



SILANE, 7.0 - 7.5% in argon

Safety Data Sheet SIS6950.1

Date of issue: 13/07/2017 Version: 1.0

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

1.1. Product identifier

Product form : Mixture
 Physical state : Gas
 Product name : SILANE, 7.0 - 7.5% in argon
 Product code : SIS6950.1
 Formula : H4Si
 Synonyms : SILICANE
 MONOSILANE
 SILICON TETRAHYDRIDE
 Chemical family : HYDRIDOSILANE

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

1.2.1. Relevant identified uses

Use of the substance/mixture : Chemical intermediate

1.2.2. Uses advised against

No additional information available

1.3. Details of the supplier of the safety data sheet

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1.4. Emergency telephone number

Emergency number : CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

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

Flammable gases, Category 1 H220
 Gases under pressure : Compressed gas H280
 Full text of H statements : see section 16

Adverse physicochemical, human health and environmental effects

No additional information available

2.2. Label elements

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

Hazard pictograms (CLP) :



GHS02

Signal word (CLP) :

Danger

Hazard statements (CLP) :

H220 - Extremely flammable gas.
 H280 - Contains gas under pressure; may explode if heated.

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Precautionary statements (CLP) : P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P377 - Leaking gas fire: Do not extinguish, unless leak can be stopped safely.
P381 - In case of leakage, eliminate all ignition sources.
P403 - Store in a well-ventilated place.
P410+P403 - Protect from sunlight. Store in a well-ventilated place.

2.3. Other hazards

No additional information available

SECTION 3: Composition/information on ingredients

3.1. Substances

Not applicable

3.2. Mixtures

Name	Product identifier	%	Classification according to Regulation (EC) No. 1272/2008 [CLP]
Argon	(CAS-No.) 7440-37-1 (EC-No.) 231-147-0	92.5 - 93	Press. Gas (Comp.), H280
Silane	(CAS-No.) 7803-62-5 (EC-No.) 232-263-4	7 - 7.5	Flam. Gas 1, H220 Press. Gas (Liq.), H280 Acute Tox. 4 (Inhalation:gas), H332

Full text of H-statements: see section 16

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Remove contaminated clothing and shoes. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). If possible show this sheet; if not available show packaging or label.

First-aid measures after inhalation : Remove person to fresh air and keep comfortable for breathing. If you feel unwell, seek medical advice.

First-aid measures after skin contact : Wash with plenty of water/.... Get medical advice/attention.

First-aid measures after eye contact : Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical advice/attention.

First-aid measures after ingestion : Never give anything by mouth to an unconscious person. Get medical advice/attention.

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

Symptoms/effects after inhalation : May cause irritation to the respiratory tract.

Symptoms/effects after skin contact : May cause skin irritation.

Symptoms/effects after eye contact : May cause eye irritation. At levels below the flammability limit, silane is expected to affect the eyes by absorption and deposition of silicon dioxide, causing severe irritation and possible corneal damage.

Symptoms/effects after ingestion : May be harmful if swallowed.

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

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : If unable to stop the flow of gas, silane should be allowed to burn until consumed. Secondary fires may be extinguished with alcohol resistant foam, carbon dioxide, dry chemical. Use of high expansion foam (100:1) is recommended to cover flames.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Extremely flammable gas. Irritating fumes and organic acid vapors may develop when material is exposed to water or open flame.

Explosion hazard : Silane spontaneously ignites on contact with air.

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5.3. Advice for firefighters

- Firefighting instructions : Exercise caution when fighting any chemical fire. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so. Silane should be allowed to burn until consumed. Excessive pressure may develop in gas cylinders exposed to fire-heated silane may explode on contact with air. Cool cylinders and surroundings with water from a suitable distance.
- Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection. Avoid all eye and skin contact and do not breathe vapour and mist.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

- General measures : Ventilate area. Use special care to avoid static electric charges. Eliminate every possible source of ignition.

6.1.1. For non-emergency personnel

- Protective equipment : Wear protective equipment as described in Section 8.
- Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

- Protective equipment : Do not attempt to take action without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions

No additional information available

6.3. Methods and material for containment and cleaning up

- Methods for cleaning up : Stop flow of gas if possible. The potential exists for spontaneous ignition and explosion. Allow vapors to disperse.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

- Additional hazards when processed : Flammable gas. Catches fire spontaneously if exposed to air.
- Precautions for safe handling : Containers and transfer lines require grounding during use. Prevent reverse flow. Provide good ventilation in process area to prevent formation of vapour. Do not breathe vapours. Eliminate all ignition sources if safe to do so. Systems utilizing silane that do not involve complete consumption of silane should be equipped with burn boxes. See- Book of SEMI Standards, Facilities Standards and Safety Guidelines, Mountain View, CA, Semiconductor Equipment and Materials Int'l, 1993. Use only in well ventilated areas.
- Hygiene measures : Wash contaminated clothing before reuse. Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work.

7.2. Conditions for safe storage, including any incompatibilities

- Technical measures : Proper grounding procedures to avoid static electricity should be followed.
- Storage conditions : Store in sealed cylinders in isolated area. Protect from sunlight. Store in a well-ventilated place.
- Incompatible materials : Acids. alcohols. Oxidizing agent.
- Storage area : Store in a well-ventilated place. Store away from heat.

7.3. Specific end use(s)

No additional information available

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

SILANE, 7.0 - 7.5% in argon		
Australia	TWA (mg/m ³)	0.63 mg/m ³
Australia	TWA (ppm)	0.2 ppm
Silane (7803-62-5)		
Belgium	Limit value (mg/m ³)	6.7 mg/m ³
Belgium	Limit value (ppm)	5 ppm
France	VME (mg/m ³)	7 mg/m ³
France	VME (ppm)	5 ppm
Greece	OEL TWA (mg/m ³)	7 mg/m ³
Greece	OEL TWA (ppm)	5 ppm
Italy - Portugal - USA ACGIH	ACGIH TWA (ppm)	5 ppm

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Silane (7803-62-5)		
USA NIOSH	NIOSH REL (TWA) (mg/m ³)	7 mg/m ³
USA NIOSH	NIOSH REL (TWA) (ppm)	5 ppm
Spain	VLA-ED (mg/m ³)	6.7 mg/m ³
Spain	VLA-ED (ppm)	5 ppm
Switzerland	MAK (mg/m ³)	0.7 mg/m ³
Switzerland	MAK (ppm)	0.5 ppm
United Kingdom	WEL TWA (mg/m ³)	0.67 mg/m ³
United Kingdom	WEL TWA (ppm)	0.5 ppm
United Kingdom	WEL STEL (mg/m ³)	1.3 mg/m ³
United Kingdom	WEL STEL (ppm)	1 ppm
Denmark	Grænseværdie (langvarig) (mg/m ³)	0.7 mg/m ³
Denmark	Grænseværdie (langvarig) (ppm)	0.5 ppm
Finland	HTP-arvo (8h) (mg/m ³)	0.67 mg/m ³
Finland	HTP-arvo (8h) (ppm)	0.5 ppm
Finland	HTP-arvo (15 min)	2 mg/m ³
Finland	HTP-arvo (15 min) (ppm)	1.5 ppm
Ireland	OEL (8 hours ref) (mg/m ³)	0.7 mg/m ³
Ireland	OEL (8 hours ref) (ppm)	0.5 ppm
Ireland	OEL (15 min ref) (mg/m ³)	1.5 mg/m ³
Ireland	OEL (15 min ref) (ppm)	1 ppm
Norway	Grenseverdier (AN) (mg/m ³)	0.7 mg/m ³
Norway	Grenseverdier (AN) (ppm)	0.5 ppm
Norway	Grenseverdier (Korttidsverdi) (mg/m ³)	0.7 mg/m ³
Norway	Grenseverdier (Korttidsverdi) (ppm)	0.5 ppm
Canada (Quebec)	VEMP (mg/m ³)	6.6 mg/m ³
Canada (Quebec)	VEMP (ppm)	5 ppm
Australia	TWA (mg/m ³)	6.6 mg/m ³
Australia	TWA (ppm)	5 ppm
Portugal	OEL TWA (ppm)	5 ppm

8.2. Exposure controls

Appropriate engineering controls:

Provide local exhaust or general room ventilation.

Personal protective equipment:

Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Avoid all unnecessary exposure.

Hand protection:

Neoprene or nitrile rubber gloves

Eye protection:

Chemical goggles. Contact lenses should not be worn

Skin and body protection:

Wear suitable protective clothing

Respiratory protection:

Where exposure through inhalation may occur from use, respiratory protection equipment is recommended. NIOSH-certified combination organic vapor/acid gas (yellow cartridge) respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	: Gas
Appearance	: Flammable mixture gas.
Molecular mass	: 32.12 g/mol

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Colour	: Colourless.
Odour	: Disagreeable.
Odour threshold	: No data available
Refractive index	: No additional information available
pH	: No data available
Relative evaporation rate (butylacetate=1)	: No data available
Melting point	: No data available
Freezing point	: -185 °C
Boiling point	: -112 °C
Flash point	: < -40 °C
Critical temperature	: -3.5 °C
Auto-ignition temperature	: < 20 °C
Decomposition temperature	: No data available
Flammability (solid, gas)	: Extremely flammable gas.
Vapour pressure	: 530 kPa @ -118°C
Relative vapour density at 20 °C	: 1.342 g/l
Relative density	: 0.68 @ -185°C
% Volatiles	: 100 %
Solubility	: Reacts with water.
Log Pow	: No data available
Log Kow	: No data available
Viscosity, kinematic	: No data available
Viscosity, dynamic	: No data available
Explosive properties	: No data available
Oxidising properties	: No data available
Explosive limits	: 1.37 - 98 vol % (lower; upper)

9.2. Other information

Gas group : Compressed gas

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable in sealed cylinders stored under a dry inert atmosphere.

10.3. Possibility of hazardous reactions

Reacts with oxygen in air, igniting spontaneously. Mixtures with mercury explode when shaken in the presence of air. Platinum, platinum and iron salts and other Lewis acids can cause generation of flammable hydrogen gas.

10.4. Conditions to avoid

Heat. Sparks. Open flame.

10.5. Incompatible materials

Acids. alcohols. Oxidizing agent.

10.6. Hazardous decomposition products

Silicon dioxide.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Silane (7803-62-5)

LC50 inhalation rat (ppm)	9600 ppm/4h
ATE CLP (gases)	9600 ppmv/4h

Skin corrosion/irritation	: Not classified
Serious eye damage/irritation	: Not classified
Respiratory or skin sensitisation	: Not classified
Germ cell mutagenicity	: Not classified

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Carcinogenicity	: Not classified None of the components in this product at concentrations >0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.
Reproductive toxicity	: Not classified
STOT-single exposure	: Not classified
STOT-repeated exposure	: Not classified
Aspiration hazard	: Not classified
Symptoms/effects after inhalation	: May cause irritation to the respiratory tract.
Symptoms/effects after skin contact	: May cause skin irritation.
Symptoms/effects after eye contact	: May cause eye irritation. At levels below the flammability limit, silane is expected to affect the eyes by absorption and deposition of silicon dioxide, causing severe irritation and possible corneal damage.
Symptoms/effects after ingestion	: May be harmful if swallowed.

SECTION 12: Ecological information

12.1. Toxicity

Acute aquatic toxicity	: Not classified
Chronic aquatic toxicity	: Not classified

12.2. Persistence and degradability

No additional information available

12.3. Bioaccumulative potential

No additional information available

12.4. Mobility in soil

No additional information available

12.5. Results of PBT and vPvB assessment

No additional information available

12.6. Other adverse effects

Other adverse effects : This substance may be hazardous to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Sewage disposal recommendations	: Do not dispose of waste into sewer.
Product/Packaging disposal recommendations	: Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to licensed waste disposal facility.
Ecology - waste materials	: Avoid release to the environment.

SECTION 14: Transport information

14.1. UN number

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

14.1. UN number

UN-No. (ADR)	: 1954
UN-No. (IMDG)	: 1954
UN-No. (IATA)	: 1954
UN-No. (ADN)	: 1954
UN-No. (RID)	: 1954

14.2. UN proper shipping name

Proper Shipping Name (ADR)	: COMPRESSED GAS, FLAMMABLE, N.O.S.
Proper Shipping Name (IMDG)	: COMPRESSED GAS, FLAMMABLE, N.O.S.
Proper Shipping Name (IATA)	: Compressed gas, flammable, n.o.s.
Proper Shipping Name (ADN)	: COMPRESSED GAS, FLAMMABLE, N.O.S.
Proper Shipping Name (RID)	: COMPRESSED GAS, FLAMMABLE, N.O.S.
Transport document description (ADR)	: UN 1954 COMPRESSED GAS, FLAMMABLE, N.O.S. (SILANE, 7.0 - 7.5% in argon), 2.1, (B/D)
Transport document description (IMDG)	: UN 1954 COMPRESSED GAS, FLAMMABLE, N.O.S. (SILANE, 7.0 - 7.5% in argon), 2.1
Transport document description (IATA)	: UN 1954 Compressed gas, flammable, n.o.s. (SILANE, 7.0 - 7.5% in argon), 2.1
Transport document description (ADN)	: UN 1954 COMPRESSED GAS, FLAMMABLE, N.O.S. (SILANE, 7.0 - 7.5% in argon), 2.1

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Transport document description (RID) : UN 1954 COMPRESSED GAS, FLAMMABLE, N.O.S. (SILANE, 7.0 - 7.5% in argon), 2.1

14.3. Transport hazard class(es)

ADR

Transport hazard class(es) (ADR) : 2.1

Danger labels (ADR) : 2.1



IMDG

Transport hazard class(es) (IMDG) : 2.1

Danger labels (IMDG) : 2.1



IATA

Transport hazard class(es) (IATA) : 2.1

Hazard labels (IATA) : 2.1



ADN

Transport hazard class(es) (ADN) : 2.1

Danger labels (ADN) : 2.1



RID

Transport hazard class(es) (RID) : 2.1

Danger labels (RID) : 2.1



14.4. Packing group

Packing group (ADR) : Not applicable

Packing group (IMDG) : Not applicable

Packing group (IATA) : Not applicable

Packing group (ADN) : Not applicable

Packing group (RID) : Not applicable

14.5. Environmental hazards

Dangerous for the environment : No

Marine pollutant : No

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Other information : No supplementary information available

14.6. Special precautions for user

- Overland transport

Classification code (ADR) : 1F
Special provisions (ADR) : 274, 660, 662
Limited quantities (ADR) : 0
Excepted quantities (ADR) : E0
Packing instructions (ADR) : P200
Mixed packing provisions (ADR) : MP9
Portable tank and bulk container instructions (ADR) : (M)
Tank code (ADR) : CxBN(M)
Tank special provisions (ADR) : TA4, TT9
Vehicle for tank carriage : FL
Transport category (ADR) : 2
Special provisions for carriage - Loading, unloading and handling (ADR) : CV9, CV10, CV36
Special provisions for carriage - Operation (ADR) : S2, S20
Hazard identification number (Kemler No.) : 23
Orange plates :

23

1954

Tunnel restriction code (ADR) : B/D
EAC code : 2SE

- Transport by sea

Special provisions (IMDG) : 274
Limited quantities (IMDG) : 0
Excepted quantities (IMDG) : E0
Packing instructions (IMDG) : P200
EmS-No. (Fire) : F-D
EmS-No. (Spillage) : S-U
Stowage category (IMDG) : D
Stowage and handling (IMDG) : SW2

- Air transport

PCA Excepted quantities (IATA) : E0
PCA Limited quantities (IATA) : Forbidden
PCA limited quantity max net quantity (IATA) : Forbidden
PCA packing instructions (IATA) : Forbidden
PCA max net quantity (IATA) : Forbidden
CAO packing instructions (IATA) : 200
CAO max net quantity (IATA) : 150kg
Special provisions (IATA) : A1
ERG code (IATA) : 10L

- Inland waterway transport

Classification code (ADN) : 1F
Special provisions (ADN) : 274, 66
Limited quantities (ADN) : 0
Excepted quantities (ADN) : E0
Equipment required (ADN) : PP, EX, A
Ventilation (ADN) : VE01
Number of blue cones/lights (ADN) : 1

- Rail transport

Special provisions (RID) : 274, 660, 662

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Limited quantities (RID)	: 0
Excepted quantities (RID)	: E0
Packing instructions (RID)	: P200
Mixed packing provisions (RID)	: MP9
Portable tank and bulk container instructions (RID)	: (M)
Tank codes for RID tanks (RID)	: CxBN(M)
Special provisions for RID tanks (RID)	: TU38, TE22, TA4, TT9
Transport category (RID)	: 2
Special provisions for carriage - Loading, unloading and handling (RID)	: CW9, CW10, CW36
Colis express (express parcels) (RID)	: CE3
Hazard identification number (RID)	: 23

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

15.1.1. EU-Regulations

Contains no REACH substances with Annex XVII restrictions

Contains no substance on the REACH candidate list

Contains no REACH Annex XIV substances

Contains no substance subject to REGULATION (EU) No 649/2012 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 4 July 2012 concerning the export and import of hazardous chemicals.

Substance(s) are not subject to Regulation (EC) No 850/2004 of the European Parliament and of the Council of 29 April 2004 on persistent organic pollutants and amending Directive 79/117/EEC.

Contains no REACH Annex XIV substances

% Volatiles : 100 %

15.1.2. National regulations

Germany

Reference to AwSV : Water hazard class (WGK) 1, Slightly hazardous to water (Classification according to AwSV, Annex 1)

12th Ordinance Implementing the Federal Immission Control Act - 12.BImSchV : Is not subject of the 12. BImSchV (Hazardous Incident Ordinance)

Netherlands

SZW-lijst van kankerverwekkende stoffen : Silane is listed

SZW-lijst van mutagene stoffen : Silane is listed

NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Borstvoeding : None of the components are listed

NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Vruchtbaarheid : None of the components are listed

NIET-limitatieve lijst van voor de voortplanting giftige stoffen – Ontwikkeling : None of the components are listed

Denmark

Class for fire hazard : Class I-1

Store unit : 1 liter

Classification remarks : F+ <Flam. Gas 1; Press. Gas (Comp.)>; Emergency management guidelines for the storage of flammable liquids must be followed

Danish National Regulations : Young people below the age of 18 years are not allowed to use the product

15.2. Chemical safety assessment

No additional information available

SECTION 16: Other information

Abbreviations and acronyms:

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Abbreviations: ND: Not Determined, No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TWA: time weighted average; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development; GHS: The Globally Harmonized System of Classification and Labelling; APF: Assigned Protection Factor

Other information : Prepared by safety and environmental affairs.

Full text of H- and EUH-statements:

Acute Tox. 4 (Inhalation:gas)	Acute toxicity (inhalation:gas) Category 4
Flam. Gas 1	Flammable gases, Category 1
Press. Gas (Comp.)	Gases under pressure : Compressed gas
Press. Gas (Liq.)	Gases under pressure : Liquefied gas
H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H332	Harmful if inhaled.

SDS EU (REACH Annex II) - Custom

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