deleterious Substances
Ethylene glycol monomethyl ether	0-0.29	109-86-4	2-405	Public	Applicable	Less than regulation	Not applicable

3.2. Mixtures

Not Applicable

4. First aid measures

Inhalation: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
If breathing is stopped, lie on your back and perform cardiopulmonary respiration.
Get medical advice/attention.

Skin contact: Take off contaminated clothing and wash before reuse.
Wash with plenty of soap and water.
If skin irritation or a rash occurs: Get medical advice/attention.

Eye contact: Immediately flush eye with plenty of clean water for at least 15 minutes. (If easy to do, remove contact lenses, if worn.) Get medical attention immediately.

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Ingestion:	After having swallowed it, Drink a large quantity of water when consciousness becomes clear and receive treatment for the doctor immediately. A mouth must not give a person without the consciousness a thing.
Protection for first aid person:	The rescuer wears a tool for appropriate protection depending on the situation.

5. Firefighting measures

Suitable extinguishing media:	Use water spray(fog), foam, dry chemical or CO2.
Extinguishing media to avoid:	Straight stream water.
Specific hazards arising from the chemical:	At the time of fire, hazardous gases (carbon monoxide,NOx and others) can be generated.
Fire fighting:	Keep upwind of fire. Eliminate all ignition sources if safe to do so. In case of fire in the surroundings, move the content/container to the safety place. If it is not possible to move, cool the content/container with water spray.
Special protective equipment and precautions for fire fighters:	Gloves, protection glasses, wear fire,flame resistant,retardant clothing, air respiratory organs wear a tool for appropriate protection.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:	Promptly remove possible ignition sources from the vicinity. Use personal protection recommended in Section 8. Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Environmental precautions:	To environment (area of the sea, the soil) must not release it.
Methods and materials for containment and cleaning up:	Absorb this product with inactive materials (example: dry sand, earth) and recover it into a waste material container. In the case of large amount, stop leakage with earth/sand to begin with, and, then, recover it. In the case of a small quantity, I adsorb it in the earth and sand, a waste and collect it in empty container which I can seal up after having removed it.

7. Handling and storage

Handling

Technical measures:	During handling, be sure to wear proper protective equipment (refer to the section 8).

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	This product can be charged with static electricity. Take countermeasures for static electricity removal (grounding, others). Wear antistatic clothes and antistatic shoes to prevent human body electrification. Use explosion-proof electrical/ventilating/lighting equipment.
Ventilation requirements:	Use the ventilation equipment described in Section 8.
Precautions for safe handling:	Not especially.

Storage

Storage conditions:	Store the containers avoiding direct sunlight. Store in less than 35℃ in a well-ventilated room.
Safety adequate container materials:	Use the container specified by the Fire Service ACT and the United Nations Transport Regulations.

8. Exposure controls/personal protection

Appropriate engineering controls: Use local ventilation equipment.
Install eye and body washing facilities near the handling place.
Display the position of equipment clearly.

Control parameters

Ingredient Name	Industrial Safety and Health Law (JAPAN)	Japan Society for Occupational Health	ACGIH-TLV	
	Administrative Control Levels	Occupational Exposure Limits	TWA	STEL
Morpholine	Not established	Not established	20ppm Skin, -mg/m3	Not established
Ethylene glycol monomethyl ether	0.1ppm -mg/m3	0.1ppm Skin, 0.31mg/m3 Skin	0.1ppm Skin, -mg/m3	Not established

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Personal protective equipment

Respiratory protection:	Use a gas mask for organic gases, air-supplied respirator, self - contained compressed air breathing apparatus on the situation.
Hand protection:	Organic solvent impermeable protective gloves (Antistatic ones are desirable.)
Eye/face protection:	Protective glasses, goggle, protective face shield.
Skin/body protection:	Wear long-sleeved working clothes and protective shoes.(Antistatic ones are desirable.) Use an oiliness apron-resistant, boots depending on the situation.
Hygiene measures:	Wash with soap and water after handling.

9. Physical and chemical properties

Product

Form:	Liquid（20℃）
Color:	Colorless transparent
Odor:	Ammonia odor
Melting point/freezing point:	-3.5(℃)
Initial boiling point and boiling range:	128.3(℃)
Flammability (solid, gas):	No data
Upper/lower flammability or explosive limits:	1.4－11.2(%)
Flash point:	32.3(℃)
Auto-ignition temperature:	310(℃)
Decomposition temperature:	No data
pH:	10.8（1%aq.）
Kinematic viscosity:	No data
Solubility:	water：Soluble. methanol：Soluble.
Partition coefficient: n-octanol/water:	No data
Vapour pressure:	1.06(ｋPa)(20℃)
Specific Gravity:	1.002(20℃)
Vapour density:	3.00
Particle characteristics:	No data

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10. Stability and reactivity

Chemical stability:	Stable under normal temperatures and pressures.
Possibility of hazardous reactions:	It may react with the oxidizing agent and generate heat.
Conditions to avoid:	Avoid heat, flames, sparks and ignition sources.
Incompatible materials:	Acid, Oxidizing agents.
Hazardous decomposition products:	No data available

11. Toxicological information

Product

Acute toxicity (oral):	Category 4
Acute toxicity (dermal):	Category 3
Acute toxicity (inhalation):	Classification not possible (Gas) Category 3 (Vapour) Classification not possible (Dust/Mist)
Skin corrosion/irritation:	Category 1
Serious eye damage/irritation:	Category 1
Respiratory sensitization:	Classification not possible
Skin sensitization:	Classification not possible
Mutagenicity:	Classification not possible
Carcinogenicity:	Classification not possible
Reproductive toxicity:	Classification not possible
Target organ effect/Single exposure:	Category 1(respiratory apparatus)
Target organ effect/Multi exposure:	Category 1(respiratory apparatus)
Respiratory toxic:	Classification not possible

Ingredient
Morpholine

Acute toxicity (oral):	Category 4 LD50: 1050-1900 mg/kg[rat]
Acute toxicity (dermal):	Category 3 LD50: 310-810 mg/kg[rabbit]
Acute toxicity (inhalation):	Exempt classification (Gas) Category 3 (Vapour) LC50: 7.8-8.2 mg/L[rat] Classification not possible (Dust/Mist)

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Skin corrosion/irritation:	Category 1 Effect on person：Based on the description that this substance is corrosive to the human skin (SIDS (2015)), and multiple test reports that necrosis occurred due to the application of this substance in skin irritation tests with rabbits (EHC 179 (1996), IARC 47 (1989), ACGIH (7th, 2001), PATTY (6th, 2012), SIDS (2015)), it was classified in Category 1.
Serious eye damage/irritation:	Category 1 Effect on person：Since it was classified in Category 1 for skin corrosive/irritation, it was classified in Category 1. Besides, as for humans, it is reported that corneal edema was caused by an application of this substance (IARC 47 (1989)), and there is a description of severe irritation (ACGIH (7th, 2001), IARC 47 (1989), PATTY (6th, 2012)). Effect on animals：In an eye irritation test with rabbits, an application of this substance caused edema, corneal opacity, and staphyloma (EHC 179 (1996)).
Respiratory sensitization:	Classification not possible Effect on person：Classification not possible due to lack of data.
Skin sensitization:	Classification not possible Effect on animals：Classification not possible due to lack of data. There is a description that no sensitization was shown in the skin sensitization test by the modified Buehler method with guinea pigs (EHC 179 (1996), PATTY (6th, 2012)). However, since it is a result at a 2% concentration of this substance, and the information on the experimental conditions and results, etc. is not sufficient, it was classified as "Classification not possible."

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Product Name: **MORPHOLINE**

Mutagenicity:	Classification not possible As for in vivo, it is reported that it was negative in a dominant lethal test with rats, negative in a micronucleus test, a chromosomal aberration test, and a gene mutation test with Syrian hamster fetuses, and negative in a chromosome aberration test (SIDS (2015), IARC 47 (1989), Environmental Risk Assessment for Chemical Substances Vol. 4 (Ministry of the Environment, 2005)). In addition, it is reported that chromosomal aberration tests with bone marrow cells of rats and guinea pigs were positive, but it is described that there were deficiencies in these tests (EHC 179 (1996)). As for in vitro, it was negative in many of bacterial reverse mutation tests, positive in a mouse lymphoma test, negative in a chromosome aberration test, and negative or positive results in sister chromatid exchange tests with mammalian cultured cells (IARC 47 (1989), SIDS (2015), Environmental Risk Assessment for Chemical Substances Vol.4 (Ministry of the Environment, 2005), EHC 179 (1996), PATTY (6th, 2012)). From the above, it was classified as "Classification not possible" according to the GHS Classification Guidance for the Japanese Government.
Carcinogenicity:	Classification not possible IARC:3, ACGIH:A4
Reproductive toxicity:	Classification not possible Classification not possible due to lack of data.
Target organ effect/Single exposure:	Category 1(respiratory apparatus) It is reported that the liquid and vapor of this substance are irritating to the mucous membranes, and the researcher himself who handled this substance developed nasal irritation and cough (ACGIH (7th, 2001)). As for experimental animals, there is a report that in a 4-hour inhalation exposure test with rats, an increase in respiratory rate and the finding of lung irritation were observed at 73 ppm (0.252 mg/L) within the range of Category 1 (PATTY (6th, 2012)). The information on humans was not adopted as evidence since there is only one case, but in an animal test, the effect on the lung was seen at the dose of Category 1, therefore, it was classified in Category 1 (respiratory organs).

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Target organ effect/Multi exposure:	Category 1(respiratory apparatus) No information on humans is available. As for experimental animals, in a 13-week inhalation toxicity study with rats exposed to the vapour (6 hours/day, 5 days/week), focal necrosis and necrotic cell debris in the nasal cavity at or above 340 mg/m3 (converted guidance value: 0.25 mg/L) within the guidance value range for Category 2, increases in focal erosion and squamous metaplasia in the turbinate, maxilloturbinate, nasal septum, and anterior nasal cavity, and chronic pneumonia at 920 mg/m3 (converted guidance value: 0.66 mg/L) were observed (Environmental Risk Assessment for Chemical Substances Vol. 4 (Ministry of the Environment, 2005), EHC 179 (1996), ACGIH (7th, 2001), PATTY (6th, 2012), IARC 47 (1989)). In a 104-week inhalation toxicity study with rats exposed to the vapour, focal necrosis of the skin, necrosis of the turbinate bones at or above 180 mg/m3 within the guidance value range for Category 1, and inflammation and hyperplasia of the turbinate epithelium in the nasal cavity, corneal inflammation, edema and ulcer in the eyes etc. at 540 mg/m3 (0.54 mg/L) within the guidance value range (vapour) for Category 2 were observed (Environmental Risk Assessment for Chemical Substances Vol. 4 (Ministry of the Environment, 2005), EHC 179 (1996), ACGIH (7th, 2001), PATTY (6th, 2012)). Besides, significant necrosis of the turbinate bone was observed at 180 mg/m3 (0.18 mg/L) in this 104-week study, but in the evaluation documents other than Environmental Risk Assessment for Chemical Substances Vol. 4 (Ministry of the Environment, 2005), it is described that effects on the respiratory system were observed only at 540 mg/m3 (0.54 mg/L). From the above, since effects on the nasal cavity considered to be due to irritation are observed as the main effect, it was classified in Category 1 (respiratory organs).
Respiratory toxic:	Classification not possible Effect on person : Classification not possible due to lack of data.

Ethylene glycol monomethyl ether

Acute toxicity (oral):	No Classification LD50: 2370-5490 mg/kg[rat]
Acute toxicity (dermal):	Category 4 LD50: 1280-3920 mg/kg[rabbit]
Acute toxicity (inhalation):	Exempt classification (Gas) Category 4 (Vapour) LC50: 16 mg/L[rat] Classification not possible (Dust/Mist)

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Skin corrosion/irritation:	No Classification Mild [rabbit] Effect on animals：There were multiple primary skin irritation tests with rabbits, among which there is a report that no irritation was observed in a test by 4-hour application of 0.5 mL of the undiluted liquid of this substance (according to EEC guideline) (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), ECETOC TR95 (2005), BUA 198 (1996)), and a report that mild irritation was observed in a test by 24-hour application of 483 mg of this substance (IUCLID (2000)). From the above results, it was classified as "Not classified" (Category 3 in UN GHS classification).
Serious eye damage/irritation:	No Classification None [rabbit] Effect on animals：There is a report that, in an eye irritation test with rabbits (OECD TG 405), after applying 0.1 mL of the undiluted liquid of this substance, the average irritation scores of 24 to 72 hours after application stood at 1.3-1.1 for conjunctival redness, 0.5-0.2 for conjunctival edema and 0.2-0.0 for corneal opacity, and it was not irritating (BUA 198 (1996)). In addition, there is a report that, in another eye irritation test with rabbits, no irritation was observed after applying 0.5 mL of the undiluted liquid of this substance (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), ECETOC TR95 (2005)). From the above results, it was classified as "Not classified."
Respiratory sensitization:	Classification not possible Effect on person：Classification not possible due to lack of data.
Skin sensitization:	Classification not possible Effect on animals：Classification not possible due to lack of data. Besides, there is a report that, in a maximization test with guinea pigs, no sensitization was observed (CICAD 67 (2010)). However, because details including test conditions and test results were unknown, it was classified as "Classification not possible."

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Mutagenicity:	Classification not possible Other mutagenicity:The substance was classified as "Classification not possible" because it was not possible to classify a substance as "Not classified" according to the revised GHS classification guidance for the Japanese government. As for in vivo, it showed mostly negative results with some weakly positive results in dominant lethal tests and chromosomal aberration tests with rats and mice, a micronucleus test with mice and sister chromatid exchange tests with humans peripheral blood and mice bone marrow cells (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), OEL Documentations (Japan Society For Occupational Health (JSOH), 2009), CEPA (2002), ECETOC TR95 (2005), CICAD 67 (2010), DFGOT vol. 6 (1994), PATTY (6th, 2012)). As for in vitro, it was negative in a bacterial reverse mutation test and a gene mutation test with cultured mammalian cells, and except for one positive result in a chromosomal aberration test, it was all negative in a chromosomal aberration test and a sister chromatid exchange test with humans lymphocytes, and an unscheduled DNA synthesis test with humans fibroblasts (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), Environmental Risk Assessment for Chemical Substances Vol. 4 (Ministry of the Environment, 2005), OEL Documentations (Japan Society For Occupational Health (JSOH), 2009), CEPA (2002), ECETOC TR95 (2005), CICAD 67 (2010), DFGOT vol. 6 (1994), PATTY (6th, 2012)).
Carcinogenicity:	Classification not possible Classification not possible due to lack of data.

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Reproductive toxicity:	Category 1B In a multi-generation reproductive toxicity test with rats and mice by the oral route (drinking water), a decrease in the number of surviving fetuses, reduced conception rate and a decrease in the number of pregnancies were observed at doses equivalent to ca. 20-200 mg/kg bw/day (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007)). In teratogenicity tests by the oral route, in mice, at doses (60-300 mg/kg/day) where no maternal toxicity was observed, or decreased body weight gain was observed, increased incidence of fetal death, malformations of the fore/hind limbs (syndactyly, brachydactyly, oligodactyly and polydactyly), skeletal malformations (bifurcation or split of cervical vertebral arches), external malformation (exencephaly) were observed. In rats, cardiovascular malformations were observed at a dose (equivalent to 31 mg/kg/day) where no maternal toxicities were observed. In Macaca fascicularis, there is a report on embryonic death at or above 12 mg/kg/day, all embryonic deaths and a missing digit on each forelimb in one dead embryo at 36 mg/kg/day. In teratogenicity tests by the inhalation route, in mice, testicular hypoplasia and skeletal variations were observed in the fetus at a concentration (50 ppm) where decreased body weight gain was observed in maternal animals. In rats, skeletal variations were reported. In rabbits, increased fetal resorptions, decreased fetal weight, external malformations (arthrogryposis, clubfoot, no nails, brachydactyly, oligodactyly and umbilical hernia, etc.), skeletal malformations (phalanx defect), visceral malformations (ventricular septum defect, subclavian arterial hypoplasia, renal agenesis, renal malformation, renal pelvis dilatation, diaphragmatic hernia, ovarian defects and bladder hypoplasia, etc.) (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007)) were reported. In teratogenicity tests by the dermal route, in rats, external malformations (bent forelimbs) and visceral anomalies (swelling of the kidney pelvis, dilatation of the ureter) were reported at a dose (500 mg/kg) where decreased body weight gain was observed in maternal animals (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007)). From the above, reproductive effects were observed clearly in experimental animals. Additionally, it was listed as reproductive toxicants Group 1 (known to exhibit reproductive toxicity in humans) in Recommendation of

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Occupational Exposure Limits (2013) (provisional proposed in 2013). In the OEL Documentations (Japan Society For Occupational Health (JSOH), 2009), regarding reproductive effects on humans, it was described that "A follow-up survey was conducted on 28 female workers who were exposed to EGME for an average of 4.6 years between 1970 and 1977 at a manufacturing facility of radio and television capacitors. 41 children were born from 28 females. Children who were not exposed during the pregnancy period served as a control group. As the result, although the frequency of congenital anomaly and chromosomal aberrations seemed significantly higher in the exposed group, it was necessary to decipher cautiously because exposure levels in the past and at the survey time were unknown, and the genotoxicity of this substance was negative, and the observed increase in the frequency of chromosomal structural abnormalities was considered due to possible effects from combined exposure with other substances."
From the above, although clear reproductive effects on experimental animals were observed, the effects on humans were ambiguous. Therefore, it was classified in Category 1B.

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Target organ effect/Single exposure: Category 1(central nerve system,blood systems,kidney)
Category 3(respiratory tract irritation,anesthetic action)
It was mildly irritating to the respiratory tract in humans. By the inhalation route, it caused cough, sore throat, dizziness, headache, nausea, vomiting and confusion, and there were some cases of loss of consciousness at high concentrations. By the oral route, as in the case reports, there were reports of acute effects such as death, nausea, cyanosis, tachypnea, tachycardia, metabolic acidosis, central nervous symptoms such as confusion and frenzy, acute hemorrhagic gastritis, acute pancreatitis, blackened kidneys and renal tubular degeneration, congestive edema in the brain and meninges (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007)), fatty changes in the liver, blackened kidneys and renal tubule degeneration, congestion and edema in the brain and meninges, metabolic acidosis and lung disorders (Environmental Risk Assessment for Chemical Substances Vol. 4 (Ministry of the Environment, 2005), CICAD 67 (2010)). Moreover, it is described in the CICAD 67 (2010) that human epidemiological data are indicative of a clear association between exposure and effects on the hemal system as well as those on the nervous system. In experimental animals, there were reports of hematological effects by the oral, inhalation and dermal routes in rats, etc. (CICAD 67 (2010)), lung and kidney disorder by inhalation in mice (OEL Documentations (Japan Society For Occupational Health (JSOH), 2009), ACGIH (7th, 2006)), lung edema, slight liver injury, marked kidney injury and hemoglobinuria by the oral route in mice (PATTY (6th, 2012)), neurological toxicity such as inhibition of conditioned avoidance response, increased barbiturate induced sleeping time and partial hindlimb paralysis at and above 395 mg/m3 by inhalation of rats and mice (CICAD 67 (2010)). These findings were observed within the guidance value range of Category 1. Besides, findings of the liver and lungs were considered as secondary effects of this substance. From the above, it was classified in Category 1 (central nervous system, hemal system, kidney), Category 3 (respiratory tract irritation, narcotic effects).

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Target organ effect/Multi exposure:	Category 1(blood systems,testis) In epidemiological studies from human occupational exposure, red blood cell count, hemoglobin concentration and hematocrit value were significantly reduced in the group of male workers exposed to this substance, compared to the non-exposed control group, and the frequency of anemia increased to 26.1% in the exposed group compared to 3.2% in the control group. At the time when clear hematotoxicities were observed in the exposed group, and 2.5 months and 6 months after the time when the workplace environments were improved, follow-up measurement of the air concentrations of this substance at the workplace and the urinary metabolites (methoxyacetic acid: MAA) in the exposed group were conducted. As a result, both showed a high correlation, and it was considered that the exposure to this substance and the onset of hematotoxicity were related (CICAD 67 (2010)). In addition, among epidemiological survey reports, there is a report that inhibited spermatogenesis was observed (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), ECETOC TR95 (2005), CICAD 67 (2010)). In experimental animals, atrophy of the thymus and testis was observed at a dose (70 mg/kg/day) equivalent to Category 2 in a test in which rats were dosed by drinking water for 13 weeks, and decreased weight and tissue changes in the testis were observed at high doses exceeding the range of Category 2 in a test in which mice were dosed by drinking water for 13 weeks (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), CICAD 67 (2010)). Additionally, decreased leukocyte counts, hemoglobin concentration and hematocrit value, and testis atrophy were observed at concentrations (0.31-0.93 mg/L) equivalent to Category 2 also in tests in which rats or rabbits were exposed to the vapour of this substance by inhalation for 13 weeks (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), ECETOC TR95 (2005), CICAD 67 (2010)). From the above, based on the findings in humans and experimental animals, it was classified in Category 1 (hemal system, testis). Besides, it was confirmed that multiple findings, adopted in the previous classification, to humans related to the effects on the central nervous system (such as nervous symptom, encephalopathy) were all due to effects of acute or repeated exposure by combined exposure with other substance (Initial Risk Assessment Report (NITE, CERI, NEDO, 2007), ECETOC TR95 (2005), CICAD 67 (2010)). Therefore, it was deleted from the target organs in the current classification.

NIPPON NYUKAZAI CO., LTD.

SAFETY DATA SHEET

SDS: A6001-0100_E001
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Product Name: MORPHOLINE

Respiratory toxic:	Classification not possible Effect on person : Classification not possible due to lack of data.

12. Ecological information

Product

Ecotoxicity	
Acute toxicity:	Category 3
Chronic toxicity:	No Classification
Persistence and degradability :	No information.
Bioaccumulative potential :	No information.
Mobility in soil:	No information.
Hazardous to the ozone layer:	Classification not possible
Other impact :	No information.

Ingredient
Morpholine

Ecotoxicity	
Acute toxicity:	Category 3
Fish:	96hrLC50:> 100 mg/L[Oryzias latipes]
Daphnia:	48hrEC50: 45 mg/L[Daphnia magna]
Algae:	No data
Chronic toxicity:	No Classification
Fish:	No data
Daphnia:	21dayNOEC: 5.0 mg/L[Daphnia magna]
Algae:	72hrNOEC: 30.9 mg/L[Pseudokirchneriella subcapitata]
Persistence and degradability :	Not rapidly biodegradable
Bioaccumulative potential :	Low bioconcentration
Hazardous to the ozone layer:	Classification not possible

Ethylene glycol monomethyl ether

Ecotoxicity	
Acute toxicity:	No Classification
Fish:	96hrLC50:> 88.9 mg/L[Oryzias latipes]
Daphnia:	48hrEC50:> 84.8 mg/L[Daphnia magna]
Algae:	72hrErC50:>= 93.2 mg/L[Pseudokirchneriella subcapitata]
Chronic toxicity:	No Classification
Fish:	No data
Daphnia:	21dayNOEC:> 84.8 mg/L[Daphnia magna]
Algae:	72hrNOEC:>= 93.2 mg/L[Pseudokirchneriella subcapitata]
Persistence and degradability :	Readily biodegradable
Bioaccumulative potential :	No data
Hazardous to the ozone layer:	Classification not possible

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13. Disposal considerations

Disposal methods: When waste materials and waste water are to be treated, collect them into specified containers and entrust the disposal to a disposal contractor having an industrial waste disposal contractor permit.
Do not use the used containers for other purposes like filling other substances. Be sure to dispose of them after treating the content according to the above description. In case of recycling the container, return the container as it is after fitting a stopper without filling anything into it.

14. Transport information

International regulations	UN classification :	8（Subsidiary risk 3）
	UN number :	2054
	Proper shipping name :	MORPHOLINE
	Packing group :	I
Domestic restriction:		Transport the material in accordance with the regulations in your country or region.
Specific security precaution and condition of transportation:		Load the containers in such a way as not to wet with water,fall down, tumble, or being damaged. Cover the loaded cargo to prevent direct sunlight.
Emergency Response Guide (ERG) Numbers:		132

15. Regulatory information

Regulatory information with regard to this substance in your country or region should be examined by your own responsibility.

16. Other information

Reference: Information obtained in NITE (National Institute of Technology and Evaluation) and other literature surveys.

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Disclaimer	About the description: This SDS was created in accordance with JIS Z 7253 based on the materials and data available at the time of creation. Detailed information such as composition and ingredients corresponding to overseas legal regulation registration confirmation etc. may not be described, so please contact our sales staff separately if necessary. Precautions are for normal handling. In case of special handling, it is the responsibility of the user to take safety measures suitable for the intended use and usage. We have paid close attention to the contents, but we do not guarantee the contents. This product can only be used for industrial purposes. If you want to use it for other purposes, please contact us in advance.