SECTION 1: Product and Company Identification

1.1 Product identifier

Product name	:	Argon
Trade name	:	Not applicable.

1.2 Other means of identification

Chemical Name	:	Argon
Chemical Formula	:	Ar

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- compressed gas.
Characteristic	:	Non-flammable.
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)	:	Warning
Hazard statement(s)	:	H281: Contains refrigerated gas; may cause cryogenic burns or injury
Precautionary statements		
Prevention	:	P282 - Wear cold insulating gloves and either face shield or eye protection.

Response	:	P336 + P315 - Thaw frosted parts with lukewarm water. Do not rub affected area. Get immediate medical advice/attention.
Storage	:	P403 – Store in a well-ventilated place.
Disposal	:	None.

EMERGENCY OVERVIEW	:	**Extremely cold liquid and gas under pressure, direct contact with liquid can cause frostbite, can cause rapid suffocation, avoid breathing gas, self-contained breathing apparatus (SCBA) may be required.**

2.3 Other hazards which do not result in classification

Potential Health Hazard

Skin	:	Contact with liquid may cause cold burns/frost bite. Liquid contact could cause frostbite.
Eyes	:	Contact with liquid may cause cold burns/frost bite.
Inhalation	:	High concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness without warning and so rapidly that victim may be unable to protect themselves.
Ingestion	:	Ingestion is not considered a potential route of exposure.
Chronic Health Hazard	:	No applicable.

Exposure Guidelines

Primary Routes of Entry	:	Inhalation: Eye and skin contact.
Target Organs	:	None.
Symptoms	:	exposure to oxygen deficient atmosphere may cause the following symptoms: dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.
Aggravated Medical Conditions	:	None.

SECTION 3. Composition/Information on ingredients

3.1 Substances / 3.2. Mixture

Substance name	Contents	CAS No.
Argon	Concentration is nominal. For the exact product composition, please refer to Iwatani technical specifications.	7440-37-1

SECTION 4. First-aid measures

4.1 Description of first aid measures

General advice	:	Remove victim to uncontaminated area wearing self-contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.
Inhalation	:	If breathing has stopped or is labored, give assisted respirations.

		Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. In case of shortness of breath, give oxygen. Keep victim warm and rested. Call a doctor.
Skin contact	:	In case of frostbite, obtain medical treatment immediately. Wash frost bitten areas with plenty of water. Do not remove clothing. Do not rub frozen parts as tissue damage may result. Cover wound with sterile dressing. As soon as practical, place the affected area in a warm water bath- which has a temperature not to exceed 40°C (105 °F).
Eye contact	:	In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Keep eye wide open while rinsing.
Ingestion	:	Ingestion is not considered a potential route of exposure.

SECTION 5. Fire-fighting measures

5.1 Extinguishing media

Suitable extinguishing media	:	Use any standard agent – choose the one most appropriate for type of surrounding fire (material itself is not flammable).
Unsuitable extinguishing media	:	None.

5.2 Special hazards arising from the substance or mixture

Specific hazards	:	Exposure to fire may cause containers to rupture/explode. Spill will rapidly vaporize forming an oxygen deficient vapor cloud. Vapor cloud may observe visibility. Do not direct water spray at container vent. Move away from container and cool with water from a protected position. Keep containers and surroundings cool with water spray.
Hazardous combustion products	:	None.

5.3 Advice for fire-fighters

Special fire fighting procedures	:	Move container away or cool with water from a protected position. If possible, stop flow of product.
Special protective equipment for fire-fighters	:	Wear self-contained breathing apparatus for firefighting if necessary. Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Guideline: EN 469 - Protective clothing for firefighters. Performance requirements for protective clothing for firefighting. EN 15090 - Footwear for firefighters. EN 659 - Protective gloves for firefighters. EN 443 - Helmets for fire fighting in buildings and other structures. EN 137 - Respiratory protective devices - Self-contained open circuit compressed air breathing apparatus with full face mask - Requirements, testing, marking.

SECTION 6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level.
Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe.

6.2 Environmental precautions

Prevent further leakage or spillage.
Prevent from entering sewers, basements and work pits, or any place where its accumulation can be dangerous.
Do not discharge into any place where its accumulation could be dangerous.

6.3 Methods and materials for containment and cleaning up

Methods for cleaning up	:	Ventilate area.
Additional advice	:	If possible, stop flow of product. Increase ventilation to the release area and monitor oxygen level. Vapour cloud may obscure visibility. Do not spray water directly at leak. If leak is from cylinder or cylinder valve, call the Iwatani emergency contact number. If leak is in the user's system, close the cylinder valve and safety vent the pressure before attempting repairs.

SECTION 7. Handling and storage

7.1 Precautions for safe handling

Know and understand the properties and hazards of the product before use. Only experienced and properly instructed persons should handle compressed gases. Before using the product, determine its identity by reading the label. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents.
Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. 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. Damaged valves should be reported immediately to the supplier. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier do not remove or interchange connections. Ensure the complete gas system has been checked for leaks before use.
Prevent entrapment of cryogenic liquid in closed systems not protected with relief device. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier.
Employ suitable pressure regulating devices on all containers when the gas is emitted to systems with lower pressure rating than that of the container. Do not subject containers to abnormal mechanical shocks which may cause damage to their valve or safety devices. Only transfer lines designed for cryogenic liquids shall be used.

7.2 Conditions for safe storage, including any incompatibilities

Storage Conditions	:	WARNING! Do not change or force fit connections. Always keep container in upright position. Do not allow storage temperature to exceed 50°c (122°F). Container should be stored in a purpose build compound which should be

ventilated, preferably in the open air. Full containers should be stored so that oldest stock is used first. Do not store in a confined space.
Full and empty cylinders should be segregated. Store containers in location free from fire risk and away from sources of heat and ignition. Return empty containers in a timely manner. Stored containers should be periodically checked for general condition and leakage.
Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. All vents should be piped to the exterior of the building.
Cryogenic containers are equipped with pressure relief devices to control internal pressure. Under normal conditions these containers will periodically vent product. Observe all regulations and local requirements regarding storage of containers.

SECTION 8. Exposure controls/personal protection

8.1 Control parameters/Occupational exposure limits

None of the components have assigned exposure limits.

8.2 Appropriate engineering control measures

Natural or mechanical to prevent oxygen deficient atmospheres below 19.5% oxygen.
Keep self-contained breathing apparatus readily available for emergency use.

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	:	Sturdy work gloves are recommended for handling cylinders. Loose fitting thermal insulated or leather gloves. The breakthrough time of the selected glove (s) must be greater than the intended use period. Standard EN 388 – Protective gloves against mechanical risk.
Eye/face protection	:	Safety eyewear, goggles or face-shield to EN166 should be used to avoid exposure to liquid splashes. Wear eye protection to EN 166 when using gases. Where there is reasonable probability of liquid contact, wear chemical safety goggles. EN 166 - Personal Eye Protection.
Skin or Body protection	:	Never allow any unprotected part of the body to touch uninsulated pipes or vessel which contain cryogenic fluids. The extremely cold metal will cause the flesh to stick and tear when one attempts to withdraw from it. Safety shoes are recommended when handling cylinders. Wear safety shoes while handling containers ISO 20345 - Personal protective equipment - Safety footwear.
Respiratory protection	:	Use self-contained breathing apparatus. Air purifying respirators will not

provide protection. Users of breathing apparatus must be trained.

Hygiene measures : Ensure adequate ventilation, especially in confined areas.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Physical state	:	Gas
Colour	:	Colourless.
Odour	:	No odour warning properties.
Odour threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
pH	:	No applicable.
Melting point	:	-189 °C (-308.2 °F)
Boiling point	:	-186 °C (-302.8 °F)
Freezing point	:	No data available.
Flash point	:	Not applicable.
Critical Temperature	:	-122 °C (251.6 °F)
Flammability (solid, gas)	:	This product is not flammable.
Lower explosive limit	:	Not applicable.
Upper explosive limit	:	Not applicable.
Vapour pressure	:	Not applicable.
Vapour density (air=1)	:	Not applicable.
Molecular mass	:	40 g/mol
Solubility	:	Water 67.3 mg/l.
Viscosity	:	No data available.
Partition coefficient: n-octanol/water	:	Not applicable.
Evaporation rate	:	Not applicable.
Decomposition temperature	:	Not applicable.

Section 10. Stability and reactivity

10.1 Reactivity

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

10.2 Chemical stability

Stable under normal conditions.

10.3 Possibility of hazardous reactions

None.

10.4 Conditions to avoid

Avoid moisture in installation systems.

10.5 Incompatible materials

None.

10.6 Hazardous decomposition products

None.

SECTION 11. Toxicology information

11.1 Information on toxicological effects

No known toxicological effects from this product.

SECTION 12. Ecological information

12.1 Ecotoxicity

No ecological damage caused by this product.

12.2 Persistence and degradability

Not established.

12.3 Bioaccumulative potential

Not established.

12.4 Mobility in soil

No additional information available.

SECTION 13. Disposal information

13.1 Disposal methods

Waste disposal recommendations	:	Dispose of content/container with local, regional, national and international regulations. Return unused product in original cylinder to supplier.
Contaminated packaging	:	Return in the shipping container PROPERLY LABELED WITH ANY VALVE OUTLET PLUGS OR CAPS SECURED AND VALVE PROTECTION CAP IN PLACE to Iwatani for proper disposal.

SECTION 14. Transport information

14.1 UN number

: UN1951

14.2 UN proper shipping name

: ARGON, COMPRESSED

14.3 Transport Hazard Class(es)

UNRTDG (United Nations Recommendations Transport Dangerous Goods)

Class	:	2.2
Subsidiary risk	:	Not classified.

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

Class	:	2.2
Subsidiary risk	:	Not classified.

IMDG (International Maritime Dangerous Goods) – Code

Class	:	2.2
Subsidiary risk	:	Not classified.

14.4 Packing group

Not assigned by regulation.

14.5 Environmental hazards

None.

14.6 Special precaution for user

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