

	<h1>SAFETY DATA SHEET</h1>	Page : 1/10
		Revised edition no : 4.00
		Revision date : 2018-07-18
		Supersedes : 2016-02-22
<h2>Arsine</h2>		005
		Country : DE / Language : EN

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

1.1. Product identifier

Trade name : Arsine, ARSINE (N50, N58)
 SDS no : 005
 Chemical description : Arsine
 CAS-No. : 7784-42-1
 EC-No. : 232-066-3
 EC Index-No. : 033-006-00-7
 Registration-No. : 01-2120048082-66
 Chemical formula : AsH₃

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

Relevant identified uses : Industrial and professional. Perform risk assessment prior to use.
 Laboratory use.
 Chemical reaction / Synthesis.
 Use for manufacture of electronic/photovoltaic components.
 Contact supplier for more information on uses.
 Uses advised against : Consumer use.

1.3. Details of the supplier of the safety data sheet

Company identification

Supplier

AIR LIQUIDE Deutschland GmbH
 Luise-Rainer-Straße 5
 40235 Düsseldorf - GERMANY
 T +49 (0)211 6699-0 - F +49 (0)211 6699-222
info@airliquide.de

E-Mail address (competent person) : info.SDB@airliquide.de

1.4. Emergency telephone number

Emergency telephone number : +49 (0)2151 398668
 Availability
 (24 / 7)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classification according to Regulation (EC) No. 1272/2008 [CLP]

Physical hazards	Flammable gases, Category 1	H220
	Gases under pressure : Liquefied gas	H280
Health hazards	Acute toxicity (inhalation:gas) Category 1	H330
	Specific target organ toxicity — Repeated exposure, Category 2	H373
Environmental hazards	Hazardous to the aquatic environment — Acute Hazard, Category 1	H400
	Hazardous to the aquatic environment — Chronic Hazard, Category 1	H410

2.2. Label elements

Labelling according to Regulation (EC) No. 1272/2008 [CLP]

Hazard pictograms (CLP) :



GHS02

GHS04

GHS06

GHS08

GHS09

Signal word (CLP) : Danger

Arsine

005

Country : DE / Language : EN

Hazard statements (CLP) :

- H220 - Extremely flammable gas..
- H280 - Contains gas under pressure; may explode if heated..
- H330 - Fatal if inhaled..
- H373 - May cause damage to organs through prolonged or repeated exposure..
- H410 - Very toxic to aquatic life with long lasting effects..

Precautionary statements (CLP)

- Prevention :
 - P260 - Do not breathe gas, vapours.
 - P273 - Avoid release to the environment..
 - P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking..
- Response :
 - P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely..
 - P381 - In case of leakage, eliminate all ignition sources.
 - P308+P313 - IF exposed or concerned: Get medical advice.
 - P304+P340+P315 - IF INHALED : Remove person to fresh air and keep comfortable for breathing. Get immediate medical advice / attention.
- Storage :
 - P403 - Store in a well-ventilated place..
 - P405 - Store locked up..

2.3. Other hazards

: Contact with liquid may cause cold burns/frostbite.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	Composition [V-%]:	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Arsine	(CAS-No.) 7784-42-1 (EC-No.) 232-066-3 (EC Index-No.) 033-006-00-7 (Registration-No.) 01-2120048082-66	100	Flam. Gas 1, H220 Press. Gas (Liq.), H280 Acute Tox. 1 (Inhalation:gas), H330 STOT RE 2, H373 Aquatic Acute 1, H400 Aquatic Chronic 1, H410

Contains no other components or impurities which will influence the classification of the product.

3.2. Mixtures : Not applicable.

SECTION 4: First aid measures

4.1. Description of first aid measures

- Inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
- Skin contact : In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.
- Eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.

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

: Delayed adverse effects possible.
Refer to section 11.

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

: Obtain medical assistance.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Arsine**005**

Country : DE / Language : EN

- Suitable extinguishing media : Water spray or fog.
Dry powder.
- Unsuitable extinguishing media : Carbon dioxide.
Do not use water jet to extinguish.

5.2. Special hazards arising from the substance or mixture

- Specific hazards : Exposure to fire may cause containers to rupture/explode.
- Hazardous combustion products : Arsenic and its oxides.

5.3. Advice for firefighters

- Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas receptacles to rupture. Cool endangered receptacles with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems.
If possible, stop flow of product.
Use water spray or fog to knock down fire fumes if possible.
Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
Move containers away from the fire area if this can be done without risk.
- Special protective equipment for fire fighters : Wear gas tight chemically protective clothing in combination with self contained breathing apparatus.
Standard EN 943-2: Protective clothing against liquid and gaseous chemicals, aerosols and solid particles. Gas-tight chemical protective suits for emergency teams.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**

- : Try to stop release.
Evacuate area.
Monitor concentration of released product.
Consider the risk of potentially explosive atmospheres.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Eliminate ignition sources.
Ensure adequate air ventilation.
Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
Act in accordance with local emergency plan.
Stay upwind.

6.2. Environmental precautions

- : Try to stop release.

6.3. Methods and material for containment and cleaning up

- : Keep area evacuated and free from ignition sources until any spilled liquid has evaporated (ground free from frost).

6.4. Reference to other sections

- : See also sections 8 and 13.

SECTION 7: Handling and storage**7.1. Precautions for safe handling**

- Safe use of the product : The product must be handled in accordance with good industrial hygiene and safety procedures.
Only experienced and properly instructed persons should handle gases under pressure.
Consider pressure relief device(s) in gas installations.
Ensure the complete gas system was (or is regularly) checked for leaks before use.

	SAFETY DATA SHEET	Page : 4/10
		Revised edition no : 4.00
		Revision date : 2018-07-18
		Supersedes : 2016-02-22
Arsine		005
		Country : DE / Language : EN

Do not smoke while handling product.
 Avoid exposure, obtain special instructions before use.
 Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
 Installation of a cross purge assembly between the cylinder and the regulator is recommended.
 Avoid suck back of water, acid and alkalis.
 Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment.
 Purge air from system before introducing gas.
 Take precautionary measures against static discharge.
 Keep away from ignition sources (including static discharges).
 Consider the use of only non-sparking tools.
 Do not breathe gas.
 Avoid release of product into atmosphere.
 Ensure equipment is adequately earthed.

Safe handling of the gas receptacle :

- : Refer to supplier's container handling instructions.
- Do not allow backfeed into the container.
- Protect cylinders from physical damage; do not drag, roll, slide or drop.
- 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.
- If user experiences any difficulty operating cylinder valve discontinue use and contact supplier.
- Never attempt to repair or modify container valves or safety relief devices.
- Damaged valves should be reported immediately to the supplier.
- Keep container valve outlets clean and free from contaminants particularly oil and water.
- Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
- Close container valve after each use and when empty, even if still connected to equipment.
- Never attempt to transfer gases from one cylinder/container to another.
- Never use direct flame or electrical heating devices to raise the pressure of a container.
- Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.
- Suck back of water into the container must be prevented.
- Open valve slowly to avoid pressure shock.

7.2. Conditions for safe storage, including any incompatibilities

- : Observe all regulations and local requirements regarding storage of containers.
- Containers should not be stored in conditions likely to encourage corrosion.
- Container valve guards or caps should be in place.
- Containers should be stored in the vertical position and properly secured to prevent them from falling over.
- Stored containers should be periodically checked for general condition and leakage.
- Keep container below 50°C in a well ventilated place.
- Store containers in location free from fire risk and away from sources of heat and ignition.
- Keep away from combustible materials.
- Segregate from oxidant gases and other oxidants in store.
- All electrical equipment in the storage areas should be compatible with the risk of a potentially explosive atmosphere.

7.3. Specific end use(s)

: None.

Arsine

005

Country : DE / Language : EN

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Arsine (7784-42-1)		
OEL : Occupational Exposure Limits		
Germany	TWA (DE) OEL 8h [mg/m ³] TRGS 900	0.016 mg/m ³
	TWA (DE) OEL 8h [ppm] TRGS 900	0.005 ppm
	Peak exposure limitation factor (DE) OEL TRGS 900	8(II)
	Remark (TRGS 900)	AGS

DNEL (Derived-No Effect Level) : No data available.

PNEC (Predicted No-Effect Concentration) : No data available.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

- : Product to be handled in a closed system and under strictly controlled conditions.
- Provide adequate general and local exhaust ventilation.
- Preferably use permanent leak-tight installations (e.g. welded pipes).
- Systems under pressure should be regularly checked for leakages.
- Ensure exposure is below occupational exposure limits (where available).
- Gas detectors should be used when toxic gases may be released.
- Consider the use of a work permit system e.g. for maintenance activities.

8.2.2. Individual protection measures, e.g. personal protective equipment

- : A risk assessment should be conducted and documented in each work area to assess the risks related to the use of the product and to select the PPE that matches the relevant risk. The following recommendations should be considered:
PPE compliant to the recommended EN/ISO standards should be selected.
- Eye/face protection
 - : Wear goggles when transfilling or breaking transfer connections.
 - Standard EN 166 - Personal eye-protection - specifications.
- Skin protection
 - Hand protection
 - : Wear working gloves when handling gas containers.
 - Standard EN 388 - Protective gloves against mechanical risk.
 - Wear cold insulating gloves when transfilling or breaking transfer connections.
 - Standard EN 511 - Cold insulating gloves.
 - Other
 - : Consider the use of flame resistant anti-static safety clothing.
 - Standard EN ISO 14116 - Limited flame spread materials.
 - Standard EN ISO 1149-5 - Protective clothing: Electrostatic properties.
 - Wear safety shoes while handling containers.
 - Standard EN ISO 20345 - Personal protective equipment - Safety footwear.
- Respiratory protection
 - : Gas filters may be used if all surrounding conditions e.g. type and concentration of the contaminant(s) and duration of use are known.
 - Use gas filters with full face mask, where exposure limits may be exceeded for a short-term period, e.g. connecting or disconnecting containers.
 - Recommended: Filter B (grey).
 - Gas filters do not protect against oxygen deficiency.
 - Standard EN 14387 - Gas filter(s), combined filter(s) and full face mask - EN 136.
 - Keep self contained breathing apparatus readily available for emergency use.
 - 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.
- Thermal hazards
 - : None in addition to the above sections.

8.2.3. Environmental exposure controls

- : Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.

Arsine**005**

Country : DE / Language : EN

SECTION 9: Physical and chemical properties**9.1. Information on basic physical and chemical properties**

Appearance

- Physical state at 20°C / 101.3kPa : Gas.
- Colour : Colourless.

Odour	: Garlic like. Poor warning properties at low concentrations.
Odour threshold	: Odour threshold is subjective and inadequate to warn of overexposure.
Melting point	: -117 °C
Boiling point	: -62.5 °C
Flash point	: Not applicable for gases and gas mixtures.
Flammability range	: 3.9 - 77.8 vol %
Relative vapour density at 20 °C	: Not applicable.
Evaporation rate (ether=1)	: Not applicable for gases and gas mixtures.
Vapour pressure [20°C]	: 15 bar(a)
Vapour pressure [50°C]	: 27.5 bar(a)
Relative density, gas (air=1)	: 2.7
Relative density, liquid (water=1)	: 1.6
Solubility in water	: 778 mg/l
pH value	: Not applicable for gases and gas mixtures.
Partition coefficient n-octanol/water [log Kow]	: Not applicable for inorganic gases.
Decomposition point [°C]	: Not applicable.
Auto-ignition temperature	: 285 °C
Viscosity [20°C]	: No reliable data available.
Explosive Properties	: Not applicable.
Oxidising Properties	: Not applicable.

9.2. Other information

Molar mass	: 78 g/mol
Critical temperature [°C]	: 100 °C
Other data	: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level.

SECTION 10: Stability and reactivity**10.1. Reactivity**

: No reactivity hazard other than the effects described in sub-sections below.

10.2. Chemical stability

: Stable under normal conditions.

10.3. Possibility of hazardous reactions: Can form explosive mixture with air.
May react violently with oxidants.**10.4. Conditions to avoid**: Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems.**10.5. Incompatible materials**: Air, Oxidisers.
For additional information on compatibility refer to ISO 11114.

Arsine**005**

Country : DE / Language : EN

10.6. Hazardous decomposition products

: Under normal conditions of storage and use, hazardous decomposition products should not be produced.

SECTION 11: Toxicological information**11.1. Information on toxicological effects****Acute toxicity** : Fatal if inhaled.
Fatal intoxication possible with low concentrations.

LC50 inhalation rat (ppm)	10 ppm/4h
Skin corrosion/irritation	: No known effects from this product.
Serious eye damage/irritation	: No known effects from this product.
Respiratory or skin sensitisation	: No known effects from this product.
Germ cell mutagenicity	: No known effects from this product.
Carcinogenicity	: No known effects from this product.
Reproductive toxicity	:
Toxic for reproduction : Fertility	: No known effects from this product.
Toxic for reproduction : unborn child	: No known effects from this product.
STOT-single exposure	: Damage to red blood cells (haemolytic poison). Damage to central nervous system. Damage to kidneys and liver.
STOT-repeated exposure	: May cause damage to organs through prolonged or repeated exposure. Damage to red blood cells (haemolytic poison). Damage to central nervous system.
Target organ(s)	: Respiratory tract.
Aspiration hazard	: Not applicable for gases and gas mixtures.

SECTION 12: Ecological information**12.1. Toxicity****Assessment** : Very toxic to aquatic life.
Very toxic to aquatic life with long lasting effects.

EC50 48h - Daphnia magna [mg/l] : No data available.

EC50 72h - Algae [mg/l] : No data available.

LC50 96 h - Fish [mg/l] : No data available.

12.2. Persistence and degradability**Assessment** : Not applicable for inorganic gases.**12.3. Bioaccumulative potential****Assessment** : No data available.**12.4. Mobility in soil****Assessment** : Because of its high volatility, the product is unlikely to cause ground or water pollution.
Partition into soil is unlikely.**12.5. Results of PBT and vPvB assessment****Assessment** : Not classified as PBT or vPvB.

Arsine

005

Country : DE / Language : EN

12.6. Other adverse effects

Other adverse effects : No known effects from this product.
 Effect on the ozone layer : None.
 Effect on global warming : No known effects from this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Contact supplier if guidance is required.
 Do not discharge into areas where there is a risk of forming an explosive mixture with air.
 Waste gas should be flared through a suitable burner with flash back arrestor.
 Must not be discharged to atmosphere.
 Toxic and corrosive gases formed during combustion should be scrubbed before discharge to atmosphere.
 Ensure that the emission levels from local regulations or operating permits are not exceeded.
 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.
 Return unused product in original cylinder to supplier.
 List of hazardous waste codes (from Commission Decision 2001/118/EC) : 16 05 04 *: Gases in pressure containers (including halons) containing dangerous substances.

13.2. Additional information

: External treatment and disposal of waste should comply with applicable local and/or national regulations.

SECTION 14: Transport information

14.1. UN number

UN-No. : 2188

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : ARSINE

Transport by air (ICAO-TI / IATA-DGR) : Arsine

Transport by sea (IMDG) : ARSINE

14.3. Transport hazard class(es)

Labelling



2.3 : Toxic gases.
 2.1 : Flammable gases.
 Environmentally hazardous substances

Transport by road/rail (ADR/RID)

Class : 2.
 Classification code : 2TF.
 Tunnel Restriction : D - Passage forbidden through tunnels of category D and E.

Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.3 (2.1)
 Emergency Schedule (EmS) - Fire : F-D.
 Emergency Schedule (EmS) - Spillage : S-U.

14.4. Packing group

Transport by road/rail (ADR/RID) : Not established.
 Transport by air (ICAO-TI / IATA-DGR) : Not established.

Arsine**005**

Country : DE / Language : EN

Transport by sea (IMDG) : Not established.

14.5. Environmental hazards

Transport by road/rail (ADR/RID) : Environmentally hazardous substance / mixture.

Transport by air (ICAO-TI / IATA-DGR) : Environmentally hazardous substance / mixture.

Transport by sea (IMDG) : Marine pollutant

14.6. Special precautions for user**Packing Instruction(s)**

Transport by road/rail (ADR/RID) : P200.

Transport by air (ICAO-TI / IATA-DGR)

Passenger and Cargo Aircraft : Forbidden.

Cargo Aircraft only : Forbidden.

Transport by sea (IMDG) : P200.

Special transport precautions

: 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.

Before transporting product containers:

- Ensure there is adequate ventilation.
- Ensure that containers are firmly secured.
- Ensure cylinder valve is closed and not leaking.
- Ensure valve outlet cap nut or plug (where provided) is correctly fitted.
- Ensure valve protection device (where provided) is correctly fitted.

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

: Not applicable.

SECTION 15: Regulatory information**15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture****EU-Regulations**

Restrictions on use : None.

Seveso Directive : 2012/18/EU (Seveso III) : Listed.

National regulations

National legislation : Ensure all national/local regulations are observed.

Germany

Water hazard class (WGK) : Water hazard class (WGK) 3, severe hazard to waters (Classification according to VwVwS, Annex 1 or 2; ID No. 214)

Other information, restrictions and prohibition regulations : [German regulations] BetriebssicherheitsV mit TRBSen insbesondere TRBS 3145 / TRGS 725 Ortsbewegliche Druckgasbehälter, TRBS 2141, BGR 500 Teil 2.33: "Umgang mit Gasen", GefahrstoffV mit Technischen Regeln Gefährliche Stoffe TRGS insbesondere TRGS 407 "Tätigkeiten mit Gasen - Gefährdungsbeurteilung", TRGS 400, 500, 510, 900." BGR 104, TRBS 2152.

15.2. Chemical safety assessment

A CSA has not yet been carried out.

SECTION 16: Other information

Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010.

Arsine**005**

Country : DE / Language : EN

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
CAS# - Chemical Abstract Service number
PPE - Personal Protection Equipment
LC50 - Lethal Concentration to 50 % of a test population
RMM - Risk Management Measures
PBT - Persistent, Bioaccumulative and Toxic
vPvB - Very Persistent and Very Bioaccumulative
STOT- SE : Specific Target Organ Toxicity - Single Exposure
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 code - International Maritime Dangerous Goods
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
WGK - Water Hazard Class

Training advice

: Ensure operators understand the flammability hazard.
Users of breathing apparatus must be trained.
Ensure operators understand the toxicity hazard.

Further information

: This Safety Data Sheet has been established in accordance with the applicable European Union legislation.

Full text of H- and EUH-statements

Acute Tox. 1 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 1
Aquatic Acute 1	Hazardous to the aquatic environment — Acute Hazard, Category 1
Aquatic Chronic 1	Hazardous to the aquatic environment — Chronic Hazard, Category 1
Flam. Gas 1	Flammable gases, Category 1
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
STOT RE 2	Specific target organ toxicity — Repeated exposure, Category 2
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H330	Fatal if inhaled.
H373	May cause damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

DISCLAIMER OF LIABILITY

: Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.

Details given in this document are believed to be correct at the time of going to press.

Whilst proper care has been taken in the preparation of this document, no liability for injury or damage resulting from its use can be accepted.