

Safety Data Sheet



Section 1: Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product identifier

Product Name • Cyclohexane (1-2%), n-Hexane (4-6%), n-Heptane (5-6%), n-Pentane (Balance)

Product Code • M-C412245/E-1

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

Relevant identified use(s) • Please provide product use

1.3 Details of the supplier of the safety data sheet

Manufacturer • Air Liquide
2700 Post Oak Blvd.
Houston, TX 77056
United States
www.us.airliquide.com
sds@airliquide.com

Telephone (Technical) • 713-896-2896

Telephone (Technical) • 800-819-1704

1.4 Emergency telephone number

Manufacturer • 800-424-9300

Manufacturer • +1 703-527-3887

Section 2: Hazards Identification

EU/EEC

According to Regulation (EC) No 1272/2008 (CLP)/REACH 1907/2006 [amended by 453/2010]

According to EU Directive 67/548/EEC (DSD) or 1999/45/EC (DPD)

2.1 Classification of the substance or mixture

CLP

- Flammable Liquids 2 - H225
- Aspiration 1 - H304
- Skin Irritation 2 - H315
- Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation - H335
- Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects - H336
- Reproductive Toxicity 2 - H361f
- Hazardous to the aquatic environment Chronic 2 - H411
- EUH066

DSD/DPD

- Highly Flammable (F)
- Harmful (Xn)
- Irritant (Xi)
- Substances Toxic To Reproduction - Category 3
- Dangerous to the Environment (N)
- R11, R37, R51, R53, R62, R65, R66, R67

2.2 Label Elements

CLP

DANGER



- Hazard statements**
- H225 - Highly flammable liquid and vapour
 - H304 - May be fatal if swallowed and enters airways
 - H315 - Causes skin irritation
 - H335 - May cause respiratory irritation
 - H336 - May cause drowsiness or dizziness
 - H361f - Suspected of damaging fertility.
 - EUH066 - Repeated exposure may cause skin dryness or cracking.

Precautionary statements

- Prevention**
- P201 - Obtain special instructions before use.
 - P202 - Do not handle until all safety precautions have been read and understood.
 - P210 - Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking.
 - P233 - Keep container tightly closed.
 - P240 - Ground and/or bond container and receiving equipment.
 - P241 - Use explosion-proof electrical/ventilating/lighting/equipment.
 - P242 - Use only non-sparking tools.
 - P243 - Take precautionary measures against static discharge.
 - P261 - Avoid breathing mist/vapours/spray.
 - P264 - Wash thoroughly after handling.
 - P271 - Use only outdoors or in a well-ventilated area.
 - P273 - Avoid release to the environment.
 - P280 - Wear protective gloves/protective clothing/eye protection/face protection.
 - P281 - Use personal protective equipment as required.

- Response**
- P370+P378 - In case of fire: Use appropriate media for extinction.
 - P304+P340 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
 - P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
 - P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
 - P321 - Specific treatment, see supplemental first aid information.
 - P332+P313 - If skin irritation occurs: Get medical advice/attention.
 - P362 - Take off contaminated clothing and wash before reuse.
 - P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
 - P331 - Do NOT induce vomiting.
 - P308+P313 - IF exposed or concerned: Get medical advice/attention.
 - P391 - Collect spillage.

- Storage/Disposal**
- P233 - Keep container tightly closed.
 - P403+P235 - Store in a well-ventilated place. Keep cool.
 - P405 - Store locked up.
 - P501 - Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

DSD/DPD



- Risk phrases**
- R11 - Highly flammable.
 - R37 - Irritating to respiratory system.
 - R51 - Toxic to aquatic organisms.
 - R53 - May cause long-term adverse effects in the aquatic environment.
 - R62 - Possible risk of impaired fertility.
 - R65 - Harmful: may cause lung damage if swallowed.
 - R66 - Repeated exposure may cause skin dryness or cracking.
 - R67 - Vapours may cause drowsiness and dizziness.

- Safety phrases**
- S9 - Keep container in a well ventilated place
 - S16 - Keep away from sources of ignition - No Smoking.
 - S37 - Wear suitable gloves.
 - S57 - Use appropriate containment to avoid environmental contamination.

2.3 Other Hazards

- CLP**
- According to Regulation (EC) No. 1272/2008 (CLP) this material is considered hazardous.
- DSD/DPD**
- According to European Directive 1999/45/EC this preparation is considered dangerous.

United States (US)

According to OSHA 29 CFR 1910.1200 HCS

2.1 Classification of the substance or mixture

- OSHA HCS 2012**
- Flammable Liquids 2 - H225
 - Aspiration 1 - H304
 - Skin Irritation 2 - H315
 - Eye Irritation 2A - H319
 - Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation - H335
 - Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects - H336
 - Reproductive Toxicity 2 - H361
 - Specific Target Organ Toxicity Repeated Exposure 2 - H373

2.2 Label elements

OSHA HCS 2012

DANGER



- Hazard statements**
- Highly flammable liquid and vapour - H225
 - May be fatal if swallowed and enters airways - H304
 - Causes skin irritation - H315
 - Causes serious eye irritation - H319
 - May cause respiratory irritation - H335
 - May cause drowsiness or dizziness - H336
 - Suspected of damaging fertility or the unborn child. - H361
 - May cause damage to organs - Nervous System, Central Nervous System (CNS) through prolonged or repeated exposure - H373

Precautionary statements

- Prevention**
- Obtain special instructions before use. - P201
 - Do not handle until all safety precautions have been read and understood. - P202
 - Keep away from heat, sparks, open flames and/or hot surfaces. - No smoking. - P210
 - Keep container tightly closed. - P233
 - Ground and/or bond container and receiving equipment. - P240
 - Use explosion-proof electrical/ventilating/lighting/equipment. - P241
 - Use only non-sparking tools. - P242
 - Take precautionary measures against static discharge. - P243
 - Do not breathe mist/vapours/spray. - P260
 - Wash thoroughly after handling. - P264
 - Use only outdoors or in a well-ventilated area. - P271
 - Wear protective gloves/protective clothing/eye protection/face protection. - P280
- Response**
- In case of fire: Use appropriate media for extinction. - P370+P378
 - IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. - P304+P340
 - Call a POISON CENTER or doctor/physician if you feel unwell. - P312
 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. - P303+P361+P353
 - Specific treatment, see supplemental first aid information. - P321

If skin irritation occurs: Get medical advice/attention. - P332+P313
 Take off contaminated clothing and wash before reuse. - P362
 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. - P305+P351+P338
 If eye irritation persists: Get medical advice/attention. - P337+P313
 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician. - P301+P310
 Do NOT induce vomiting. - P331
 IF exposed or concerned: Get medical advice/attention. - P308+P313
 IF exposed or if you feel unwell: Call a POISON CENTER or doctor/physician. - P309+P311
 Get medical advice/attention if you feel unwell. - P314

Storage/Disposal

- Keep container tightly closed. - P233
- Store in a well-ventilated place. Keep cool. - P403+P235
- Store locked up. - P405
- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations. - P501

2.3 Other hazards

OSHA HCS 2012

- Under United States Regulations (29 CFR 1910.1200 - Hazard Communication Standard), this product is considered hazardous.

Canada

According to WHMIS

2.1 Classification of the substance or mixture

WHMIS

- Flammable Liquids - B2
- Other Toxic Effects - D2A
- Other Toxic Effects - D2B

2.2 Label elements

WHMIS



- Flammable Liquids - B2
- Other Toxic Effects - D2A
- Other Toxic Effects - D2B

2.3 Other hazards

WHMIS

- In Canada, the product mentioned above is considered hazardous under the Workplace Hazardous Materials Information System (WHMIS).

2.4 Other information

NFPA



Section 3 - Composition/Information on Ingredients

3.1 Substances

- Material does not meet the criteria of a substance in accordance with Regulation (EC) No 1272/2008.

3.2 Mixtures

Composition				
Chemical Name	Identifiers	%	LD50/LC50	Classifications According to Regulation/Directive
Cyclohexane	CAS:110-82-7 EC Number:203-806-2 EU Index:601-017-00-1	1% TO 2%	Ingestion/Oral-Rat LD50 • 12705 mg/kg	EU DSD/DPD: Annex I: F; R11 Xi; R38/37 N; R50-53 Xn; R65 R67 EU CLP: Annex VI: Flam. Liq. 2, H225; Asp. Tox. 1, H304; Skin Irrit. 2, H315; STOT RE 3: Resp. Irrit., H335; STOT SE 3: Narc., H336; Aquatic Acute 1, H400; Aquatic Chronic 1, H410 OSHA HCS 2012: Flam. Liq. 2; Eye Irrit. 2A, STOT SE 3: Resp. Irrit. & Narc.; Skin Irrit. 2; Asp. Tox. 1
Heptane	CAS:142-82-5 EC Number:205-563-8 EU Index:601-008-00-2	5% TO 6%	Inhalation-Rat LC50 • 103 g/m ³ 4 Hour(s)	EU DSD/DPD: Annex I: F; R11 Xi; R38 N; R50-53 Xn; R65 R67 EU CLP: Annex VI: Flam. Liq. 2, H225; Asp. Tox. 1, H304; Skin Irrit. 2, H315; STOT SE 3, H336; Aquatic Acute 1, H400; Aquatic Chronic 1, H410 OSHA HCS 2012: Flam. Liq. 2; Skin Irrit. 2; Eye Irrit. 2; Asp. Tox. 1; STOT SE 3: Narc.
Hexane	CAS:110-54-3 EC Number:203-777-6 EU Index:601-037-00-0	4% TO 6%	Ingestion/Oral-Rat LD50 • 25 g/kg Inhalation-Rat LC50 • 627000 mg/m ³ 3 Minute (s)	EU DSD/DPD: Annex I: F; R11 Xi; R38/37 N; R51-53 Repr.Cat.3; R62 Xn; R65-48/20 R67 EU CLP: Annex VI: Flam. Liq. 2, H225; Repr. 2, H361f; Asp. Tox. 1, H304; STOT RE 2, H373; Skin Irrit. 2, H315; STOT RE 3: Resp. Irrit., H335; STOT SE 3: Narc., H336; Aquatic Chronic 2, H411 OSHA HCS 2012: Flam. Liq. 2; Repr. 2; STOT RE 2 (CNS, Nervous System); Skin Irrit. 2; Eye Irrit. 2B; STOT SE 3: Narc. & Resp. Irrit.; Asp. Tox. 1
Pentane	CAS:109-66-0 EC Number:203-692-4 EU Index:601-006-00-1	86% TO 90%	Inhalation-Rat LC50 • 364 g/m ³ 4 Hour(s) Ingestion/Oral-Rat LD50 • >2000 mg/kg	EU DSD/DPD: Annex I: F+; R12 N; R51-53 Xn; R65 R66 R67 EU CLP: Annex VI: Flam. Liq. 1, H224; Asp. Tox. 1, H304; STOT SE 3, H336; Aquatic Chronic 2, H411; EUH066 OSHA HCS 2012: Flam Liq 1; Asp. Tox. 1.; Eye Irrit. 2A; Skin Irrit. 2; STOT SE 3: Narc.

See Section 16 for full text of H-statements and R-phrases.

Section 4 - First Aid Measures

4.1 Description of first aid measures

Inhalation

- Administer oxygen if breathing is difficult. Give artificial respiration if victim is not breathing. Move victim to fresh air.

Skin

- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin. In case of contact with substance, immediately flush skin with running water for at least 20 minutes. Remove and isolate contaminated clothing. Wash skin with soap and water.

Eye

- In case of contact with substance, immediately flush eyes with running water for at least 20 minutes.

Ingestion

- Have conscious and alert person drink 1 to 2 glasses of water. Never give anything by mouth to an unconscious person. Do NOT induce vomiting. Get medical attention immediately.

4.2 Most important symptoms and effects, both acute and delayed

- Refer to Section 11 - Toxicological Information.

4.3 Indication of any immediate medical attention and special treatment needed

Notes to Physician

- All treatments should be based on observed signs and symptoms of distress in the

patient. Consideration should be given to the possibility that overexposure to materials other than this product may have occurred.

Section 5 - Firefighting Measures

5.1 Extinguishing media

Suitable Extinguishing Media • LARGE FIRES: Water spray, fog or alcohol-resistant foam.
SMALL FIRES: Dry chemical, CO₂, water spray or alcohol-resistant foam.

Unsuitable Extinguishing Media • No data available

5.2 Special hazards arising from the substance or mixture

Unusual Fire and Explosion Hazards • Containers may explode when heated.
Vapor explosion hazard indoors, outdoors or in sewers.
HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
Many liquids are lighter than water.
Runoff to sewer may create fire or explosion hazard.
Vapors may form explosive mixtures with air.
Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products • Carbon monoxide.

5.3 Advice for firefighters

- Structural firefighters' protective clothing will only provide limited protection. Wear positive pressure self-contained breathing apparatus (SCBA). Move containers from fire area if you can do it without risk.
LARGE FIRES: Cool containers with flooding quantities of water until well after fire is out.

Section 6 - Accidental Release Measures

6.1 Personal precautions, protective equipment and emergency procedures

Personal Precautions • Ventilate enclosed areas. Do not walk through spilled material. Wear appropriate personal protective equipment, avoid direct contact. Avoid contact with skin, eyes, and clothing. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Emergency Procedures • As an immediate precautionary measure, isolate spill or leak area for at least 50 meters (150 feet) in all directions. If tank, rail car or tank truck is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. LARGE SPILL: Consider initial downwind evacuation for at least 300 meters (1000 feet) ELIMINATE all ignition sources (no smoking, flares, sparks or flames in immediate area). Keep unauthorized personnel away. Stay upwind. Keep out of low areas. Ventilate closed spaces before entering.

6.2 Environmental precautions

- Prevent entry into waterways, sewers, basements or confined areas.

6.3 Methods and material for containment and cleaning up

Containment/Clean-up Measures • Stop leak if you can do it without risk.
Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
Use clean non-sparking tools to collect absorbed material.
A vapor suppressing foam may be used to reduce vapors.
All equipment used when handling the product must be grounded.
LARGE SPILLS: Dike far ahead of liquid spill for later disposal.
LARGE SPILLS: Water spray may reduce vapor; but may not prevent ignition in closed spaces.

6.4 Reference to other sections

- Refer to Section 8 - Exposure Controls/Personal Protection and Section 13 - Disposal Considerations.

Section 7 - Handling and Storage

7.1 Precautions for safe handling

Handling

- Keep away from heat and ignition sources – No Smoking. Take precautionary measures against static charges. All equipment used when handling the product must be grounded. Use only non-sparking tools. Use explosion-proof - electrical, ventilating and/or lighting equipment. Use only with adequate ventilation. Wear appropriate personal protective equipment, avoid direct contact. Do not breathe mist, vapors, spray. Avoid contact with skin, eyes, and clothing. Empty containers retain product residue and can be hazardous. Do not cut, weld, puncture or incinerate container. Wash thoroughly with soap and water after handling and before eating, drinking, or using tobacco.

7.2 Conditions for safe storage, including any incompatibilities

Storage

- Keep container tightly closed. Store in a cool, dry, well-ventilated place. Keep away from heat, sparks, and flame.

7.3 Specific end use(s)

- Refer to Section 1.2 - Relevant identified uses.

Section 8 - Exposure Controls/Personal Protection

8.1 Control parameters

Exposure Limits/Guidelines						
	Result	ACGIH	Canada Ontario	Canada Quebec	China	Europe
Cyclohexane (110-82-7)	TWAs	100 ppm TWA	100 ppm TWA	300 ppm TWAEV; 1030 mg/m3 TWAEV	250 mg/m3 TWA	200 ppm TWA; 700 mg/m3 TWA
	STELs	Not established	Not established	Not established	375 mg/m3 STEL	Not established
Hexane (110-54-3)	TWAs	50 ppm TWA	50 ppm TWA	50 ppm TWAEV; 176 mg/m3 TWAEV	100 mg/m3 TWA	20 ppm TWA; 72 mg/m3 TWA
	STELs	Not established	Not established	Not established	180 mg/m3 STEL	Not established
Heptane (142-82-5)	STELs	500 ppm STEL (listed under Heptane, all isomers)	500 ppm STEL (listed under Heptane, all isomers)	500 ppm STEV; 2050 mg/m3 STEV	1000 mg/m3 STEL	Not established
	TWAs	400 ppm TWA (listed under Heptane, all isomers)	400 ppm TWA	400 ppm TWAEV; 1640 mg/m3 TWAEV	500 mg/m3 TWA	Not established
Pentane (109-66-0)	TWAs	600 ppm TWA (listed under Pentane, all isomers)	600 ppm TWA	120 ppm TWAEV; 350 mg/m3 TWAEV	500 mg/m3 TWA (listed under Pentane (all isomers))	1000 ppm TWA; 3000 mg/m3 TWA
	STELs	Not established	Not established	Not established	1000 mg/m3 STEL (listed under Pentane (all isomers))	Not established
Exposure Limits/Guidelines (Con't.)						
	Result	France	Germany DFG	Germany TRGS	Ireland	Israel
	STELs	375 ppm STEL [VLCT]; 1300 mg/m3 STEL [VLCT]	Not established	Not established	Not established	Not established

Cyclohexane (110-82-7)	TWAs	200 ppm TWA [VME] (restrictive limit); 700 mg/m ³ TWA [VME] (restrictive limit)	Not established	200 ppm TWA AGW (exposure factor 4); 700 mg/m ³ TWA AGW (exposure factor 4)	200 ppm TWA; 700 mg/m ³ TWA	100 ppm TWA
	Ceilings	Not established	800 ppm Peak; 2800 mg/m ³ Peak	Not established	Not established	Not established
	MAKs	Not established	200 ppm TWA MAK; 700 mg/m ³ TWA MAK	Not established	Not established	Not established
Hexane (110-54-3)	TWAs	20 ppm TWA [VME] (restrictive limit); 72 mg/m ³ TWA [VME] (restrictive limit)	Not established	50 ppm TWA AGW (exposure factor 8); 180 mg/m ³ TWA AGW (exposure factor 8)	20 ppm TWA; 72 mg/m ³ TWA	50 ppm TWA
	Ceilings	Not established	400 ppm Peak; 1440 mg/m ³ Peak	Not established	Not established	Not established
	MAKs	Not established	50 ppm TWA MAK; 180 mg/m ³ TWA MAK	Not established	Not established	Not established
Heptane (142-82-5)	STELs	500 ppm STEL [VLCT] (restrictive limit); 2085 mg/m ³ STEL [VLCT] (restrictive limit)	Not established	Not established	Not established	500 ppm STEL
	TWAs	400 ppm TWA [VME] (restrictive limit); 1668 mg/m ³ TWA [VME] (restrictive limit)	Not established	500 ppm TWA AGW (all isomers, exposure factor 1); 2100 mg/m ³ TWA AGW (all isomers, exposure factor 1)	500 ppm TWA; 2085 mg/m ³ TWA	400 ppm TWA (listed under Heptane, all isomers)
	Ceilings	Not established	500 ppm Peak; 2100 mg/m ³ Peak	Not established	Not established	Not established
	MAKs	Not established	500 ppm TWA MAK; 2100 mg/m ³ TWA MAK	Not established	Not established	Not established
Pentane (109-66-0)	TWAs	1000 ppm TWA [VME] (restrictive limit); 3000 mg/m ³ TWA [VME] (restrictive limit)	Not established	1000 ppm TWA AGW (The risk of damage to the embryo or fetus can be excluded when AGW and BGW values are observed, exposure factor 2); 3000 mg/m ³ TWA AGW (The risk of damage to the embryo or fetus can be excluded when AGW and BGW values are observed, exposure factor 2)	1000 ppm TWA; 3000 mg/m ³ TWA	600 ppm TWA (listed under Pentane, all isomers)
	STELs	Not established	Not established	Not established	750 ppm STEL; 2250 mg/m ³ STEL	Not established
			2000 ppm Peak (listed under			

	Ceilings	Not established	Pentane); 6000 mg/m3 Peak (listed under Pentane)	Not established	Not established	Not established
	MAKs	Not established	1000 ppm TWA MAK; 3000 mg/m3 TWA MAK	Not established	Not established	Not established

Exposure Limits/Guidelines (Con't.)

	Result	Italy	NIOSH	OSHA	OSHA Vacated	Portugal
Cyclohexane (110-82-7)	TWAs	100 ppm TWA; 350 mg/m3 TWA	300 ppm TWA; 1050 mg/m3 TWA	300 ppm TWA; 1050 mg/m3 TWA	300 ppm TWA; 1050 mg/m3 TWA	100 ppm TWA [VLE-MP]
Hexane (110-54-3)	TWAs	20 ppm TWA; 72 mg/m3 TWA	50 ppm TWA; 180 mg/m3 TWA	500 ppm TWA; 1800 mg/m3 TWA	50 ppm TWA; 180 mg/m3 TWA	50 ppm TWA [VLE-MP]
Heptane (142-82-5)	STELs	Not established	Not established	Not established	500 ppm STEL; 2000 mg/m3 STEL	500 ppm STEL [VLE-CD]
	TWAs	500 ppm TWA; 2085 mg/m3 TWA	85 ppm TWA; 350 mg/m3 TWA	500 ppm TWA; 2000 mg/m3 TWA	400 ppm TWA; 1600 mg/m3 TWA	400 ppm TWA [VLE-MP]
	Ceilings	Not established	440 ppm Ceiling (15 min); 1800 mg/m3 Ceiling (15 min)	Not established	Not established	Not established
Pentane (109-66-0)	TWAs	667 ppm TWA; 2000 mg/m3 TWA	120 ppm TWA; 350 mg/m3 TWA	1000 ppm TWA; 2950 mg/m3 TWA	600 ppm TWA; 1800 mg/m3 TWA	600 ppm TWA [VLE-MP]
	Ceilings	Not established	610 ppm Ceiling (15 min); 1800 mg/m3 Ceiling (15 min)	Not established	Not established	Not established
	STELs	Not established	Not established	Not established	750 ppm STEL; 2250 mg/m3 STEL	Not established

Exposure Limits/Guidelines (Con't.)

	Result	Spain	Sweden
Cyclohexane (110-82-7)	TWAs	200 ppm TWA [VLA-ED] (indicative limit value; manufacturing, commercialization, and use restrictions under REACH); 700 mg/m3 TWA [VLA-ED] (indicative limit value; manufacturing, commercialization, and use restrictions under REACH)	300 ppm LLV; 1000 mg/m3 LLV
	STELs	Not established	370 ppm STV; 1300 mg/m3 STV
	TWAs	20 ppm TWA [VLA-ED] (indicative limit value); 72 mg/m3 TWA [VLA-ED] (indicative limit value)	25 ppm LLV; 90 mg/m3 LLV
		0.2 mg/L Medium: urine Time: end of workweek Parameter: 2,5-Hexanedione (without hydrolysis; means free 2,5-hexanedione,	

Hexane (110-54-3)	Under Review	unconjugated. This substance is a metabolite of n-hexane and methyl-n-butyl ketone it means after four or five consecutive days of work with exposure, as soon as possible after the end of the last working day, as biological indicators are eliminated with half-lives greater than five hours; these indicators accumulate in the body during the work week, therefore the sampling time is critical in relation to previous exposures.)	Not established
	Biological Limit Values (BLV)	0.4 mg/L urine end of workweek 2,5-Hexanedione (without hydrolysis) (1,8)	Not established
	STELs	Not established	50 ppm STV; 180 mg/m3 STV
Heptane (142-82-5)	TWAs	500 ppm TWA [VLA-ED] (indicative limit value); 2085 mg/m3 TWA [VLA-ED] (indicative limit value)	200 ppm LLV; 800 mg/m3 LLV
	STELs	Not established	300 ppm STV; 1200 mg/m3 STV
Pentane (109-66-0)	TWAs	1000 ppm TWA [VLA-ED] (indicative limit value); 3000 mg/m3 TWA [VLA-ED] (indicative limit value)	600 ppm LLV; 1800 mg/m3 LLV
	STELs	Not established	750 ppm STV; 2000 mg/m3 STV

Exposure Control Notations

Portugal

- Hexane (110-54-3): **Skin:** (skin - potential for cutaneous exposure)

France

- Hexane (110-54-3): **Reproductive Toxins:** (Reproductive Toxin category 3)

Germany DFG

- Cyclohexane (110-82-7): **Pregnancy:** (classification not yet possible)
- Heptane (142-82-5): **Pregnancy:** (classification not yet possible)
- Hexane (110-54-3): **Pregnancy:** (no risk to embryo/fetus if exposure limits adhered to)
- Pentane (109-66-0): **Pregnancy:** (no risk to embryo/fetus if exposure limits adhered to)

8.2 Exposure controls

Engineering Measures/Controls

- Good general ventilation should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits.

If exposure limits have not been established, maintain airborne levels to an acceptable level. Use explosion-proof - electrical, ventilating and/or lighting equipment.

Personal Protective Equipment

Respiratory

- Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or symptoms are experienced.

Eye/Face

- Wear safety glasses.

Skin/Body

- Wear leather gloves when handling cylinders.

Environmental Exposure Controls

- Follow best practice for site management and disposal of waste. Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

Key to abbreviations

ACGIH = American Conference of Governmental Industrial Hygiene

LLV = Limit Level Value is the exposure limit for 8-hour work day

MAK = Maximale Arbeitsplatz Konzentration is the maximum permissible concentration

NIOSH = National Institute of Occupational Safety and Health

OSHA = Occupational Safety and Health Administration

STEL = Short Term Exposure Limits are based on 15-minute exposures

STEV = Short Term Exposure Value

TWAEV = Time-Weighted Average Exposure Value

TWA = Time-Weighted Averages are based on 8h/day, 40h/week exposures

Section 9 - Physical and Chemical Properties

9.1 Information on Physical and Chemical Properties

Material Description			
Physical Form	Liquid	Appearance/Description	Colorless liquid with a gasoline-like odor.
Color	Colorless	Odor	Gasoline like.
Odor Threshold	990 ppm (pentane)		
General Properties			
Boiling Point	37 C(98.6 F)	Melting Point	Data lacking
Decomposition Temperature	Data lacking	pH	Data lacking
Specific Gravity/Relative Density	0.633 Water=1	Water Solubility	Data lacking
Viscosity	Data lacking	Explosive Properties	Not explosive.
Oxidizing Properties:	Not an oxidizer.		
Volatility			
Vapor Pressure	Data lacking	Vapor Density	2.6 Air=1
Evaporation Rate	Data lacking		
Flammability			
Flash Point	< -40.6 C(< -41.08 F)	UEL	7.7 %
LEL	1.37 %	Autoignition	Data lacking
Flammability (solid, gas)	Flammable Liquid.		
Environmental			
Octanol/Water Partition coefficient	Data lacking		

9.2 Other Information

- No additional physical and chemical parameters noted.

Section 10: Stability and Reactivity

10.1 Reactivity

- No dangerous reaction known under conditions of normal use.

10.2 Chemical stability

- Stable under normal temperatures and pressures.

10.3 Possibility of hazardous reactions

- Hazardous polymerization will not occur.

10.4 Conditions to avoid

- Excess heat, sparks, open flame.

10.5 Incompatible materials

- Oxidizing agents.

10.6 Hazardous decomposition products

- Carbon monoxide.

Section 11 - Toxicological Information

11.1 Information on toxicological effects

Components		
Cyclohexane (1% TO 2%)	110-82-7	Acute Toxicity: Ingestion/Oral-Rat LD50 • 12705 mg/kg; Irritation: Skin-Rabbit • 1548 mg 2 Day(s)-Intermittent
Hexane (4% TO 6%)	110-54-3	Acute Toxicity: Ingestion/Oral-Rat LD50 • 25 g/kg; Inhalation-Rat LC50 • 48000 ppm 4 Hour(s); Irritation: Eye-Rabbit • 10 mg • Mild irritation; Reproductive: Inhalation-Rat TCLo • 5000 ppm (6-19D preg); <i>Reproductive Effects:Specific Developmental Abnormalities:</i> Musculoskeletal system ; <i>Reproductive Effects:Specific Developmental Abnormalities:</i> Urogenital system

GHS Properties	Classification
Acute toxicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Aspiration Hazard	EU/CLP • Aspiration 1 OSHA HCS 2012 • Aspiration 1
Carcinogenicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Germ Cell Mutagenicity	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Skin corrosion/Irritation	EU/CLP • Skin Irritation 2 OSHA HCS 2012 • Skin Irritation 2
Skin sensitization	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
STOT-RE	EU/CLP • Classification criteria not met OSHA HCS 2012 • Specific Target Organ Toxicity Repeated Exposure 2
STOT-SE	EU/CLP • Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects; Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation OSHA HCS 2012 • Specific Target Organ Toxicity Single Exposure 3: Narcotic Effects; Specific Target Organ Toxicity Single Exposure 3: Respiratory Tract Irritation

Toxicity for Reproduction	EU/CLP • Toxic to Reproduction 2 OSHA HCS 2012 • Toxic to Reproduction 2
Respiratory sensitization	EU/CLP • Classification criteria not met OSHA HCS 2012 • Classification criteria not met
Serious eye damage/Irritation	EU/CLP • Classification criteria not met OSHA HCS 2012 • Eye Irritation 2A

Potential Health Effects

Inhalation

- Acute (Immediate)**
 - May cause respiratory irritation. May affect the central nervous system. Symptoms may include dizziness, drowsiness, lethargy, coma and death.
- Chronic (Delayed)**
 - No data available

Skin

- Acute (Immediate)**
 - Causes skin irritation.
- Chronic (Delayed)**
 - No data available

Eye

- Acute (Immediate)**
 - Causes serious eye irritation.
- Chronic (Delayed)**
 - No data available

Ingestion

- Acute (Immediate)**
 - Material may be aspirated into lungs during ingestion and/or subsequent vomiting. Aspiration of this material will cause severe lung injury, chemical pneumonitis, pulmonary edema or death.
- Chronic (Delayed)**
 - No data available

Other

- Chronic (Delayed)**
 - Chronic exposure to hexane may produce important peripheral neuropathy (motor sensory) and CNS abnormalities.

Reproductive Effects

- Inhalation of Hexane has caused reproductive effects in studies with animals.

Key to abbreviations

LC = Lethal Concentration

LD = Lethal Dose

TC = Toxic Concentration

Section 12 - Ecological Information

12.1 Toxicity

- Toxic to aquatic life with long lasting effects.

12.2 Persistence and degradability

- Material data lacking.

12.3 Bioaccumulative potential

- Material data lacking.

12.4 Mobility in Soil

- Material data lacking.

12.5 Results of PBT and vPvB assessment

- No PBT and vPvB assessment has been conducted.

12.6 Other adverse effects

- No studies have been found.

Section 13 - Disposal Considerations

13.1 Waste treatment methods

Product waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Packaging waste

- Dispose of content and/or container in accordance with local, regional, national, and/or international regulations.

Section 14 - Transport Information

	14.1 UN number	14.2 UN proper shipping name	14.3 Transport hazard class(es)	14.4 Packing group	14.5 Environmental hazards
DOT	NDA	NDA	NDA	NDA	NDA
TDG	NDA	NDA	NDA	NDA	NDA
IMO/IMDG	NDA	NDA	NDA	NDA	NDA
IATA/ICAO	NDA	NDA	NDA	NDA	NDA

14.6 Special precautions for user

- None known.

14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code

- Not relevant.

14.8 Other information

- DOT** • Cyclohexane has a reportable quantity of 1000 lbs (454 kg) as listed in Appendix A to 49 CFR 172.101. Hexane has a reportable quantity of 5000 lbs (2270 kg) as listed in Appendix A to 49 CFR 172.101.

Section 15 - Regulatory Information

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

SARA Hazard Classifications • Acute, Chronic, Fire

State Right To Know				
Component	CAS	MA	NJ	PA
Cyclohexane	110-82-7	Yes	Yes	Yes
Heptane	142-82-5	Yes	Yes	Yes
Hexane	110-54-3	Yes	Yes	Yes
Pentane	109-66-0	Yes	Yes	Yes

Inventory						
Component	CAS	Canada DSL	Canada NDSL	China	EU EINECS	EU ELNICS
Cyclohexane	110-82-7	Yes	No	Yes	Yes	No
Heptane	142-82-5	Yes	No	Yes	Yes	No
Hexane	110-54-3	Yes	No	Yes	Yes	No

Pentane	109-66-0	Yes	No	Yes	Yes	No
Inventory (Con't.)						
Component	CAS	TSCA				
Cyclohexane	110-82-7	Yes				
Heptane	142-82-5	Yes				
Hexane	110-54-3	Yes				
Pentane	109-66-0	Yes				

Canada

Labor

Canada - WHMIS - Classifications of Substances

• Pentane	109-66-0	B2
• Cyclohexane	110-82-7	B2, D2B
• Heptane	142-82-5	B2, D2B
• Hexane	110-54-3	B2, D2A, D2B

Canada - WHMIS - Ingredient Disclosure List

• Pentane	109-66-0	1 %
• Cyclohexane	110-82-7	1 %
• Heptane	142-82-5	1 %
• Hexane	110-54-3	1 %

Environment

Canada - CEPA - Priority Substances List

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

China

Environment

China - Ozone Depleting Substances - First Schedule

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

China - Ozone Depleting Substances - Second Schedule

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

China - Ozone Depleting Substances - Third Schedule

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

Other

China - Annex I & II - Controlled Chemicals Lists

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

China - Dangerous Goods List

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

China - Export Control List - Part I Chemicals

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

Europe**Other****EU - CLP (1272/2008) - Annex VI - Table 3.2 - Classification**

• Pentane	109-66-0	F+; R12 N; R51-53 Xn; R65 R66 R67
• Cyclohexane	110-82-7	F; R11 Xi; R38 N; R50-53 Xn; R65 R67
• Heptane	142-82-5	F; R11 Xi; R38 N; R50-53 Xn; R65 R67
• Hexane	110-54-3	F; R11 Xi; R38 N; R51-53 Repr.Cat.3; R62 Xn; R65-48/20 R67

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Concentration Limits

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	5%≤C: Xn; R:48/20

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Labelling

• Pentane	109-66-0	F+ Xn N R:12-51/53-65-66-67 S:(2)-9-16-29-33-61-62
• Cyclohexane	110-82-7	F Xn N R:11-38-65-67-50/53 S:(2)-9-16-25-33-60-61-62
• Heptane	142-82-5	F Xn N R:11-38-65-67-50/53 S:(2)-9-16-29-33-60-61-62
• Hexane	110-54-3	F Xn N R:11-38-48/20-62-65-67-51/53 S:(2)-9-16-29-33-36/37-61-62

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Notes - Substances and Preparations

• Pentane	109-66-0	C
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	C
• Hexane	110-54-3	Not Listed

EU - CLP (1272/2008) - Annex VI - Table 3.2 - Safety Phrases

• Pentane	109-66-0	S:(2)-9-16-29-33-61-62
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• Cyclohexane	110-82-7	S:(2)-9-16-25-33-60-61-62
• Heptane	142-82-5	S:(2)-9-16-29-33-60-61-62
• Hexane	110-54-3	S:(2)-9-16-29-33-36/37-61-62

Germany

Environment

Germany - TA Luft - Types and Classes

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

Germany - Water Classification (VwVwS) - Annex 1

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

Germany - Water Classification (VwVwS) - Annex 2 - Water Hazard Classes

• Pentane	109-66-0	ID Number 452, hazard class 2 - hazard to waters
• Cyclohexane	110-82-7	ID Number 63, hazard class 2 - hazard to waters
• Heptane	142-82-5	ID Number 120, hazard class 2 - hazard to waters
• Hexane	110-54-3	ID Number 124, hazard class 2 - hazard to waters

Germany - Water Classification (VwVwS) - Annex 3

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	ID Number 120, hazard class 2 - hazard to waters
• Hexane	110-54-3	Not Listed

Other

Germany - Specifically Regulated Chemicals in TRGS

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

Portugal

Other

Portugal - Prohibited Substances

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

United Kingdom

Environment

United Kingdom - Pollution Inventory - Schedule 1 - Thresholds for Releases to Air

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

Other**United Kingdom - Workplace Exposure Limits (WELs) - Substances in Review**

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

United Kingdom - List of Dangerous Substances in Water

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

United States**Labor****U.S. - OSHA - Process Safety Management - Highly Hazardous Chemicals**

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - OSHA - Specifically Regulated Chemicals

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

Environment**U.S. - CAA (Clean Air Act) - 1990 Hazardous Air Pollutants**

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	

U.S. - CERCLA/SARA - Hazardous Substances and their Reportable Quantities

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	1000 lb final RQ; 454 kg final RQ
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	5000 lb final RQ; 2270 kg final RQ

U.S. - CERCLA/SARA - Radionuclides and Their Reportable Quantities

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances EPCRA RQs

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - CERCLA/SARA - Section 302 Extremely Hazardous Substances TPQs

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - CERCLA/SARA - Section 313 - Emission Reporting

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	1.0 % de minimis concentration
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	1.0 % de minimis concentration

U.S. - CERCLA/SARA - Section 313 - PBT Chemical Listing

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - RCRA (Resource Conservation & Recovery Act) - U Series Wastes - Acutely Toxic Wastes & Other Hazardous Characteristics

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	waste number U056 (Ignitable waste)
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

United States - California**Environment****U.S. - California - Proposition 65 - Carcinogens List**

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - California - Proposition 65 - Developmental Toxicity

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - California - Proposition 65 - Maximum Allowable Dose Levels (MADL)

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - California - Proposition 65 - No Significant Risk Levels (NSRL)

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Female

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - California - Proposition 65 - Reproductive Toxicity - Male

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

United States - Pennsylvania**Labor****U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List**

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

U.S. - Pennsylvania - RTK (Right to Know) - Special Hazardous Substances

• Pentane	109-66-0	Not Listed
• Cyclohexane	110-82-7	Not Listed
• Heptane	142-82-5	Not Listed
• Hexane	110-54-3	Not Listed

15.2 Chemical Safety Assessment

- No Chemical Safety Assessment has been carried out.

Section 16 - Other Information**Relevant Phrases (code & full text)**

- H224 - Extremely flammable liquid and vapour
- H373 - May cause damage to organs through prolonged or repeated exposure.
- H400 - Very toxic to aquatic life
- H410 - Very toxic to aquatic life with long lasting effects
- R12 - Extremely flammable.
- R37/38 - Irritating to respiratory system and skin.
- R38 - Irritating to skin.
- R48/20 - Harmful: danger of serious damage to health by prolonged exposure through inhalation.
- R50 - Very toxic to aquatic organisms.

Last Revision Date

- 09/September/2014

Preparation Date

- 09/September/2014

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- To the best of Air Liquide's knowledge, the information contained herein is reliable and accurate as of this date; however, accuracy, suitability or completeness are not guaranteed and no warranties of any type, either express or implied, are provided. The information contained herein relates only to this specific product. If this gas mixture is

combined with other materials, all component properties must be considered. Data may be changed from time to time. Be sure to consult the latest edition.

Key to abbreviations

NDA = No Data Available
