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

1.1. Product identifier : Hexafluoroethane

CAS No. : 76-16-4

Chemical formula : C2F6

Synonyms : Hexafluoroethane (R116), Halocarbon 116

REACH Registration Number: 01-2119974606-26

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

Use of the Substance/Mixture : General Industrial

Restrictions on Use : No data available.

1.3. Details of the supplier of the safety data sheet : Versum Materials UK, Limited
5th Floor
6 St. Andrew Street
London
EC4A 3AE

Email Address – Technical Information : techinfo@versummaterials.com

Telephone :

1.4. Emergency telephone number :

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Gases under pressure - Liquefied gas. H280:Contains gas under pressure; may explode if heated.

2.2. Label elements

Hazard pictograms/symbols

Signal Word: Warning

Hazard Statements:

H280:Contains gas under pressure; may explode if heated.

Precautionary Statements:

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

2.3. Other hazards

Use a back flow preventative device in the piping.
Close valve after each use and when empty.
Can cause rapid suffocation.
Compressed liquefied gas.
Avoid breathing gas.
Direct contact with liquid can cause frostbite.
Self contained breathing apparatus (SCBA) may be required.

SECTION 3: Composition/information on ingredients

3.1. Substances

Components	EINECS / ELINCS Number	CAS Number	Concentration (Volume)
Perfluoroethane	200-939-8	76-16-4	100 %

Components	Classification (CLP)	REACH Reg. #
Perfluoroethane	Press. Gas (Liq.) ;H280	01-2119974606-26

Concentration is nominal. For the exact product composition, please refer to technical specifications.

3.2. Mixtures : Not applicable.

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.

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. Seek medical advice.

Skin contact : Wash frost-bitten areas with plenty of water. Do not remove clothing. Cover wound with sterile dressing.

Ingestion : Ingestion is not considered a potential route of exposure.

Inhalation : Move to fresh air. 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.

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

Symptoms : Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

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

Treatment : This material may make the heart more susceptible to arrhythmias. Catecholamines such as epinephrine and drugs having similar effect should be reserved for specific indications and used only with extreme caution. If exposed or concerned: Get medical attention/advice.

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : All known extinguishing media can be used.

Extinguishing media which must not be used for safety reasons. : No data available.

5.2. Special hazards arising from the substance or mixture

: Exposure to high temperatures may yield toxic by- products which may be corrosive in the presence of moisture. Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Product is nonflammable and does not support combustion. Move away from container and cool with water from a protected position. If possible, stop flow of product. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out.

5.3. Advice for firefighters

: Wear self contained breathing apparatus for fire fighting if necessary. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters. 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

: Evacuate personnel to safe areas. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Ventilate the area. Monitor oxygen level.

6.2. Environmental precautions

: Should not be released into the environment. Do not discharge into any place where its accumulation could be dangerous. Prevent further leakage or spillage. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.

6.3. Methods and material for containment and cleaning up

: Ventilate the area.

Additional advice : If possible, stop flow of product. Increase ventilation to the release area and monitor oxygen level. If leak is from cylinder or cylinder valve, call the emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

6.4. Reference to other

: For more information refer to Sections 8 & 13

sections

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122°F). Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. 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. Use an adjustable strap wrench to remove over-tight or rusted caps. 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. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. 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. Close valve after each use and when empty. Replace outlet caps or plugs and container caps as soon as container is disconnected from equipment. Do not subject containers to abnormal mechanical shock. Never attempt to lift a cylinder by its valve protection cap or guard. Always use backflow protective device in piping. When returning cylinder install valve outlet cap or plug leak tight. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C (122°F). Never attempt to increase liquid withdrawal rate by pressurizing the container without first checking with the supplier. Never permit liquefied gas to become trapped in parts of the system as this may result in hydraulic rupture.

7.2. Conditions for safe storage, including any incompatibilities

Full containers should be stored so that oldest stock is used first. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Observe all regulations and local requirements regarding storage of containers. 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. Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Keep containers tightly closed in a cool, well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C (122°F). Return empty containers in a timely manner.

Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance whit local regulations. Keep away from combustible material.

7.3. Specific end use(s)

Refer to section 1 or the extended SDS if applicable.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

If applicable, refer to the extended section of the SDS for further information on CSA.

8.2. Exposure controls

Engineering measures

Provide natural or mechanical ventilation to prevent oxygen deficient atmospheres below 19.5% oxygen.

Personal protective equipment

Respiratory protection	:	Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmosphere. Air purifying respirators will not provide protection. Users of breathing apparatus must be trained.
Hand protection	:	Wear working gloves when handling gas containers. Standard EN 388 - Protective gloves against mechanical risk.
Eye/face Protection	:	Safety glasses recommended when handling cylinders. Standard EN 166 - Personal eye-protection.
Skin and body protection	:	Safety shoes are recommended when handling cylinders. Standard EN ISO 20345 - Personal protective equipment - Safety footwear.
Special instructions for protection and hygiene	:	Ensure adequate ventilation, especially in confined areas.
Environmental Exposure Controls	:	If applicable, refer to the extended section of the SDS for further information on CSA.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

(a/b) Physical state/Colour	:	Compressed liquefied gas. Colorless.
(c) Odour	:	No odor warning properties.
(d) Density	:	0.0058 g/cm3 (0.362 lb/ft3) at 21 °C (70 °F) Note: (as vapor)
(e) Relative Density	:	1.23 (water = 1)
(f) Melting point / freezing point	:	-149 °F (-100.7 °C)
(g) Boiling point/range	:	-109 °F (-78.2 °C)
(h) Vapor pressure	:	435.10 psia (30.00 bara) at 68 °F (20 °C)
(i) Water solubility	:	No data available.
(j) Partition coefficient: n-octanol/water [log Kow]	:	2
(k) pH	:	Not applicable for gases and gas mixtures.
(l) Viscosity	:	No reliable data available.

(m) Particle characteristics	:	Not applicable for gases and gas mixtures.
(n) Upper and lower explosion / flammability limits	:	No data available.
(o) Flash point	:	Not applicable for gases and gas mixtures.
(p) Autoignition temperature	:	Not known.
(q) Decomposition temperature	:	Not applicable.

9.2. Other information

Explosive properties	:	Not applicable.
Oxidizing properties	:	Not applicable.
Molecular Weight	:	138 g/mol
Odor threshold	:	Odour threshold is subjective and inadequate to warn of overexposure.
Evaporation rate	:	Not applicable for gases and gas mixtures.
Flammability (solid, gas)	:	Refer to product classification in Section 2
Specific Volume	:	0.1729 m3/kg (2.77 ft3/lb) at 21 °C (70 °F)
Relative vapor density	:	4.765 (air = 1) Heavier than air.

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	:	Thermal decomposition yields toxic products that can be corrosive in the presence of moisture.
10.4. Conditions to avoid	:	Alkali and alkaline earth metals - powdered aluminum, zinc, etc.
10.5. Incompatible materials	:	No data available.
10.6. Hazardous decomposition products	:	No data available.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Likely routes of exposure

Effects on Eye	:	Contact with liquid may cause cold burns/frostbite.
Effects on Skin	:	Contact with liquid may cause cold burns/frostbite.
Inhalation Effects	:	Inhalation of high concentrations may also cause mild central nervous system depression and heartbeat irregularities. In high concentrations may cause asphyxiation. Symptoms may include loss of mobility/consciousness. Victim may not be aware of asphyxiation. Asphyxiation may bring about unconsciousness without warning and so rapidly that victim may be unable to protect themselves.
Ingestion Effects	:	Ingestion is not considered a potential route of exposure.
Symptoms	:	Exposure to oxygen deficient atmosphere may cause the following symptoms: Dizziness. Salivation. Nausea. Vomiting. Loss of mobility/consciousness.

Acute toxicity

Acute Oral Toxicity	:	No data is available on the product itself.
Acute Inhalation Toxicity	:	No data is available on the product itself.

Inhalation - Components

Hexafluoroethane (R116)	LC50 (4 h) : > 500000 ppm	Species : Rat.
Hexafluoroethane (R116)	NOAEC : 200000 ppm	Species : Dog.

Acute Dermal Toxicity	:	No data is available on the product itself.
Skin corrosion/irritation	:	No data available.
Serious eye damage/eye irritation	:	No data available.
Sensitization.	:	No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity	:	No data available.
Reproductive toxicity	:	No data is available on the product itself.
Germ cell mutagenicity	:	This material was not mutagenic in a bacterial assay.
Specific target organ systemic toxicity (single exposure)	:	No data available.
Specific target organ systemic toxicity (repeated exposure)	:	Rats exposed to 20.7% Hexafluoroethane, 23 hours per day for 37 weeks, exhibited no adverse clinical signs. Growth was slightly depressed. Hematology, serum chemistry and pathology evaluations revealed no compound-related changes. Rats that were exposed to 0.3% Hexafluoroethane for 30 minutes and observed for 14 days exhibited an increase in daily urine volume and increased creatinine. Fluoride ion excretion was also increased four days after exposure. Histopathology revealed reversible kidney changes. Dogs that were exposed to

60% Hexafluoroethane did not exhibit cardiac sensitization. Dogs that were exposed to 20% Hexafluoroethane for five minutes and then challenged with epinephrine did not exhibit cardiac sensitization. Anesthetized guinea pigs, cats and dogs exposed to 20% Hexafluoroethane exhibited a slightly increased likelihood of a cardiac sensitization response to infused epinephrine. Rats and guinea pigs exposed to 12.1% Hexafluoroethane, 23 hours per day for ten days, exhibited no adverse clinical signs. Growth was slightly depressed. Necropsy revealed slight lung and liver changes.

Aspiration hazard : No data available.

SECTION 12: Ecological information

12.1. Toxicity

Aquatic toxicity : No data is available on the product itself.

Toxicity to fish - Components		
Hexafluoroethane (R116)	LC50 (96 h) : 82.3 mg/l	Species : Fathead minnow (Pimephales promelas).
Toxicity to daphnia - Components		
Hexafluoroethane (R116)	EC50 (48 h) : 47.4 mg/l	Species : Daphnia magna.
Toxicity to algae - Components		
Hexafluoroethane (R116)	EC50 (96 h) : 37.5 mg/l	Species : Algae.

Toxicity to other organisms : No data is available on the product itself.

12.2. Persistence and degradability

No data available.

12.3. Bioaccumulative potential

Refer to Section 9 "Partition Coefficient (n-octanol/water)".

12.4. Mobility in soil

No data available.

12.5. Results of PBT and vPvB assessment

If applicable, refer to the extended section of the SDS for further information on CSA.

12.6. Other adverse effects

Not covered by the 'Montreal Protocol'. Contains fluorinated greenhouse gases covered by Kyoto Protocol. For quantities see concentrations or cylinder contents.

Effect on the ozone layer

Ozone Depleting Potential : No data available.

Global Warming Potential : No data available.

SECTION 13: Disposal considerations

13.1. Waste treatment methods : Contact supplier if guidance is required. 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. List of hazardous waste codes: 14 06 01: Chlorofluorocarbons, HCFC, HFC.

Contaminated packaging : Return cylinder to supplier.

SECTION 14: Transport information

ADR

UN/ID No.	: UN2193
Proper shipping name	: HEXAFLUOROETHANE
Class or Division	: 2
Tunnel Code	: (C/E)
Label(s)	: 2.2
ADR/RID Hazard ID no.	: 20
Marine Pollutant	: No

IATA

UN/ID No.	: UN2193
Proper shipping name	: Hexafluoroethane
Class or Division	: 2.2
Label(s)	: 2.2
Marine Pollutant	: No

IMDG

UN/ID No.	: UN2193
Proper shipping name	: HEXAFLUOROETHANE
Class or Division	: 2.2
Label(s)	: 2.2
Marine Pollutant	: No
Segregation Group:	: None

RID

UN/ID No.	: UN2193
Proper shipping name	: HEXAFLUOROETHANE
Class or Division	: 2
Label(s)	: 2.2
Marine Pollutant	: No

Transport in bulk according to Annex II of Marpol and the IBC Code
For complete transportation information, contact customer service.
Further Information
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. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact customer service.

SECTION 15: Regulatory information

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

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

Other Regulations
REGULATION (EC) No 1907/2006 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 18 December 2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH), establishing a European Chemicals Agency, amending Directive 1999/45/EC and repealing Council Regulation (EEC) No 793/93 and Commission Regulation (EC) No 1488/94 as well as Council Directive 76/769/EEC and Commission Directives 91/155/EEC, 93/67/EEC, 93/105/EC and 2000/21/EC.

COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Regulation (EC) No 1272/2008 the European Parliament and of the Council of 16 December 2008 on classification, labelling and packaging of substances and mixtures, amending and repealing Directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006.

Control of Substances Hazardous to Health Regulations 2002 (as amended)

Health and Safety at Work etc. Act 1974

Management of Health and Safety at Work Regulations (Northern Ireland) 2000 c.388, and as amended

The Health and Safety at Work etc. Act 1974 (Application to Environmentally Hazardous Substances) Regulations 2002 (England and Wales and Scotland) 11 March 2002 c.282, and as amended

Health and Safety at Work Order (Application to Environmentally Hazardous Substances) Regulations (Northern Ireland) 2003 (Northern Ireland) 14 March 2003 c52, and as amended

The Control of Major Accident Hazards Regulations 2015 c483

The Control of Major Accident Hazards Regulations (Northern Ireland) 2015 c325

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations 2011 c1885, and as amended

The Carriage of Dangerous Goods and Use of Transportable Pressure Equipment Regulations with amendments (Northern Ireland) 2011 c365

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 c.407

The Water Environment Regulations (Northern Ireland) 2017 c.81

Pollution Prevention and Control Act 1999 c.24

The Fluorinated Greenhouse Gases Regulations 2015 c.310

The Fluorinated Greenhouse Gases Regulations (Northern Ireland) 2015 c.425

The Acetylene Safety (England and Wales and Scotland) Regulations 2014 c.1639

The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations 1972 c.917

The Highly Flammable Liquids and Liquefied Petroleum Gases Regulations (Northern Ireland) 1975 c.256

Dangerous Substances and Explosive Atmospheres Regulations (Northern Ireland) 2003 c.152

The Dangerous Substances and Explosive Atmospheres Regulations 2002 c.2776

Pollution Prevention and Control Act 1999

The Environmental Permitting (England and Wales) Regulations 2016

Ozone Depleting Substances Regulations 2015

15.2. Chemical safety assessment

A CSA has not yet been carried out.

SECTION 16: Other information

Ensure all national/local regulations are observed.

Hazard Statements:
H280 Contains gas under pressure; may explode if heated.

Indication of Method:
Gases under pressure Liquefied gas. Contains gas under pressure; may explode if heated. Calculation method

Abbreviations and acronyms:
ATE - Acute Toxicity Estimate
CLP - Classification Labelling Packaging Regulation; Regulation (EC) No 1272/2008
REACH - Registration, Evaluation, Authorisation and Restriction of Chemicals Regulation (EC) No 1907/2006
EINECS - European Inventory of Existing Commercial Chemical Substances

ELINCS - European List of Notified Chemical Substances
CAS# - Chemical Abstract Service number
PPE - Personal Protection Equipment
Kow - octanol-water partition coefficient
DNEL - Derived No Effect Level
LC50 - Lethal Concentration to 50 % of a test population
LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose)
NOEC - No Observed Effect Concentration
PNEC - Predicted No Effect Concentration
RMM - Risk Management Measure
OEL - Occupational Exposure Limit
PBT - Persistent, Bioaccumulative and Toxic
vPvB - Very Persistent and Very Bioaccumulative
STOT - Specific Target Organ Toxicity
CSA - Chemical Safety Assessment
EN - European Standard
UN - United Nations
ADR - European Agreement concerning the International Carriage of Dangerous Goods by Road
IATA - International Air Transport Association
IMDG - International Maritime Dangerous Goods
RID - Regulations concerning the International Carriage of Dangerous Goods by Rail
WGK - Water Hazard Class

Key literature references and sources for data:
ECHA - Guidance on the compilation of safety data sheets
ECHA - Guidance on the application of the CLP Criteria
ARIEL database

Prepared by : Versum Materials, Product Regulatory Department

For additional information, please visit Versum Materials' Product Stewardship web site.
http://www.versummaterials.com/productstewardship/

This Safety Data Sheet has been established in accordance with the applicable European Directives and applies to all countries that have translated the Directives in their national laws. COMMISSION REGULATION (EU) 2015/830 of 28 May 2015 amending Regulation (EC) No 1907/2006 of the European Parliament and of the Council on the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

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