

Hydrogen (refrigerated)**067B****SECTION 1. Identification of the substance/mixture and of the company/undertaking****1.1. Product identifier**

Trade name	: Hydrogen (refrigerated)
SDS Nr	: 067B
Chemical description	: Hydrogen CAS No :1333-74-0 EC No :215-605-7 Index No :001-001-00-9
Registration-No.	: Listed in Annex IV / V REACH, exempted from registration.
Chemical formula	: H ₂

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. Test gas / Calibration gas. Chemical reaction / Synthesis. Laboratory use. Contact supplier for more uses information. Use as a fuel. Shield gas for welding processes.
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1.3. Details of the supplier of the safety data sheet

Company identification	: AIR LIQUIDE Deutschland GmbH Hans-Günther-Sohl-Straße 5 D-40235 Düsseldorf GERMANY Telefon: +49 (0)211 6699-0 - Fax: +49 (0)211 6699-222
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****Hazard Class and Category Code(s), Regulation (EC) No 1272/2008 (CLP)**

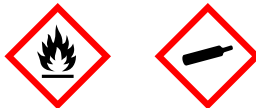
• Physical hazards	: Flammable gases - Category 1 - Danger - (CLP : Flam. Gas 1) - H220 Gases under pressure - Refrigerated liquefied gas - Warning - (CLP : Press. Gas) - H281
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Classification EC 67/548 or EC 1999/45

Classification	: F+; R12 Not included in Annex VI.
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2.2. Label elements**Labelling Regulation EC 1272/2008 (CLP)**

• Hazard pictograms



• Hazard pictograms code	: GHS02 - GHS04
• Signal words	: Danger
• Hazard statements	: H220 - Extremely flammable gas. H281 - Contains refrigerated gas; may cause cryogenic burns or injury.



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SECTION 2. Hazards identification (continued)

• Precautionary statements

- Prevention : P210 - Keep away from heat, sparks, open flames or hot surfaces. – No smoking.
P282 - Wear cold insulating gloves, face shield, eye protection.
- Response : P336+P315 - Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice / attention.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - Eliminate all ignition sources if safe to do so.
- Storage : P403 - Store in a well-ventilated place.

2.3. Other hazards

Other hazards : None.

SECTION 3. Composition/information on ingredients

3.1. Substance / 3.2. Mixture

Substance.

Substance name	Content [Vol-%]	CAS No EC No Index No Registration no.	Classification(DSD)	Classification(CLP)
Hydrogen	100 %	1333-74-0 215-605-7 001-001-00-9 * 1	F+; R12	Flam. Gas 1 (H220) Press. Gas (H281)

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

* 1: Listed in Annex IV / V REACH, exempted from registration.

* 2: Registration deadline not expired.

* 3: Registration not required: Substance manufactured or imported < 1t/y

Full text of R-phrases see chapter 16. Full text of H-statements see chapter 16

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

- : In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/ consciousness. Victim may not be aware of asphyxiation.
In low concentrations may cause narcotic effects. Symptoms may include dizziness, headache, nausea and loss of co-ordination.

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

: None.

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SECTION 5. Fire-fighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Dry powder.
Water spray or fog.
- 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 : None.

5.3. Advice for firefighters

- Specific methods : Move containers away from the fire area if this can be done without risk.
Do not extinguish a leaking gas flame unless absolutely necessary. Spontaneous/explosive re-ignition may occur. Extinguish any other fire.
If possible, stop flow of product.
If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire.
Use fire control measures appropriate to 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.
Use water spray or fog to knock down fire fumes if possible.
- Special protective equipment for fire fighters : In confined space use self-contained breathing apparatus.
None necessary.
Standard EN 137 - Self-contained open-circuit compressed air breathing apparatus with full face mask.
Standard EN 469 - Protective clothing for firefighters. Standard - EN 659: Protective gloves for firefighters.

SECTION 6. Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- : Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.
Use protective clothing.
Ensure adequate air ventilation.
Eliminate ignition sources.
Evacuate area.
Try to stop release.
Consider the risk of potentially explosive atmospheres.

6.2. Environmental precautions

- : Try to stop release.

6.3. Methods and material for containment and cleaning up

- : Liquid spillages can cause embrittlement of structural materials.
Ventilate area.

6.4. Reference to other sections

- Reference to other sections : See also sections 8 and 13.

Hydrogen (refrigerated)**067B****SECTION 7. Handling and storage****7.1. Precautions for safe handling****Safe use of the product**

- : Do not breathe gas.
- Avoid release of product into atmosphere.
- Take precautionary measures against static discharge.
- Keep away from ignition sources (including static discharges).
- Use only properly specified equipment which is suitable for this product, its supply pressure and temperature. Contact your gas supplier if in doubt.
- Purge air from system before introducing gas.
- Do not smoke while handling product.
- Only experienced and properly instructed persons should handle gases under pressure.
- Ensure the complete gas system was (or is regularly) checked for leaks before use.
- Assess the risk of potentially explosive atmosphere and the need for explosion-proof equipment.
- Consider the use only non-sparking tools.
- The product must be handled in accordance with good industrial hygiene and safety procedures.
- Consider pressure relief device(s) in gas installations.

Safe handling of the gas receptacle

- : Suck back of water into the container must be prevented.
- Refer to supplier's container handling instructions.
- Do not allow backfeed into the container.
- Replace valve outlet caps or plugs and container caps where supplied as soon as container is disconnected from equipment.
- Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.
- 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.
- Keep container valve outlets clean and free from contaminants particularly oil and water.
- 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.
- Damaged valves should be reported immediately to the supplier.

7.2. Conditions for safe storage, including any incompatibilities

- : Keep container below 50°C in a well ventilated place.
- Segregate from oxidant gases and other oxidants in store. Store containers in location free from fire risk and away from sources of heat and ignition. Stored containers should be periodically checked for general condition and leakage.
- Observe all regulations and local requirements regarding storage of containers.
- 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. Container valve guards or caps should be in place. All electrical equipment in the storage areas should be compatible with the risk of potentially explosive atmosphere. Keep away from combustible materials.

7.3. Specific end use(s)

- : None.



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SECTION 8. Exposure controls/personal protection

8.1. Control parameters

DNEL: Derived no effect level (Workers)

: No data available.

PNEC: Predicted no effect concentration

: No data available.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

: Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly checked for leakages. Gas detectors should be used when flammable gases/vapours may be released. Consider work permit system e.g. for maintenance activities.

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

: Protect eyes, face and skin from liquid splashes. 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 and a face shield when transfilling or breaking transfer connections. Wear safety glasses with side shields. Standard EN 166 - Personal eye-protection.

• Skin protection

- Hand protection

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

- 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.

• Thermal hazards

: Wear cold insulating gloves when transfilling or breaking transfer connections. Standard EN 511 - Cold insulating gloves.

8.2.3. Environmental exposure controls

: The substance is not classified for human health hazards or for environment effects and it is not PBT or vPvB so that no exposure assessment or risk characterisation is required. For tasks where the intervention of workers is required, the substance must be handled in accordance with good industrial hygiene and safety procedures.

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

: Odourless.

pH value

: Not applicable.

Molar mass [g/mol]

: 2

Melting point [°C]

: -259

Boiling point [°C]

: -253

Critical temperature [°C]

: -240

Flash point [°C]

: Not applicable for gases and gas-mixtures.

Evaporation rate (ether=1)

: Not applicable for gases and gas-mixtures.



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Flammability range [vol% in air]	: 4 to 77
Vapour pressure [20°C]	: Not applicable.
Relative density, gas (air=1)	: 0.07
Relative density, liquid (water=1)	: 0.07
Solubility in water [mg/l]	: 1.6
Partition coefficient n-octanol/water [log Pow]	: Not applicable for inorganic gases.
Auto-ignition temperature [°C]	: 560
Viscosity at 20°C [mPa.s]	: Not applicable.
Explosive Properties	: Not applicable.
Oxidising properties	: None.

9.2. Other information

Other data : Burns with an invisible flame.

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.

10.5. Incompatible materials: Air, Oxidiser.
For additional information on compatibility refer to ISO 11114**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	: No known toxicological effects from this product.
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.
Carcinogenicity	: No known effects from this product.
Germ cell mutagenicity	: No known effects from this product.
Reproductive toxicity	: No known effects from this product.
STOT-single exposure	: No known effects from this product.



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STOT-repeated exposure : No known effects from this product.
Aspiration hazard : Not applicable for gases and gas-mixtures.

SECTION 12. Ecological information**12.1. Toxicity**

Assessment : No ecological damage caused by this product.

12.2. Persistence and degradability

Assessment : No ecological damage caused by this product.

12.3. Bioaccumulative potential

Assessment : No ecological damage caused by this product.

12.4. Mobility in soil

Assessment : No ecological damage caused by this product.

12.5. Results of PBT and vPvB assessment

: Not classified as PBT or vPvB.

12.6. Other adverse effects

:
Can cause frost damage to vegetation.
Effect on ozone layer : None.
Effect on the global warming : None.

SECTION 13. Disposal considerations**13.1. Waste treatment methods**

: 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.
Do not discharge into any place where its accumulation could be dangerous.
Consult supplier for specific recommendations.
Refer to the code of practice of ELGA (Doc. 30/10 "Disposal of Gases, downloadable at <http://www.elga.org>) for more guidance on suitable disposal methods
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

: None.

SECTION 14. Transport information**14.1. UN number**

UN number : 1966
Labelling ADR, IMDG, IATA





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SECTION 14. Transport information (continued)

: 2.1 : flammable gas.

14.2. UN proper shipping name

Transport by road/rail (ADR/RID) : HYDROGEN, REFRIGERATED LIQUID
Transport by air (ICAO-TI / IATA-DGR) : HYDROGEN, REFRIGERATED LIQUID
Transport by sea (IMDG) : HYDROGEN, REFRIGERATED LIQUID

14.3. Transport hazard class(es)

Transport by road/rail (ADR/RID)
Class : 2
Classification code : 3 F
H.I. nr : 223
Tunnel Restriction : B/D Tank carriage: Passage forbidden through tunnels of category B, C, D
Transport by air (ICAO-TI / IATA-DGR)
Transport by sea (IMDG)
Emergency Schedule (EmS) - Fire : F-D
Emergency Schedule (EmS) - Spillage : S-U

14.4. Packing group

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

14.5. Environmental hazards

Transport by road/rail (ADR/RID) : None.
Transport by air (ICAO-TI / IATA-DGR) : None.
Transport by sea (IMDG) : No

14.6 Special precautions for user

Packing Instruction(s)
Transport by road/rail (ADR/RID) : P203
Transport by air (ICAO-TI / IATA-DGR)
Passenger and Cargo Aircraft : DO NOT LOAD IN PASSENGER AIRCRAFT.
Cargo Aircraft only : FORBIDDEN.
Transport by sea (IMDG) : P203
Special precautions for user : - Ensure there is adequate ventilation.
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 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.
Avoid transport on vehicles where the load space is not separated from the driver's compartment.

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

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not applicable.



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Hydrogen (refrigerated)**067B****SECTION 15. Regulatory information****15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture****EU legislation**

- Restrictions on use : None.
Seveso directive 96/82/EC : Listed.

National legislation

- : Ensure all national/local regulations are observed.
- 4. BImSchV (Germany) : Listed.
- Water hazard class (WGK) : WGK Germany: Not hazardous to waters.
- Other regulations and technical rules (not complete) : [German regulations]
BetriebssicherheitsV mit TRBSen insbesondere TRBS 3145 / TRGS 725 "Ortsbewegliche Druckgasbehälter", TRGS 2141, BGR Regel 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 does not need to be carried out for this product.

SECTION 16. Other information

- Indication of changes : Revised safety data sheet in accordance with commission regulation (EU) No 453/2010
Training advice : The hazard of asphyxiation is often overlooked and must be stressed during operator training. Ensure operators understand the flammability hazard.
Further information : This Safety Data Sheet has been established in accordance with the applicable European Union legislation.
List of full text of R-phrases in section 3. : R12 : Extremely flammable.
List of full text of H-statements in section 3. : H220 - Extremely flammable gas.
H281 - Contains refrigerated gas; may cause cryogenic burns or injury.
DISCLAIMER OF LIABILITY : Before using this product in any new process or experiment, a thorough material compatibility and safety study should be carried out.
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