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

1.1. Product identifier : Hydrogen bromide

Chemical formula : HBr

Synonyms : Hydrogen bromide, Anhydrous Hydrobromic Acid

Refer to Section 3 for REACH information

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

Use of the Substance/Mixture : General Industrial

Restrictions on Use : No data available.

1.3 Details of the supplier of the safety data sheet : Air Products Ireland Ltd
Unit 950 Western Industrial Estate
Kileen Road
Dublin 12
Ireland

Email Address – Technical Information : GASTECH@airproducts.com

Telephone : 1-4659650

1.4. Emergency telephone number : (01) 463 4200 / +353 1 463 4200

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Gases under pressure - Liquefied gas. H280:Contains gas under pressure; may explode if heated.
Acute toxicity - Inhalation Category 3 H331:Toxic if inhaled.
Skin corrosion - Category 1A H314:Causes severe skin burns and eye damage.
Specific target organ toxicity - single exposure - Category 3 H335:May cause respiratory irritation.

2.2. Label elements

Hazard pictograms/symbols

Signal Word: Danger

Hazard Statements:

H280:Contains gas under pressure; may explode if heated.
H314:Causes severe skin burns and eye damage.
H331:Toxic if inhaled.
H335:May cause respiratory irritation.

Precautionary Statements:

Prevention	:	P280:Wear protective gloves/protective clothing/eye protection/face protection.
Response	:	P303+P361+P353 :IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. P305+P351+P338 :IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P310 :Immediately call a POISON CENTRE/doctor.
Storage	:	P403+P233:Store in a well-ventilated place. Keep container tightly closed.
Disposal	:	P501:Disposal of contents/container to be specified in accordance with regulations.

2.3 Other Hazards

Reacts with water to form corrosive acids.
Use a back flow preventative device in the piping.
Do not open valve until connected to equipment prepared for use.
Use only with equipment of compatible materials of construction, rated for cylinder pressure.
Close valve after each use and when empty.
Wear self-contained breathing apparatus and protective suit.
Direct contact with liquid can cause frostbite.
May react violently with water.
Do not breathe gas.
Corrosive to eyes, respiratory system and skin.
Compressed liquefied gas.

Environmental Effects

Dangerous for the environment.

SECTION 3: Composition/information on ingredients

Substance/Mixture : Substance

Components	EINECS / ELINCS Number	CAS Number	Concentration (Volume)
Hydrogen bromide	233-113-0	10035-10-6	100 %

Components	Classification (CLP)	REACH Reg. #
Hydrogen bromide	Press. Gas (Liq.) ;H280 Skin Corr. 1A ;H314 STOT SE 3 ;H335	01-2119479072-39-

If REACH registration numbers do not appear the substance is either exempt from registration, does not meet the minimum volume threshold for registration, or the registration date has not yet come due.
Refer to section 16 for full text of each relevant R-phrase and H-phrases.

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped. Use chemically protective clothing.

Eye contact : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Keep eye wide open while rinsing.

Skin contact : Flush with copious amounts of water until treatment is available. Immediate medical treatment is necessary as untreated wounds from corrosion of the skin heal slowly and badly.

Ingestion : Ingestion is not considered a potential route of exposure.

Inhalation : Move to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. Mouth to mouth resuscitation is not recommended. Use a barrier device. If unconscious place in recovery position and seek medical advice. In case of shortness of breath, give oxygen. Consult a doctor.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms : Irritating to eyes and respiratory system. Cough.

4.3 Indication of any immediate medical attention and special treatment needed

Treatment : Treat bronchospasm and laryngeal edema if present . Observe for delayed chemical pneumonitis, pulmonary hemorrhage or edema.

SECTION 5: Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media : All known extinguishing media can be used.

Extinguishing media which must not be used for safety reasons. : No data available.

5.2 Special hazards arising from the substance or mixture

: Product is nonflammable and does not support combustion. Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Product is nonflammable and does not support combustion. Use of water may result in the formation of very toxic aqueous solutions. Move away from container and cool with water from a protected position. Keep containers and surroundings cool with water spray. Do not allow run-off from fire fighting to enter drains or water courses. If possible, stop flow of product.

5.3 Advice for fire-fighters

: Use self-contained breathing apparatus and chemically protective clothing. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask. EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

: Evacuate personnel to safe areas. Ventilate the area. Approach suspected leak areas with caution. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits.

6.2 Environmental precautions

: Should not be released into the environment. Prevent further leakage or spillage if safe to do so. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

6.3 Methods and material for containment and cleaning up

: Ventilate the area. Wash contaminated equipment or sites of leaks wit h copious quantities of water. Reduce vapor with fog or fine water spray.

Additional advice : Large releases may require considerable downwind evacuation. If possible, stop flow of product. Increase ventilation to the release area and monitor

concentrations. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

6.4 Reference to Other Sections : For more information refer to Sections 8 & 13

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Use equipment rated for cylinder pressure. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling or being knocked over. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122°F). Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Use an adjustable strap wrench to remove over-tight or rusted caps. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Replace outlet caps or plugs and container caps as soon as container is disconnected from equipment. Do not subject containers to abnormal mechanical shock. Never attempt to lift a cylinder by its valve protection cap or guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Keep container valve outlets clean and free from contaminates particularly oil and water. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Purge air from system before introducing gas. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Installation of a cross purge assembly between the cylinder and the regulator is recommended. When returning cylinder install valve outlet cap or plug leak tight. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C (122°F). Never attempt to increase liquid withdrawal rate by pressurizing the container without first checking with the supplier. Never permit liquefied gas to become trapped in parts of the system as this may result in hydraulic rupture.

7.2 Conditions for safe storage, including any incompatibilities

Full containers should be stored so that oldest s tock is used first. Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Observe all regulations and local

requirements regarding storage of containers. Stored containers should be periodically checked for general condition and leakage. Local codes may have special requirements for toxic gas storage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C (122°F). Return empty containers in a timely manner.

Technical measures/Precautions

Provide sufficient air exchange and/or exhaust in work rooms. Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance whit local regulations.

7.3 Specific end use(s)

Refer to section 1 or the extended SDS if applicable

Never inventory more than a six month supply of the product.

SECTION 8: Exposure controls / personal protection

8.1 Control parameters

Exposure limit(s)

Hydrogen bromide	Short Term Exposure Limit (STEL): EU ELV	2 ppm	6.7 mg/m3

If applicable, refer to the extended section of the SDS for further information on CSA.

8.2 Exposure controls

Engineering measures

Handle product only in closed system or provide appropriate exhaust ventilation at machinery.
Provide natural or mechanical ventilation to prevent accumulation above exposure limits.
Provide readily accessible eye wash stations and safety showers.

Personal protective equipment

Respiratory protection : Keep self contained breathing apparatus readily available for emergency use. Users of breathing apparatus must be trained. Use gas filters and full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers. Gas filters do not protect against oxygen deficiency. Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known. Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136. Consult respiratory device supplier´s product information for the selection of the appropriate device. Self contained breathing apparatus is recommended, where unknown exposure may be expected, e.g. during maintenance activities on installation systems. Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

Hand protection : Wear working gloves when handling gas containers.
Standard EN 388 - Protective gloves against mechanical risk.

		Wear chemically resistant protective gloves. Standard EN 374 - Protective gloves against chemicals. Consult glove manufacturer´s product information on material suitability and material thickness. The breakthrough time of the selected gloves must be greater than the intended use period. Acid resistant gloves.
Eye/face Protection	:	Wear safety glasses with side shields. Wear goggles and a face shield when transfilling or breaking transfer connections. Standard EN 166 - Personal eye-protection.
Skin and body protection	:	Acid resistant gloves (e.g. butyl rubber, neoprene, polyethylene) and splash suit when connecting, disconnecting or opening cylinders. Cold temperatures may cause embrittlement of protective material resulting in breakage and exposure. Contact with cold evaporating liquid on gloves or suit may cause cryogenic burns or frostbite. Safety shoes are recommended when handling cylinders. Standard EN ISO 20345 - Personal protective equipment - Safety footwear. Keep suitable chemically resistant protective clothing readily available for emergency use. Standard EN943-1 - Full protective suits against liquid, solid and gaseous chemicals.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas. Provide good ventilation and/or local exhaust to prevent accumulation of concentrations above exposure limits.
Environmental Exposure Controls	:	If applicable, refer to the extended section of the SDS for further information on CSA.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

(a/b) Physical state/Colour	:	Liquefied gas. Gives off white fumes in moist air
(c) Odour	:	Pungent.
(c) Odour	:	Mixture contains one or more component(s) which have the following odor: Pungent.
(d) Density	:	0.0034 g/cm3 (0.212 lb/ft3) at 21 °C (70 °F) Note: (as vapor)
(e) Relative Density	:	2.2 (water = 1)
(f) Melting point / freezing point	:	-124 °F (-86.9 °C)
(g) Boiling point/range	:	-1,169 °F (-66,7 °C)

(h) Vapor pressure	:	304.57 psia (21.00 bara) at 68 °F (20 °C)
(i) Water solubility	:	Hydrolyses.
(j) Partition coefficient (n-octanol/water)	:	Not applicable.
(k) pH	:	Not applicable.
(l) Viscosity	:	Not applicable.
(m) Particle characteristics	:	No data available.
(n) Lower and upper explosion / flammability limits	:	No data available.
(o) Flash point	:	Not applicable.
(p) Autoignition temperature	:	No data available.
(q) Decomposition temperature	:	No data available.

9.2. Other information

Explosive properties	:	No data available.
Oxidizing properties	:	No data available.
Molecular Weight	:	80.92 g/mol
Odor threshold	:	No data available.
Evaporation rate	:	Not applicable.
Flammability (solid, gas)	:	Refer to product classification in Section 2
Specific Volume	:	0.2959 m3/kg (4.74 ft3/lb) at 21 °C (70 °F)
Relative vapor density	:	2.794 (air = 1)

SECTION 10: Stability and reactivity

10.1 Reactivity	:	Refer to possibility of hazardous reactions and/or incompatible materials sections.
10.2. Chemical stability	:	Stable under normal conditions.
10.3. Possibility of hazardous	:	Unstable over prolonged periods of time.

reactions

10.4. Conditions to avoid	:	Extended storage time.
10.5. Incompatible materials	:	Water. Aluminium. Strong bases.
10.6 Hazardous decomposition products	:	Hydrogen, by reaction with metals. Bromine.

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Likely routes of exposure

Effects on Eye	:	Irritating to eyes. Causes severe eye burns. May cause permanent eye injury.
Effects on Skin	:	Contact with liquid may cause cold burns/frostbite. Causes skin irritation. Causes skin burns.
Inhalation Effects	:	Irritating to respiratory system. Can cause severe lung damage. May be fatal if inhaled. Delayed adverse effects possible. Prolonged exposure to small concentrations may result in pulmonary edema. Delayed fatal pulmonary edema possible.
Ingestion Effects	:	No data available.
Symptoms	:	Irritating to eyes and respiratory system. Cough.

Acute toxicity

Acute Oral Toxicity	:	No data is available on the product itself.
Acute Inhalation Toxicity	:	LC50 (1 h) : 2860 ppm Species : Rat.
Acute Dermal Toxicity	:	No data is available on the product itself.
Skin corrosion/irritation	:	No data available.
Serious eye damage/eye irritation	:	No data available.
Sensitization.	:	No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity	:	No data available.
Reproductive toxicity	:	No data is available on the product itself.
Germ cell mutagenicity	:	No data is available on the product itself.
Specific target organ systemic toxicity (single exposure)	:	No data available.
Specific target organ systemic toxicity (repeated exposure)	:	No data available.
Aspiration hazard	:	No data available.

SECTION 12: Ecological information

12.1 Toxicity

Aquatic toxicity	:	May cause pH changes in aqueous ecological systems.May cause pH changes in aqueous ecological systems.
Toxicity to other organisms	:	No data is available on the product itself.

12.2. Persistence and degradability

No data available.

12.3. Bioaccumulative potential

No data is available on the product itself.

12.4 Mobility in soil

No data available.

12.5 Results of PBT and vPvB assessment

If applicable, refer to the extended section of the SDS for further information on CSA.

12.6 Other adverse effects

No data available.

Effect on the ozone layer

Ozone Depleting Potential	:	No data available.
Global Warming Potential	:	No data available.

SECTION 13: Disposal considerations

13.1 Waste treatment methods : Do not attempt to dispose of residual or unused quantities. Small quantities may be disposed by slowly flowing gas in to a caustic liquid or solid scrubber. Soda lime, a sodium hydroxide-calcium oxide mixture, or calcium carbonate are suitable solid scrubber media. In accordance with local and national regulations. Return unused product in original cylinder to supplier. Contact supplier if guidance is required. Must not be discharged to atmosphere. Refer to the EIGA code of practice Doc. 30 "Disposal of Gases", downloadable at http://www.eiga.org for more guidance on suitable disposal methods. List of hazardous waste codes: 16 05 04: Gases in pressure containers (including halons) containing dangerous substances.

Contaminated packaging : Return cylinder to supplier.

SECTION 14: Transport information

ADR

UN/ID No.	:	UN1048
Proper shipping name	:	HYDROGEN BROMIDE, ANHYDROUS
Class or Division	:	2
Tunnel Code	:	(C/D)
Label(s)	:	2.3 (8)
ADR/RID Hazard ID no.	:	268
Marine Pollutant	:	No

IATA

Transport Forbidden

IMDG

UN/ID No.	:	UN1048
Proper shipping name	:	HYDROGEN BROMIDE, ANHYDROUS
Class or Division	:	2.3
Label(s)	:	2.3 (8)
Marine Pollutant	:	No

RID

UN/ID No.	:	UN1048
Proper shipping name	:	HYDROGEN BROMIDE, ANHYDROUS
Class or Division	:	2
Label(s)	:	2.3 (8)
Marine Pollutant	:	No

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact an Air Products customer service representative.

SECTION 15: Regulatory information

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

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

Other Regulations
REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Regulation (EC) No 1272/2008 the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

15.2 Chemical safety assessment

If this product does not contain exposure scenarios, the components in this product are either exempt from REACH, do not meet the minimum volume threshold for a CSA, or the CSA has not yet been completed.

SECTION 16: Other information

Ensure all national/local regulations are observed.

Hazard Statements:
H280 Contains gas under pressure; may explode if heated.
H314 Causes severe skin burns and eye damage.
H335 May cause respiratory irritation.

Indication of Method:
Gases under pressure Liquefied gas. Contains gas under pressure; may explode if heated. Calculation method

Acute toxicity Category 3 Toxic if inhaled. Calculation method

Skin corrosion Category 1A Causes severe skin burns and eye damage. Calculation method

Specific target organ toxicity - single exposure Category 3 May cause respiratory irritation. Calculation method

Abbreviations and acronyms:
ATE - Acute Toxicity Estimate
CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
EINECS - European Inventory of Existing Commercial Chemical Substances
ELINCS - European List of Notified Chemical Substances
CAS# - Chemical Abstract Service number
PPE - Personal Protection Equipment
Kow - octanol-water partition coefficient
DNEL - Derived No Effect Level
LC50 - Lethal Concentration to 50 % of a test population
LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose)
NOEC - No Observed Effect Concentration
PNEC - Predicted No Effect Concentration
RMM - Risk Management Measure
OEL - Occupational Exposure Limit
PBT - Persistent, Bioaccumulative and Toxic
vPvB - Very Persistent and Very Bioaccumulative
STOT - Specific Target Organ Toxicity
CSA - Chemical Safety Assessment
EN - European Standard
UN - United Nations
ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road
IATA - International Air Transport Association
IMDG - International Maritime Dangerous Goods
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
WGK - Water Hazard Class

Key literature references and sources for data:
ECHA - Guidance on the compilation of safety data sheets
ECHA - Guidance on the application of the CLP Criteria
ARIEL database

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at http://www.airproducts.com/productstewardship/

This Safety Data Sheet has been established in accordance with the applicable European Directives and applies to all countries that have translated the Directives in their national laws. Commission Regulation (EU) No 453/2010 of 20 May 2010 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH)

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