SECTION 1: Product and Company Identification

1.1 Product identifier

Product name	:	Acetylene, dissolved (DA)
Trade name	:	No applicable.

1.2 Other means of identification

Chemical Name	:	Acetylene
Chemical Formula	:	DA; C2H2

1.3 Recommended use and restrictions on use

Product use	:	Semiconductor Processes Industrial & Professional use Synthetic/Analytical chemistry Photovoltaic Processes

1.4 Details of supplier of the safety data sheet

Company identification	:	Iwatani Corporation (Singapore) Pte. Ltd.
Address	:	6 Shenton Way, OUE Downtown 2 #13-11, Singapore 068809
Phone	:	+65 6862 2111

1.5 Emergency contact

Emergency phone number	:	+65 6220 8347

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Physical hazards	:	Gases under pressure- dissolved gas.
Characteristic	:	Flammable, Category 1
Acute toxicity (inhalation)	:	Not classified.
Skin corrosion/irritation	:	Not classified.
Serious eye damage/eye irritation	:	Not classified.
Acute aquatic toxicity	:	Not classified.

2.2 GHS label elements, including precautionary statements

Pictogram(s)	:	
Signal word(s)	:	Danger
Hazard statement(s)	:	H220 - Extremely flammable gas H280 – Contains gas under pressure; may explode if heated
Precautionary statements		
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. P403+P410 - Store in a well-ventilated place. Protect from sunlight.
Disposal	:	None.

Emergency Overview	:	**DANGER!** Flammable gas under pressure. Can form explosive mixtures with air. Fusible plugs on top, bottom, or valve melt at 208-224°F (98-107°C). No not discharge at pressures above 15 psig (103 kPa). May cause dizziness and drowsiness. Self-contained breathing apparatus may be required by rescue workers. At normal temperature and pressure, commercial acetylene is a colourless gas with a distinctive garlic-like odour.

2.3 Other hazards which do not result in classification

OSHA Regulatory Status	:	This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).
Potential Health Effects	:	
Inhalation	:	Asphyxiant, effects are due to lack of oxygen. Moderate concentrations may cause headache, drowsiness, dizziness, excitation, excess salivation, nausea, vomiting, and unconsciousness. The vapor from a liquid release may also cause incoordination, abdominal pain. Effects may be delayed. Lack of oxygen can kill.

SECTION 3. Composition/Information on ingredients

3.1 Substances / 3.2. Mixture

Substance name	Contents	CAS No.
Acetylene, dissolved	100%	74-86-2

Acetylene cylinders are filled with a porous material containing acetone (CAS 67-64-1) into which the acetylene is dissolved.

SECTION 4. First-aid measures

4.1 Description of first aid measures

Inhalation	:	Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.
Skin contact	:	For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). in case of massive exposure, remove contaminated clothing while showering with warm water. Call a physician.
Eye contact	:	In case of splash contamination, immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

Swallowing	:	If liquid is swallowed, immediately give two glasses of water and induce vomiting if victim is conscious. Call a physician.
Notes To Physician	:	Aspirated acetone may cause severe lung damage. If a large quantity of material has been swallowed, stomach contents should be evacuated quickly in a manner that avoids aspiration. Otherwise, there is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

4.2 Most important symptoms/effect, acute and delayed

Respiratory arrest.

4.3 Indication of immediate medical attention and special treatment needed, if necessary

No information.

SECTION 5. Fire-fighting measures

5.1 Extinguishing media

Flammable properties	:	Extremely flammable gas. Forms explosive mixtures with air and oxidizing agents
Suitable extinguishing media	:	Water spray or fog, dry powder.
Unsuitable extinguishing media	:	Carbon dioxide (CO_2).

5.2 Special hazards arising from the substance or mixture

Specific hazard	:	Exposure to fire may cause containers to rupture/explode.
Hazardous combustion products	:	Carbon monoxide, Carbon dioxide.

5.3 Advice for fire-fighters

Protection of firefighters	:	Evacuate all personnel from danger area. Immediately cool cylinders with water spray from maximum distance, taking care not to extinguish flames. If flames are accidentally extinguished, explosive re-ignition may occur. Use self-contained breathing apparatus. Remove ignition sources if without risk. Stop flow of gas if without risk while continuing cooling water spray. Remove all cylinders from area of fire if without risk. Allow fire to burn out on-site fire brigades must comply with OSHA 29 CFR 1910.156.
Special physical and chemical hazards	:	Heat of fire can build pressure in cylinder and cause it to rupture. Acetylene cylinders are provided with pressure relief devices designed to vent contents when exposed to elevated temperature. No part of a cylinder should be subjected to a temperature higher than 125°F (52°C). if venting or leaking acetylene catches fire, do not extinguish flames. Flammable vapours may spread from leak, creating an explosive reignition hazard. Vapours can be ignited by pilot lights, other flames, smoking, sparks, heaters, electrical equipment, static discharge, or other ignition sources at locations distant from product handling point. Explosive atmospheres may linger. Before entering area, especially

confined areas, check atmosphere with an approved explosion meter.

Protective Equipment and Precautions for Firefighters : Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

SECTION 6. Accidental release measures

DANGER! Flammable gas under pressure.

6.1 Personal precautions, protective equipment and emergency procedures

Forms explosive mixtures with air. Immediately evacuate all personnel from danger area.
Use self-contained breathing apparatus where needed. Remove all sources of ignition if without risk.
Reduce vapours with fog or fine water spray. Shut off flow if without risk.
Ventilate area or move leaking cylinder to well-ventilated area. Flammable gas may spread from leak.
Before entering area, especially confined areas, check atmosphere with an appropriate device.

6.2 Environmental precautions

Prevent waste from contaminating the surrounding environment.
Keep personnel away.
Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

6.3 Methods and materials for containment and cleaning up

For containment : Stop leak, if possible, without risk. As an immediate precautionary measure, isolate spill or leak area in all direction.
If leak is in container or container valve, contact the appropriate emergency telephone number in Section 1.

Methods for cleaning up : Return cylinder to Iwatani or an authorized distributor.

SECTION 7. Handling and storage

7.1 Precautions for safe handling

Flammable gas under pressure.
Use piping and equipment adequately designed to withstand pressures to be encountered.
Acetylene systems should be installed only by persons knowledgeable of the unique properties of acetylene and trained and experienced in such installation. All piped acetylene systems and associated equipment must be grounded. Electrical equipment must be non-sparking or explosion-proof. Leak check with soapy water; never use a flame. Use a backflow prevention device in any piping.
Keep away from heat, sparks, and open flame.
Use only spark-proof tools and explosion-proof equipment. Never use acetylene at pressures exceeding 15 psig (1003.5kPa). can cause rapid suffocation due to oxygen deficiency. Close valve after each use; keep closed even when empty. Arcs and sparks can ignite combustible materials. Prevent fires. For more information on fire prevention in welding and cutting, see NFPA 51B, Standard for Fire Prevention During Welding, Cutting, and Other Hotwork, published by the National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101; 1-800-344-3555 https://www.nfpa.org/.

Do not strike an arc on a compressed gas cylinder.
The defect produced by an arc burn could lead to cylinder rupture.
Never work on a pressurized system.
If there is a leak, close the cylinder valve. Blow the system down in an environmentally safe manner in compliance with all federal, state, and local laws; then repair the leak.
Never place a compressed gas cylinder where it may become part of an electrical circuit.
When you mix two or more gases or liquefied gases, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, gases and liquids have properties that can cause serious injury or death.

7.2 Conditions for safe storage, including any incompatibilities

Storage Conditions : Acetylene storage in excess of 2,500 cu ft (70.79m3) is prohibited in buildings with other occupancies.

: **Store and use with adequate ventilation.**
Separate acetylene cylinders from oxygen and other oxidizers by at least 20 ft (6.1m), or use a barricade of non-combustible material. This barricade should be at least 5 ft (4.53m) high and have a fire resistance rating of at least ½ hour.

: **Post "No Smoking or Open Flames" signs in storage and use areas.**
There must be no sources of ignition. All electrical equipment in storage areas must be explosion-proof. Storage areas must meet national electric codes for Class 1 hazardous areas. Store only where temperature will not exceed 125°F (52°C). for other precautions in using acetylene, see section 16.

Incompatible materials : Copper, silver, and mercury and their salts, compounds, and high-concentration alloys can form explosive compounds with acetylene. Never use copper piping for acetylene service; use only steel or wrought iron. Brass containing less than 65% copper and certain nickel alloys are generally acceptable for use in acetylene service but may not be adequate if high corrosion or excess moisture is present.

SECTION 8. Exposure controls/personal protection

8.1 Control parameters/Occupational exposure limits

Components	CAS-No.	Value type (form of exposure)	Control parameters/permissible concentration	Basis
Acetylene	74-86-2	PEL	Not Established.	OSHA
		TWA	Simple asphyxiant.	OSHA
Acetone	67-64-1	PEL	1000 ppm, 2400mg/m^3	OSHA
		TWA	500 ppm	OSHA
		STEL	750 ppm	OSHA

TWA=Time weighted average; PEL= Permissible Exposure Limit; STEL = Short term exposure limit
TLV-TWAs should be used as a guide in the control of health hazards and not as fine lines between safe and dangerous concentrations.

IDLH = Not available.

8.2 Appropriate engineering control measures

Local Exhaust	:	Use a local exhaust system, if necessary, to prevent oxygen deficiency and to keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.
Mechanical (General)	:	General exhaust ventilation may be acceptable if it can maintain an adequate supply of air and keep hazardous fumes and gases in the worker's breathing zone below all applicable exposure limits.

8.3 Personal protection

Individual protection measures, such as personal protective equipment (PPE)		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: Protect eyes, face and skin from liquid splashes. PPE compliant to the recommended EN/ISO standards should be selected.
Hand protection	:	Wear appropriate protective chemical-resistant gloves that protect chemicals directly. Standard EN 388 – Protective gloves against mechanical risk.
Eye/face protection	:	Wear goggles with filter lenses selected as per ANSI Z49.1. Provide protective screens and goggles, if necessary, to protect others. Select as per OSHA 29 CFR 1910.33. for welding.
Skin and Body protection	:	Wear safety shoes while handling containers. ISO 20345 - Personal protective equipment - Safety footwear. Wear work gloves when handling cylinders; welding gloves for welding and cutting. As needed, wear hand, and body protection, which help to prevent injury from radiation and sparks (see ANSI Z49.1. at a minimum), this includes welder's glove and may include arm protectors, aprons, hats, and shoulder protection, as well as substantial clothing.
Respiratory protection	:	Wear NIOSH/MESA approved full or half face piece (with goggles) respiratory protective equipment.
Other Protective Equipment	:	Regardless of protective equipment, never touch live electrical parts.
Hygiene measures		Avoid contact with skin, eyes and clothing. Do not eat, drink, or smoke while working. Wash your hands with soap and water before eating or smoking.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	:	Gas
Colour	:	Colourless
Odour	:	Acetylene of 100% purity is odorless, but commercial acetylene has a distinctive, garlic-like odour.

Odour threshold	:	No data available.
pH	:	Not applicable.
Melting point	:	-82.2 °C (-116 °F)
Boiling point	:	-75.2 °C (-103.4 °F)
Flash point	:	-17.8 °C (-0 °F)
Critical Temperature	:	35.0 °C
Flammability (solid, gas)	:	Flammable gas.
Lower explosive limit	:	2.5 %
Upper explosive limit	:	100 %
Vapour pressure @ 21.1°C	:	649.6 psia (4479 kPa abs) * *Maximum cylinder pressure: 250 psig (kPa) at 70°F (21.1°C)
Vapour density @ 0 °C and 1 atm	:	0.07314 lb/ft$_3$ (1.1716 kg/m^3)
Specific gravity (water=1)	:	Not applicable.
Specific gravity (air=1) at 0 °C and 1 atm	:	0.906
Molecular mass	:	26.04 g/mol
Solubility	:	Water 1.7 vol/vol at 32°F (0°C).
Viscosity	:	No data available.
Partition coefficient: n-octanol/water	:	No data available.
Evaporation rate	:	No applicable.
Decomposition temperature	:	No data available.
Autoignition temperature	:	305 °C (581 °F) at 1 atm.

Section 10. Stability and reactivity

10.1 Reactivity

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

10.2 Chemical stability

Acetylene is stable as shipped. Avoid use at pressure above 15 psig (103 kPa).

10.3 Possibility of hazardous reactions

Fire or explosion may result from use at elevated temperatures and pressures or from use with incompatible materials.

10.4 Conditions to avoid

Elevated temperature and pressure and/or the presence of a catalyst.

10.5 Incompatible materials

Copper, silver, mercury, or their alloys; oxidizing agents; acids; halogens; moisture.

10.6 Hazardous decomposition products

Thermal decomposition or burning may produce CO/CO_2H_2. The welding and cutting process may form reaction products such as CO and CO_2. Other decomposition products of normal operation originate from the volatilization, reaction, or oxidation of the material being worked.

SECTION 11. Toxicology information

11.1 Information on toxicological effects

Acute toxicity (Oral)	:	No known effects from this product.
Acute toxicity (Inhalation)	:	No known effects from acetylene gas. The welding process may generate hazardous fumes and gases. (See sections 8 and 10).
Skin corrosion or irritation	:	No known effects from this product.
Serious eye damage or irritation	:	No known effects from this product.
Respiratory or skin sensitization	:	No known effects from this product.
Germ cell mutagenicity	:	No known effects from this product.
Carcinogenicity	:	This product is not listed by NTP, OSHA, or IARC.
Reproductive toxicity	:	No harm expected.
Specific Target Organ Toxicity (STOT)-single exposure	:	No known effects from this product.
STOT-repeated exposure	:	No known effects from this product.
Aspiration hazard	:	Not applicable to gases and gas mixtures.

SECTION 12. Ecological information

12.1 Ecotoxicity

No adverse ecological effects expected.

12.2 Other adverse effect

None known. Acetylene does not contain any Class I or class II ozone-depleting chemicals.

SECTION 13. Disposal information

13.1 Disposal methods

General	:	Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier. 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.

SECTION 14. Transport information

14.1 UN number

: UN1001

14.2 UN proper shipping name

: ACETYLENE, DISSOLVED

14.3 Transport Hazard Class(es)

UNRTDG (United Nations Recommendations Transport Dangerous Goods)

Class : 2.1
Subsidiary risk : Not classified.

IATA-DGR (International Air Transport Association – Dangerous Goods)

Class : 2.1
Subsidiary risk : Not classified.

IMDG (International Maritime Dangerous Goods) – Code

Class : 2.1
Subsidiary risk : Not classified.

14.4 Packing group

Not assigned by regulation.

14.5 Environmental hazards

Transport by road/rail (ADR/RID) : None.
Transport by sea (IATA) : None.
Transport by sea (IMDG) : Acetylene is not listed as a marine pollutant by DOT.

14.6 Special precaution for user

Cylinders transported in an enclosed, non-ventilated compartment of a vehicle can be present serious safety hazards.
Shipment of compressed gas cylinders that have been filled without the owner's consent is a violation of federal law [49 CFR 173.301(b)].
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.

SECTION 15. Regulatory information

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

Restrictions on use	:	None.
Other information, restriction and prohibition regulations	:	Ensure all national/local regulations are observed.
Applicable national regulations	:	Safety, health and environmental regulations/legislation specific for the substance or mixture are observed.

SECTION 16. Other information

16.1 Other information

Indication of changes	:	Ensure all national/local regulations are observed.
Disclaimer of liability	:	Before using this product in any new process or experiment, a thorough material combability 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 ca be accepted.

End of Safety Data Sheet