furosemide

Conforms to Regulations (EC) No 1907/2006, (EC) No 1272/2006 (CLP)

SAFETY DATASHEET

SECTION 1: Identification of the substance / mixture and of the company / undertaking

1.1. Product Identifier

Product name:	furosemide
Chemical product name:	No data available
Synonyms:	C12-H11-Cl-N2-O5-S, "5-(aminosulfonyl)-4-chloro-2-((2-furanylmethyl)amino)benzoic acid", "4-chloro-N-furfuryl-5-sulfamoylanthranilic acid", "4-chloro-N-(2-furylmethyl)-5-sulfamoylanthranilic acid", Aisemide, Aluzine, Aquamide, Aquasin, Arasemide, Beronald, Desmedin, Discoid, Diural, Diuresal, Diurolasa, Dryptal, Durafurid, Errolan, Eutensin, Franyl, Frusemide, Frusemin, Frusetic, Frusid, Fulsix, Fuluvamide, Furanthril, Furesis, Furose, Furosedon, Furosemid, Fusid, Hydrex, Hydro-Rapid, Impugan, Katlex, Lasex, Lasiletten, Lasilix, Lasix, Laxur, LB-502, Lowpstron, Macasirool, Mbilarorin, NCI-C55936, Promedes, Puresis, Radonna, Rosemide, Salix, Seguril, Sigasalur, Transit, Trofurit, Urex, Urex-M, Uritol, Urosemide, diuretic, antihypertensive, Uremide
Proper shipping name:	No data available
Chemical formula:	C12H11ClN2O5S
Other means of identification:	No data available
Index number:	No data available
ID number:	No data available
CAS number:	54-31-9
REACH registration number:	No data available
EC number:	200-203-6

1.2. Relevant identified uses of the substance or mixture and uses advised against

Relevant identified uses:	Diuretic; antihypertensive. Action is rapid (effects evident within 1 hour after oral dose). Also used in treatment of renal insufficiency and in forced diuresis regimens for the poisoning with drugs such as barbiturates. Given by mouth or by injection. Inhibits ion co-transport in the kidney.
Uses advised against:	No data available

1.3. Details of the supplier of the safety data sheet

Registered company name:	Ipca Laboratories Ltd.	Ipca Laboratories Limited.
Address:	48, Kandivli Industrial Estate, Kandivli (West), Mumbai-400 067,Post Box no. 33, P.O. Sejavta, Dist. Ratlam(M.P.)-457002,IND	48, Kandivli Industrial Estate, Kandivli (West), Mumbai- 400067,Post Box No. 33, P.O. Sejavta, Dist. Ratlam(M.P.)- 457002,IND
Telephone:	(022)66474444	(022)66474444
Fax:	(022)28686613, (07412)279083/278084	(022)28686613, (07412)279083/278084
Email:	safety.ratlam@ipca.com	safety.ratlam@ipca.com
Website:		

1.4. Emergency telephone number

Association / Organisation:		
Other emergency telephone numbers:	(07412)278000	(07412)278000

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

DSD classification:	R61(2) • May cause harm to the unborn child.
DSD classification (additional):	No data available
DPD classification:	In case of substances classification has been prepared by following DSD (Directive 67/548/EEC) and CLP Regulation (EC) No 1272/2008 regulations
CLP classification:	• Reproductive Toxicity Category 1B
CLP classification (additional):	Not applicable

2.2. Label elements

CLP label elements

Signal word:	DANGER	
Hazard statement(s):	H360	May damage fertility or the unborn child.
Additional Statement(s):	No data available	
Supplementary statement(s):	No data available	
Precautionary statement(s):	**Prevention**	
	Code	**Phrase**
	P201	Obtain special instructions before use.
	P202	Do not handle until all safety precautions have been read and understood.
	P281	Use personal protective equipment as required.
	Response	
	Code	**Phrase**
	P308+P313	IF exposed or concerned: Get medical advice/attention.
	Storage	
	Code	**Phrase**
	P405	Store locked up.
	Disposal	
	Code	**Phrase**
	P501	Dispose of contents/container to ...

DSD / DPD label elements

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Relevant risk statements are found in section 2.1

Indication(s) of danger:	CONSIDERED A DANGEROUS SUBSTANCE ACCORDING TO DIRECTIVE 67/548/EEC AND ITS AMENDMENTS.	
Safety advice:	S01	• Keep locked up.
	S22	• Do not breathe dust.
	S24	• Avoid contact with skin.
	S36	• Wear suitable protective clothing.
	S38	• In case of insufficient ventilation, wear suitable respiratory equipment.
	S37	• Wear suitable gloves.
	S39	• Wear eye/face protection.
	S53	• Avoid exposure - obtain special instructions before use.
	S401	• To clean the floor and all objects contaminated by this material, use water and detergent.
	S35	• This material and its container must be disposed of in a safe way.
	S13	• Keep away from food, drink and animal feeding stuffs.

SECTION 3: Composition / information on ingredients

3.1. Substances

1. CAS No **2. EC No** **3. Index No** **4. REACH No**	**%[weight]**	**Name**
1. 54-31-9 2. 200-203-6 3. No data available 4. No data available	>98	furosemide

SECTION 4: First aid measures

4.1. Description of first aid measures

General: No data available

Ingestion:

- If swallowed do **NOT** induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.
- Seek medical advice.

Eye Contact: If this product comes in contact with the eyes:

- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: If skin or hair contact occurs:

- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

Inhalation:

- If dust is inhaled, remove from contaminated area.
- Encourage patient to blow nose to ensure clear passage of breathing.
- If irritation or discomfort persists seek medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Inhaled:

The material is not thought to produce either adverse health effects or irritation of the respiratory tract following inhalation (as classified by EC Directives using animal models). Nevertheless, adverse systemic effects have been produced following exposure of animals by at least one other route and good hygiene practice requires that exposure be kept to a minimum and that suitable control measures be used in an occupational setting.

Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.

If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.

Ingestion:

Accidental ingestion of the material may be damaging to the health of the individual.

Large doses or frequent use of diuretics may produce fluid and electrolyte imbalance.

This, in turn, may produce increased urination, dry mouth, increased thirst, irregular heartbeat, mood or mental changes, muscle cramps or pain, nausea or vomiting, unusual tiredness or weakness, weak pulse, blurred vision, diarrhoea, headache, dizziness, loss of appetite,skin rash, pruritus, and stomach cramps or pain. Orthostatic hypotension may also result from excessive use.

Concern has been raised about the potential for diuretic-induced hypokalaemia, even when chronic or mild, to play a part in the development of ventricular arrhythmias, and sudden death. A trend towards increased mortality due to coronary heart disease, in patients with pre-existing ECG abnormalities, has also been suggested in some studies.

Tinnitus and hearing loss (usually reversible) have been observed after rapid intravenous injection of some loop diuretics.

Incompletely but fairly rapidly absorbed from the gastro-intestinal tract. Mainly excreted in the urine, largely unchanged. Variable amounts are also excreted in the bile. Exerts an inhibiting effect on electrolyte reabsorption in the proximal and distal renal tubules and in the ascending Loop of Henle. Excretion of sodium and potassium ion is thus enhanced. Side-effects of therapy include fluid and electrolyte imbalance after single large doses or prolonged administration. Infrequent symptoms

include allergy, nausea, diarrhoea, blurred vision, dizziness, headache, pancreatitis, photosensitivity, skin rashes, muscle spasm, hypotension, agranulocytosis, aplastic anaemia, thrombocytopenia and leucopenia, liver damage, paraesthesia, tinnitus and transient deafness.

Skin Contact:

The material is not thought to produce adverse health effects or skin irritation following contact (as classified by EC Directives using animal models). Nevertheless, good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.

Open cuts, abraded or irritated skin should not be exposed to this material

Entry into the blood-stream through, for example, cuts, abrasions, puncture wounds or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

Eye:

Although the material is not thought to be an irritant (as classified by EC Directives), direct contact with the eye may cause transient discomfort characterised by tearing or conjunctival redness (as with windburn). Slight abrasive damage may also result. The material may produce foreign body irritation in certain individuals.

Chronic:

There is sufficient evidence to provide a strong presumption that human exposure to the material may result in developmental toxicity, generally on the basis of:

- clear results in appropriate animal studies where effects have been observed in the absence of marked maternal toxicity, or at around the same dose levels as other toxic effects but which are not secondary non-specific consequences of the other toxic effects.

On the basis, primarily, of animal experiments, concern has been expressed by at least one classification body that the material may produce carcinogenic or mutagenic effects; in respect of the available information, however, there presently exists inadequate data for making a satisfactory assessment.

Long term exposure to high dust concentrations may cause changes in lung function (i.e. pneumoconiosis) caused by particles less than 0.5 micron penetrating and remaining in the lung. A prime symptom is breathlessness. Lung shadows show on X-ray.

Crosses the placental barrier and is excreted in milk.

4.3. Indication of any immediate medical attention and special treatment needed

for diuretics:

- The signs and symptoms of overdosage can be anticipated to be those of excessive pharmacologic effect: dehydration, hypovolaemia, hypotension, hyponatraemia, hypokalaemia, hypochloraemic alkalosis, and haemoconcentration. Treatment of overdosage should consist of fluid and electrolyte replacement.
- Patients receiving diuretics should be observed for clinical evidence of electrolyte imbalance, hypovolaemia, or prerenal azotemia. Symptoms of these disturbances may include one or more of the following: dryness of the mouth, thirst, weakness, lethargy, drowsiness, restlessness, muscle pains or cramps, muscular fatigue, hypotension, oliguria, tachycardia, nausea, and vomiting.
- Excessive diuresis may cause dehydration, blood-volume reduction, and possibly thrombosis and embolism, especially in elderly patients.
- In patients who develop fluid and electrolyte imbalances, hypovolaemia, or prerenal azotemia, the observed laboratory changes may include hyper- or hyponatraemia, hyper- or hypochloraemia, hyper- or hypokalaemia, acid-base abnormalities, and increased blood urea nitrogen (BUN). If any of these occur

Treat symptomatically.

In massive overdose treatment should be symptomatic and directed at fluid and electrolyte replacement. In the case of recent ingestion gastric lavage should be carried out.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.
- Water spray or fog - Large fires only.

5.2. Special hazards arising from the substrate or mixture

Fire Incompatibility:

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

5.3. Advice for firefighters

Fire Fighting:

- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use water delivered as a fine spray to control fire and cool adjacent area.
- **DO NOT** approach containers suspected to be hot.
- Cool fire exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

Fire/Explosion Hazard:

- Combustible solid which burns but propagates flame with difficulty; it is estimated that most organic dusts are combustible (circa 70%) - according to the circumstances under which the combustion process occurs, such materials may cause fires and / or dust explosions.
- Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions).
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust (420 micron or less) may burn rapidly and fiercely if ignited - particles exceeding this limit will generally not form flammable dust clouds; once initiated, however, larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.
- In the same way as gases and vapours, dusts in the form of a cloud are only ignitable over a range of concentrations; in principle, the concepts of lower explosive limit (LEL) and upper explosive limit (UEL) are applicable to dust clouds but only the LEL is of practical use; - this is because of the inherent difficulty of achieving homogeneous dust clouds at high temperatures (for dusts the LEL is often called the "Minimum Explosible Concentration", MEC)
- When processed with flammable liquids/vapors/mists,ignitable (hybrid) mixtures may be formed with combustible dusts. Ignitable mixtures will increase the rate of explosion pressure rise and the Minimum Ignition Energy (the minimum amount of energy required to ignite dust clouds - MIE) will be lower than the pure dust in air mixture. The Lower Explosive Limit (LEL) of the vapour/dust mixture will be lower than the individual LELs for the vapors/mists or dusts
- A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.
- Usually the initial or primary explosion takes place in a confined space such as plant or machinery, and can be of sufficient force to damage or rupture the plant. If the shock wave from the primary explosion enters the surrounding area, it will disturb any settled dust layers, forming a second dust cloud, and often initiate a much larger secondary explosion. All large scale explosions have resulted from chain reactions of this type.
- Dry dust can be charged electrostatically by turbulence, pneumatic transport, pouring, in exhaust ducts and during transport.
- Build-up of electrostatic charge may be prevented by bonding and grounding.
- Powder handling equipment such as dust collectors, dryers and mills may require additional protection measures such as explosion venting.
- All movable parts coming in contact with this material should have a speed of less than 1-meter/sec
- A sudden release of statically charged materials from storage or process equipment, particularly at elevated temperatures and/ or pressure, may result in ignition especially in the absence of an apparent ignition source
- One important effect of the particulate nature of powders is that the surface area and surface structure (and often moisture content) can vary widely from sample to sample, depending of how the powder was manufactured and handled; this means that it is virtually impossible to use flammability data published in the literature for dusts (in contrast to that published for gases and vapours).
- Autoignition temperatures are often quoted for dust clouds (minimum ignition temperature (MIT)) and dust layers (layer ignition temperature (LIT)); LIT generally falls as the thickness of the layer increases.

Combustion products include:
carbon monoxide (CO)
carbon dioxide (CO2)
hydrogen chloride
phosgene
nitrogen oxides (NOx)
sulfur oxides (SOx)
other pyrolysis products typical of burning organic material
May emit poisonous fumes.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Personal Protective Equipment:	Glasses:	Respirator:
	Chemical goggles.	Particulate

Minor Spills:

- Clean up waste regularly and abnormal spills immediately.
- Avoid breathing dust and contact with skin and eyes.
- Wear protective clothing, gloves, safety glasses and dust respirator.
- Use dry clean up procedures and avoid generating dust.
- Vacuum up or sweep up. **NOTE:** Vacuum cleaner must be fitted with an exhaust micro filter (HEPA type) (consider explosion-proof machines designed to be grounded during storage and use).
- Dampen with water to prevent dusting before sweeping.
- Place in suitable containers for disposal.

Major Spills:

Moderate hazard.

- **CAUTION:** Advise personnel in area.
- Alert Emergency Services and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spillage from entering drains or water courses.
- Recover product wherever possible.
- **IF DRY:** Use dry clean up procedures and avoid generating dust. Collect residues and place in sealed plastic bags or other containers for disposal. **IF WET:** Vacuum/shovel up and place in labelled containers for disposal.
- **ALWAYS:** Wash area down with large amounts of water and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise Emergency Services.

6.2. Environmental precautions

See section 12

6.3. Methods and material for containment and cleaning up

6.4. Reference to other sections

Personal Protective Equipment advice is contained in Section 8 of the MSDS

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Safe handling

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
- **DO NOT** enter confined spaces until atmosphere has been checked.
- **DO NOT** allow material to contact humans, exposed food or food utensils.
- Avoid contact with incompatible materials.
- When handling, **DO NOT** eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately. Launder contaminated clothing before re-use.
- Use good occupational work practice.

- Observe manufacturer's storage and handling recommendations contained within this MSDS.

- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

- Organic powders when finely divided over a range of concentrations regardless of particulate size or shape and suspended in air or some other oxidizing medium may form explosive dust-air mixtures and result in a fire or dust explosion (including secondary explosions)
- Minimise airborne dust and eliminate all ignition sources. Keep away from heat, hot surfaces, sparks, and flame.
- Establish good housekeeping practices.
- Remove dust accumulations on a regular basis by vacuuming or gentle sweeping to avoid creating dust clouds.
- Use continuous suction at points of dust generation to capture and minimise the accumulation of dusts. Particular attention should be given to overhead and hidden horizontal surfaces to minimise the probability of a "secondary" explosion. According to NFPA Standard 654, dust layers 1/32 in.(0.8 mm) thick can be sufficient to warrant immediate cleaning of the area.
- Do not use air hoses for cleaning.
- Minimise dry sweeping to avoid generation of dust clouds. Vacuum dust-accumulating surfaces and remove to a chemical disposal area. Vacuums with explosion-proof motors should be used.
- Control sources of static electricity. Dusts or their packages may accumulate static charges, and static discharge can be a source of ignition.
- Solids handling systems must be designed in accordance with applicable standards (e.g. NFPA including 654 and 77) and other national guidance.
- Do not empty directly into flammable solvents or in the presence of flammable vapors.
- The operator, the packaging container and all equipment must be grounded with electrical bonding and grounding systems. Plastic bags and plastics cannot be grounded, and antistatic bags do not completely protect against development of static charges.

Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.

- Do NOT cut, drill, grind or weld such containers.
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

Fire and explosion protection

See section 5

Other information

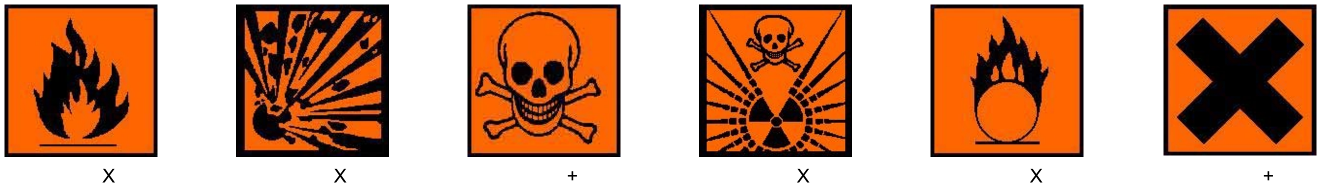
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry area protected from environmental extremes.
- Store away from incompatible materials and foodstuff containers.
- Protect containers against physical damage and check regularly for leaks.

- Observe manufacturer's storage and handling recommendations contained within this MSDS.

For major quantities:

- Consider storage in bunded areas - ensure storage areas are isolated from sources of community water (including stormwater, ground water, lakes and streams}.
- Ensure that accidental discharge to air or water is the subject of a contingency disaster management plan; this may require consultation with local authorities.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



+: May be stored together.
O: May be stored together with specific preventions.
X: Must not be stored together.

7.2. Conditions for safe storage, including any incompatibilities

Suitable container:

- Glass container is suitable for laboratory quantities
- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

Storage incompatibility:

- Avoid reaction with oxidising agents

Incompatible with calcium gluconate, ascorbic acid, tetracyclines, urea, epinephrine (adrenalin).

Package Material Incompatibilities:

Chemical Name	Container Type
	"Acetal (Delrinr)", "Cast iron", Neoprene

7.3. Specific end use(s)

See section 1.2

SECTION 8: Exposure controls / personal protection

8.1. Control parameters

Derived No Effect Level (DNEL)

Exposure Pattern	Workers	General Population	Exposure Pattern	Workers	General Population
Long term - dermal, systemic effects	No data available	No data available	**Short term - dermal, systemic effects**	No data available	No data available
Long term - inhalation, systemic effects	No data available	No data available	**Short term - inhalation, systemic effects**	No data available	No data available
Long term - oral, systemic effects	No data available	No data available	**Short term - oral, systemic effects**	No data available	No data available
Long term - dermal, local effects	No data available	No data available	**Short term - dermal, local effects**	No data available	No data available
Long term - inhalation, local effects	No data available	No data available	**Short term - inhalation, local effects**	No data available	No data available

Occupational Exposure Limits (OEL)

The following materials had no OELs on our records

• furosemide:	CAS:54-31-9

No data available

FUROSEMIDE:
Airborne particulate or vapour must be kept to levels as low as is practicably achievable given access to modern engineering controls and monitoring hardware. Biologically active compounds may produce idiosyncratic effects which are entirely unpredictable on the basis of literature searches and prior clinical experience (both recent and past).

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Enclosed local exhaust ventilation is required at points of dust, fume or vapour generation.

HEPA terminated local exhaust ventilation should be considered at point of generation of dust, fumes or vapours.

Barrier protection or laminar flow cabinets should be considered for laboratory scale handling.

A fume hood or vented balance enclosure is recommended for weighing/ transferring quantities exceeding 500 mg

When handling quantities up to 500 gram in either a standard laboratory with general dilution ventilation (e.g. 6-12 air changes per hour) is preferred. Quantities up to 1 kilogram may require a designated laboratory using fume hood, biological safety cabinet, or approved vented enclosures. Quantities exceeding 1 kilogram should be handled in a designated laboratory or containment laboratory using appropriate barrier/ containment technology.

Manufacturing and pilot plant operations require barrier/ containment and direct coupling technologies.

Barrier/ containment technology and direct coupling (totally enclosed processes that create a barrier between the equipment and the room) typically use double or split butterfly valves and hybrid unidirectional airflow/ local exhaust ventilation solutions (e.g. powder containment booths). Glove bags, isolator glove box systems are optional. HEPA filtration of exhaust from dry product handling areas is required.

Fume-hoods and other open-face containment devices are acceptable when face velocities of at least 1 m/s (200 feet/minute) are achieved. Partitions, barriers, and other partial containment technologies are required to prevent migration of the material to uncontrolled areas. For non-routine emergencies maximum local and general exhaust are necessary. Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapours, etc. evaporating from tank (in still air)	0.25-0.5 m/s (50-100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)

direct spray, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favourable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2.5 m/s (200-500 f/min.) for extraction of gases discharged 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

The need for respiratory protection should also be assessed where incidental or accidental exposure is anticipated: Dependent on levels of contamination, PAPR, full face air purifying devices with P2 or P3 filters or air supplied respirators should be evaluated.

The following protective devices are recommended where exposures exceed the recommended exposure control guidelines by factors of:

10; high efficiency particulate (HEPA) filters or cartridges

10-25; loose-fitting (Tyvek or helmet type) HEPA powered-air purifying respirator.

25-50; a full face-piece negative pressure respirator with HEPA filters

50-100; tight-fitting, full face-piece HEPA PAPR

100-1000; a hood-shroud HEPA PAPR or full face-piece supplied air respirator operated in pressure demand or other positive pressure mode.

8.2.2. Personal protection

Eye and face protection:

When handling very small quantities of the material eye protection may not be required.
For laboratory, larger scale or bulk handling or where regular exposure in an occupational setting occurs:

- Chemical goggles
- Face shield. Full face shield may be required for supplementary but never for primary protection of eyes
- Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

Skin protection: See Hand protection: below

Hand protection:

The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and
has to be observed when making a final choice.
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739, AS/NZS 2161.1 or national equivalent).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374, AS/NZS 2161.10.1 or national equivalent) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

- Rubber gloves (nitrile or low-protein, powder-free latex, latex/ nitrile). Employees allergic to latex gloves should use nitrile gloves in preference.
- Double gloving should be considered.
- PVC gloves.
- Change gloves frequently and when contaminated, punctured or torn.
- Wash hands immediately after removing gloves.
- Protective shoe covers. [AS/NZS 2210]
- Head covering.

Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.

- polychloroprene
- nitrile rubber

- butyl rubber
- fluorocaoutchouc
- polyvinyl chloride

Gloves should be examined for wear and/ or degradation constantly.

Body protection: See Other protection: below

Other protection:

- For quantities up to 500 grams a laboratory coat may be suitable.
- For quantities up to 1 kilogram a disposable laboratory coat or coverall of low permeability is recommended. Coveralls should be buttoned at collar and cuffs.
- For quantities over 1 kilogram and manufacturing operations, wear disposable coverall of low permeability and disposable shoe covers.
- For manufacturing operations, air-supplied full body suits may be required for the provision of advanced respiratory protection.
- Eye wash unit.
- Ensure there is ready access to an emergency shower.
- For Emergencies: Vinyl suit

Respiratory protection: •Particulate. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

- Respirators may be necessary when engineering and administrative controls do not adequately prevent exposures.
- The decision to use respiratory protection should be based on professional judgment that takes into account toxicity information, exposure measurement data, and frequency and likelihood of the worker's exposure - ensure users are not subject to high thermal loads which may result in heat stress or distress due to personal protective equipment (powered, positive flow, full face apparatus may be an option).
- Published occupational exposure limits, where they exist, will assist in determining the adequacy of the selected respiratory . These may be government mandated or vendor recommended.
- Certified respirators will be useful for protecting workers from inhalation of particulates when properly selected and fit tested as part of a complete respiratory protection program.
- Use approved positive flow mask if significant quantities of dust becomes airborne.
- Try to avoid creating dust conditions.

Thermal hazards:	No data available
Recommended material(s):	No data available

8.2.3. Environmental exposure controls

See section 12

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Appearance	White or yellow, odourless, tasteless crystalline powder; does not mix well with water. Soluble in alcohol (1:75), ether (1:180), acetone (1:15), dimethylformamide, solutions of alkali hydroxides.
Odour	No data available
Odour threshold	No data available
Taste	No data available
pH (1% solution)	Not applicable
pH (as supplied)	Not applicable
Melting point / freezing point (°C)	220 (decomposes)
Initial boiling point and boiling range (°C)	Not available
Flash Point (°C)	Not available
Flammability	No data available
Vapour Pressure (kPa)	Negligible
Vapour density	>1
Relative Density (Water = 1)	Not available
Solubility in water (g/L)	Partly miscible
Partition coefficient: n-octanol / water	No data available
Auto-ignition temperature (°C)	Not available
Critical Temperature	Not available.
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available
Physical State	Divided solid
Upper Explosive Limit (%)	Not available.
Lower Explosive Limit (%)	Not available
Surface Tension	No data available
Volatile Component (%vol)	Negligible
Gas group	No data available
Molecular weight (g/mol)	330.75
Evaporation Rate	Not applicable
IUCLID Remarks	No data available

9.2. Other information

No data available

SECTION 10: Stability and reactivity

10.1.	**Reactivity**	See section 7.2
10.2.	**Chemical stability**	¦

- Presence of incompatible materials.
- Product is considered stable.

- Hazardous polymerisation will not occur.

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10.3.	**Possibility of hazardous reactions**	See section 7.2
10.4.	**Conditions to avoid**	See section 7.2
10.5.	**Incompatible materials**	See section 7.2
10.6.	**Hazardous decomposition products**	See section 5.3

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Mutagenicity:	No data available
Reproductive Toxicity:	No data available
Carcinogenicity:	No data available
STOT - single exposure:	No data available

FUROSEMIDE:

unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances

TOXICITY	IRRITATION
Oral (rat) LD50:2600 mg/kg	Nil Reported
Intraperitoneal (rat) LD50:800 mg/kg	
Intravenous (rat) LD50:800 mg/kg	
Oral (mouse) LD50:2200 mg/kg	
Intravenous (mouse) LD50:308 mg/kg	
Oral (dog) LD50:2000 mg/kg	
Intravenous (dog) LD50:>400 mg/kg	
Oral (rabbit) LD50:800 mg/kg	
Intravenous (rabbit) LD50:400 mg/kg	

The substance is classified by IARC as Group 3:
NOT classifiable as to its carcinogenicity to humans.
Evidence of carcinogenicity may be inadequate or limited in animal testing.
Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).
Tinnitus, decreased pulse rate and fall in blood pressure, other cardiacchanges, arteriolar constriction, interstitial nephritis, increases anddecreases in urine volume, paternal effects, effects on embryos (extraembryonic structures), specific developmental abnormalities(musculoskeletal system) and metabolic alkalosis recorded.CARCINOGEN

furosemide	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3	Not classifiable as to its carcinogenicity to humans

SECTION 12: Ecological information

12.1. Toxicity

Fish:	No data available
Daphnia Magna:	No data available
Algae:	No data available
Toxic to aquatic micro-organisms:	No data available

FUROSEMIDE:

log Kow (Sangster 1997):	2.03

DO NOT discharge into sewer or waterways.

12.2. Persistence and degradability

Ingredient	Persistence: Water/Soil	Persistence: Air
furosemide	HIGH	No Data Available

12.3. Bioaccumulative potential

Ingredient	Bioaccumulation
furosemide	LOW

12.4. Mobility in soil

Ingredient	Mobility
furosemide	MED(ESTIMATED)

12.5. Results of PBT and vPvB assessment

	P	B	T
Relevant available data	No data available	No data available	No data available
PBT and vPvB Criteria fulfilled?	No data available	No data available	No data available

12.6. Other adverse effects

No data available

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Product / Packaging

disposal:

- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.

Otherwise:

- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.
A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate. In most instances the supplier of the material should be consulted.

- **DO NOT** allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or Incineration in a licenced apparatus (after admixture with suitable combustible material)
- Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Waste treatment options:	No data available
Sewage disposal options:	No relevant data
Other disposal recommendations:	No data available

SECTION 14: Transport information

Labels Required:	No data available

Land transport (ADR / RID / GGVSE)

No data available

14.1. UN number	None		**14.4. Packing group**	No data available	
14.2. UN proper shipping name	No data available		**14.5. Environmental hazard**	No relevant data	
14.3. Transport hazard class(es)	No data available		**14.6. Special precautions for user**	Hazard identification (Kemler)	No data available
				Classification Code	No data available
				Hazard Label	No data available
				Special provisions	No data available
				Add limited quantity	No data available

No data available

Air transport (ICAO-IATA / DGR)

No data available

14.1. UN number	None		**14.4. Packing group**	No data available	
14.2. UN proper shipping name	No data available		**14.5. Environmental hazard**	No relevant data	
14.3. Transport hazard class(es)			**14.6. Special precautions for user**	Special provisions	No data available
				Cargo Only Packing Instructions	No data available
				Cargo Only Maximum Qty / Pack	No data available
	ICAO/IATA Class:	No data available		Passenger and Cargo Packing Instructions	No data available
	ICAO/IATA Subrisk:	No data available		Passenger and Cargo Maximum Qty / Pack	No data available
	ERG Code	No data available		Passenger and Cargo Limited Quantity Packing Instructions	No data available
				Passenger and Cargo Maximum Qty / Pack	No data available

No data available

Sea transport (IMDG-Code / GGVSee)

No data available

14.1. UN number	None		**14.4. Packing group**	No data available	
14.2. UN proper shipping name	No data available		**14.5. Environmental hazard**	No relevant data	
14.3. Transport hazard class(es)	No data available	**IMDG** No data available	**14.6. Special precautions for user**	EMS Number	No data available
				Special provisions	No data available

	No data available	**Subrisk**	No data available		Special provisions	No data available
					Limited Quantities	No data available

No data available

Inland waterways transport (ADNR / River Rhine)

No data available

14.1. UN number	None			**14.4. Packing group**	No data available	
14.2. UN proper shipping name	No data available			**14.5. Environmental hazard**	No relevant data	
14.3. Transport hazard class(es)	No data available	**ADNR Label**	No data available	**14.6. Special precautions for user**	Classification code	No data available
					Limited quantity	No data available
					Equipment required	No data available
					Fire cones number	No data available

14.7. Transport in bulk according to Annex II of MARPOL 73 / 78 and the IBC code

No data available

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations / legislation specific for the substance or mixture

furosemide (CAS: 54-31-9) is found on the following regulatory lists;

"Chemwatch Candidate List of Very High Concern - List of Substance Subject to Authorization", "EU Cosmetic Directive 76/768/EEC Annex II: List of Substances which must not form part of the Composition of Cosmetic Products (English)", "European Chemical Agency (ECHA) Classification & Labelling Inventory - Chemwatch Harmonised classification", "European Chemical Agency (ECHA) Classification & Labelling Inventory - Notified classification and labelling according to CLP criteria", "European Customs Inventory of Chemical Substances (English)", "European Union - European Inventory of Existing Commercial Chemical Substances (EINECS) (English)", "European Union (EU) Directive 2008/1/EC concerning integrated pollution prevention and control, Annex III", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "OECD List of High Production Volume (HPV) Chemicals", "Scotland Pollution Inventory", "Sigma-Aldrich Transport Information", "UK The Environmental Protection (Prescribed Processes and Substances) Regulations 1991 - Release into Air Prescribed Substances"

This safety data sheet is in compliance with the following EU legislation and its adaptations – as far as applicable - : 67/548/EEC, 1999/45/EC, 98/24/EC, 92/85/EEC, 94/33/EC, 91/689/EEC, 1999/13/EC, Regulation (EU) No 453/2010, Regulation (EC) No 1907/2006, Regulation (EC) No 1272/2008, and their amendments as well as the following British legislation:

- The Control of Substances Hazardous to Health Regulations (COSHH) 2002
- COSHH Essentials
- The Management of Health and Safety at Work Regulations 1999

15.2. Chemical safety assessment

No data available

Annex VI

- Reproductive Toxicity Category 1B

RISK

Risk Codes	Risk Phrases
R61(2)	May cause harm to the unborn child.

SECTION 16: Other information

ANNEX 2: Indications of Danger

T	Toxic

Substance	CAS	Suggested codes
furosemide	54-31-9	Carc3;R40 Rep3;R63 R52/53

Denmark Advisory list for selfclassification of dangerous substances

OTHER

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

- For detailed advice on Personal Protective Equipment, refer to the following EU CEN Standards:
EN 16 Personal eye-protection
EN 340 Protective clothing
EN 374 Protective gloves against chemicals and micro-organisms
EN 13832 Footwear protecting against chemicals
EN 133 Respiratory protective devices

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