Safety Data Sheet

Hydrogen

according to the REACH Regulation (EC) 1907/2006 amended by Regulation (EU) 2020/878
Reference number: RS-H2-067A
Issue date: 02/01/2019 Revision date: 09/01/2024 Supersedes: 09/01/2023 Version: 3C

Danger

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

1.1. Product identifier

Trade name	:	Hydrogen 3.0; Hydrogen 4.0; Hydrogen 5.0; Hydrogen 5.6; Hydrogen 6.0; Gourmet H
SDS no	:	RS-H2-067A
Other means of identification	:	None.
CAS no.	:	1333-74-0
EC no.	:	215-605-7
Index no.	:	001-001-00-9
REACH 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 uses. Consumer use. Test gas / Calibration gas. Chemical reaction / Synthesis. Laboratory use. Use as a fuel. Shield gas for welding processes. Use for manufacture of electronic / photovoltaic components. Laser gas.
Uses advised against	:	Perform risk assessment prior to use. Uses other than those listed above are not supported, contact your supplier for more information on other uses.

1.3. Details of the supplier of the safety data sheet

Messer Tehnogas AD Beograd
Banjicki put , 62
RS– 11090 Belgrade, Serbia
T +381 11 35 37 200 - F +381 11 35 37 291
postoffice@messer.rs - www.messer.rs

1.4. Emergency telephone number

Emergency telephone number	:	Poison Control Center, VMA Crnotravska 17, Belgrade Serbia Tel. : +381(0) 11 360 8440 (24h)

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 1A	H220
	Gases under pressure : Compressed gas	H280

2.2. Label elements

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

Hazard pictograms (CLP) :

GHS02 GHS04

Signal word (CLP) : Danger

Hazard statements (CLP) : H220 - Extremely flammable gas.
H280 - Contains gas under pressure; may explode if heated.

Precautionary statements (CLP)

- Prevention : 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.
- Storage : P403 - Store in a well-ventilated place.

2.3. Other hazards

Asphyxiant in high concentrations.
These high concentrations are within the flammability range.
The substance / mixture has no endocrine disrupting properties.

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Hydrogen	CAS no.: 1333-74-0 EC no.: 215-605-7 Index no.: 001-001-00-9 REACH no.: *1	≤ 100	Flam. Gas 1A, H220 Press. Gas (Comp.), H280

Contains no other components or impurities which will influence the classification of the product.
**1: Listed in Annex IV / V REACH, exempted from registration.*
**3: Registration not required: Substance manufactured or imported < 1t/y.*

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. Maintain an open airway. Call a doctor. Perform cardiopulmonary resuscitation if breathing stopped.
- Skin contact : Adverse effects not expected from this product.
- Eye contact : Adverse effects not expected from this product. If irritation occurs: Flush eyes with plenty of water. Remove any contact lenses. Get medical advice / attention.
- 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. See section 11.

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

Take first aid measures. Loosen tight clothing, such as a collar, tie or belt.
Place the unconscious person in a lateral position. Seek medical attention.

SECTION 5: Firefighting measures

5.1. Extinguishing media

- Suitable extinguishing media : Water spray or fog. Dry powder. Carbon dioxide.
Shutting off the source of the gas is the preferred method of control.
Be aware of the risk of formation of static electricity with the use of CO_2 extinguishers. Do not use them in places where a flammable atmosphere may be present.

- Unsuitable extinguishing media : 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 : 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.
Approach the fire with caution because the flame is of high temperature and is practically invisible. Do not extinguish the fire until the hydrogen leak has stopped.
Move away immediately if there is a sound from the safety valves or there is any change in the color of the containers affected by the fire. Evacuate area and prohibit entry.
Prevent water used in emergency cases from entering sewers and drainage systems.
If possible, stop flow of product. Move containers away from the fire area if this can be done without risk. 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.
Avoid inhalation of materials or combustion products.

Special protective equipment for fire fighters : In confined space use self-contained breathing apparatus.
Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Standard EN 469 - Protective clothing for firefighters.
Standard EN 659 - Protective gloves for firefighters.
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

For non-emergency personnel : Act in accordance with local emergency plan.
Try to stop release.
Evacuate area.
Eliminate ignition sources.
Ensure adequate air ventilation.
Stay upwind.
See section 8 of the SDS for more information on personal protective equipment.

For emergency responders : 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.
See section 5.3 of the SDS for more information.

6.2. Environmental precautions

Try to stop release.

6.3. Methods and material for containment and cleaning up

Ventilate area.

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 : Assess the risk of potentially explosive atmospheres and the need for explosion-proof equipment. Ensure equipment is adequately earthed. Keep away from ignition sources (including static discharges). Consider the use of only non-sparking tools.Take precautionary measures against static discharge. Purge air from system before introducing gas.
The product must be handled in accordance with good industrial hygiene and safety procedures. Do not eat, drink or smoke while working with the product. Wash hands after use. Only experienced and properly instructed persons should handle gases under pressure. Wear personal protective equipment (See section 8). Consider pressure relief device(s) in gas installations. Ensure the complete gas system was(or is regularily) checked for leaks 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.
Avoid suck back of water, acid and alkalis.
Do not breathe gas.
Avoid release of product into work area.

Safe handling of the gas receptacle : Refer to supplier's container handling instructions.
Protect containers 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 the protection cap is too tight, remove it with adjustable wrench. Never insert sharp objects into the cavities of the cap, this can lead to damage to the valve and leakage.
Open valve slowly to avoid pressure shock. If user experiences any difficulty operating 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 allow backfeed into the container. Suck back of water into the container must be prevented.
Do not remove or deface labels provided by the supplier for the identification of the content of the container.
Do not remove or deface labels provided by the supplier for the identification of the content of the container.

7.2. Conditions for safe storage, including any incompatibilities

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.
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.

7.3. Specific end use(s)

None.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

OEL (Occupational Exposure Limits) : None available.

DNEL (Derived-No Effect Level) : None available.

PNEC (Predicted No-Effect Concentration) : None available.

8.2. Exposure controls

8.2.1. Appropriate engineering controls

Provide adequate general and local exhaust ventilation.
Product to be handled in a closed system.
Systems under pressure should be regularily checked for leakages.
Gas detectors should be used when flammable gases/vapours 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 safety glasses with side shields.
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 risks, performance level 1 or higher. Recommended types include wrist gloves from leather or synthetic material with equivalent performance, fabric gloves, fabric gloves with leather palms.

- Other : Consider the use of flame resistant anti-static safety clothing.
Standard EN ISO 14116 - Limited flame spread materials.
Standard EN 1149-5 - Protective clothing: Electrostatic properties.
Wear safety shoes while handling containers.
Standard EN ISO 20345 - Personal protective equipment - Safety footwear.

• Respiratory protection : Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres.
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.

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.
Melting point / Freezing point : -259 °C
Boiling point : -253 °C
Flammability : Extremely flammable gas.
Lower explosion limit : 4 vol %
Upper explosion limit : 77 vol %
Flash point : Not applicable for gases and gas mixtures.
Auto-ignition temperature : 560 °C

Decomposition temperature	:	Not applicable.
pH	:	Not applicable for gases and gas mixtures.
Viscosity, kinematic	:	No reliable data available.
Water solubility [20°C]	:	1.6 mg/l
Partition coefficient n-octanol/water (Log K_{ow})	:	Not applicable for inorganic products.
Vapour pressure [20°C]	:	Not applicable.
Vapour pressure [50°C]	:	Not applicable.
Density and/or relative density	:	Not applicable for gases and gas mixtures.
Relative vapour density (air=1)	:	0.07
Particle characteristics	:	Not applicable for gases and gas mixtures. Nanoforms are not relevant for gases and gas mixtures.

9.2. Other information

9.2.1. Information with regard to physical hazard classes

Oxidising properties	:	No oxidising properties.
Critical temperature [°C]	:	-240 °C

9.2.2. Other safety characteristics

Molar mass	:	2 g/mol
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.
A mixture of hydrogen and oxygen, explosive gas, explodes when heated, developing a large amount of heat. It reacts violently with many elements.
A mixture of hydrogen and chlorine explodes under the influence of light, and a mixture of hydrogen and fluorine also explodes in the dark.

10.4. Conditions to avoid

Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Avoid moisture in installation systems. (See Section 7.).

10.5. Incompatible materials

Air, Oxidisers. 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 hazard classes as defined in Regulation (EC) No 1272/2008

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.
Germ cell mutagenicity	:	No known effects from this product.
Carcinogenicity	:	No known effects from this product.

Toxic for reproduction : Fertility	:	No known effects from this product.
Toxic for reproduction : unborn child	:	No known effects from this product.
STOT-single exposure	:	No known effects from this product.
STOT-repeated exposure	:	No known effects from this product.
Aspiration hazard	:	Not applicable for gases and gas mixtures.

11.2. Information on other hazards

Other information	:	The substance / mixture has no endocrine disrupting properties.

SECTION 12: Ecological information

12.1. Toxicity

Assessment	:	No ecological damage caused by this product.
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	:	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

Assessment	:	Not classified as PBT or vPvB.

12.6. Endocrine disrupting properties

Assessment	:	The substance / mixture has no endocrine disrupting properties.

12.7. Other adverse effects

Other adverse effects	:	No known effects from this product.
Effect on the ozone layer	:	No effect on the ozone layer.
Global warming potential [CO_2=1]	:	6
Effect on global warming	:	When discharged in large quantities may contribute to the greenhouse effect. Contains greenhouse gases listed in Annex I of EU 2024/573.

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.
Ensure that the emission levels from local regulations or operating permits are not exceeded.
Refer to the EIGA code of practice Doc.30/21 "Disposal of Gases", downloadable at http://www.eiga.eu for more guidance on suitable disposal methods.
Do not discharge into any place where its accumulation could be dangerous.
Return unused product in original container to supplier.

List of hazardous waste codes (from Commission Decision 2000/532/EC as amended)	:	16 05 04 *: Gases in pressure containers (including halons) containing hazardous 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 or ID number

In accordance with ADR / RID / IMDG / IATA / ADN

UN-No. : 1049

14.2. UN proper shipping name

Transport by road/rail/inland waterways (ADR/RID/ADN) : HYDROGEN, COMPRESSED

Transport by air (ICAO-TI / IATA-DGR) : Hydrogen, compressed

Transport by sea (IMDG) : HYDROGEN, COMPRESSED

14.3. Transport hazard class(es)

Labelling :

2.1 : Flammable gases.

Transport by road/rail/inland waterways (ADR/RID/ADN)

Class : 2

Classification code : 1F

Hazard identification number : 23

Tunnel Restriction : B/D - Tank carriage : Passage forbidden through tunnels of category B, C, D and E. Other carriage : Passage forbidden through tunnels of category D and E

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

Class / Div. (Sub. risk(s)) : 2.1

Transport by sea (IMDG)

Class / Div. (Sub. risk(s)) : 2.1

Emergency Schedule (EmS) - Fire : F-D

Emergency Schedule (EmS) - Spillage : S-U

14.4. Packing group

Transport by road/rail/inland waterways (ADR/RID/ADN) : 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/inland waterways (ADR/RID/ADN) : None.

Transport by air (ICAO-TI / IATA-DGR) : None.

Transport by sea (IMDG) : None.

14.6. Special precautions for user

Packing Instruction(s)

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

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

Passenger and Cargo Aircraft : Forbidden.

Cargo Aircraft only : 200.

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 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. Maritime transport in bulk according to IMO instruments

Not applicable.

SECTION 15: Regulatory information

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

RS Regulations

Pravilnik o ograničenjima i zabranama proizvodnje, stavljanja u promet i korišćenja hemikalija ("Sl. glasnik RS", br. 105/2013, 52/2017, 21/2019 i 29/2024)	:	None.
Pravilnik o izvozu i uvozu određenih opasnih hemikalija („Sl. glasnik RS“ br. 93/23)	:	None.
Pravilnik o Listi opasnih materija i njihovim količinama i kriterijumima za određivanje vrste dokumenta koje izrađuje operater seveso postrojenja, odnosno kompleksa ("Sl. glasnik RS", br. 41/2010, 51/2015 i 50/2018)	:	Listed.

EU Regulations

Restrictions on use	:	None.
Other information, restriction and prohibition regulations	:	Not listed on the PIC list (Regulation EU 649/2012). Not listed on the POP list (Regulation EU 2019/1021).
Seveso Directive : 2012/18/EU (Seveso III)	:	Listed.

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 2020/878. In Section 4, the Safety Data Sheet is supplemented with information first aid measures. In Section 5, the Safety Data Sheet is supplemented with information about special hazards arising from the substance or mixture. In Section 8, the Safety Data Sheet is supplemented with information about exposure control and personal protection. In Section 12, the Safety Data Sheet is supplemented with information about other adverse effects. In Section 13, the Safety Data Sheet is supplemented with information about waste treatment methods. In Section 15, the Safety Data Sheet is supplemented with regulatory information.
Abbreviations and acronyms	:	ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road ATE - Acute Toxicity Estimate CAS - Chemical Abstract Service number CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008 CSA - Chemical Safety Assessment DNEL - Derived No Effect Levels EINECS - European Inventory of Existing Commercial Chemical Substances EC- European Community number EIGA - European Industrial Gases Association EN - European Standard

IATA - International Air Transport Association
ICAO - International Civil Aviation Organization
IMDG code - International Maritime Dangerous Goods
IMO - International Maritime Organization
LC50 - Lethal Concentration to 50 % of a test population
LD50 - Lethal Dose 50%
LEL - Lower Explosive Limit
OEL - Occupational exposure limits
PBT - Persistent, Bioaccumulative and Toxic
PNEC - Predicted No Effect Concentration
PPE - Personal Protection Equipment
REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
RMM - Risk Management Measures
STOT - RE - Specific Target Organ Toxicity - Repeated Exposure
STOT- SE - Specific Target Organ Toxicity - Single Exposure
STEL - Short Term Exposure Limit
TWA –8-hour total weight average
UEL - Upper explosive limit
UFI - Unique Formula Identifier
UN - United Nations
vPvB - Very Persistent and Very Bioaccumulative
WGK - Water Hazard Class

Training advice : Receptacle under pressure.
Ensure operators understand the flammability hazard.

Further information : Classification in accordance with the procedures and calculation methods of Regulation (EC) 1272/2008 (CLP).
Key literature references and sources of data are maintained in EIGA doc 169 : 'Classification and Labelling Guide', downloadable at http://www.eiga.eu

Full text of H- and EUH-statements	
Flam. Gas 1A	Flammable gases, Category 1A
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
Press. Gas (Comp.)	Gases under pressure : Compressed gas

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.

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