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

1.1 Product identifier

Chemical name:	Cyclohexanone
Commercial name:	Cyclohexanone
Other names:	cyclohexyl ketone, anone, hexanon, anone sextone, sextone, ketohexamethylene
EC No. (EINECS):	203-631-1
REACH Registration No.:	01-2119453616-35-XXXX

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

Identified uses

Intermediate product for organic syntheses, solvent, additive in formulas

Uses advised against

not required

1.3 Details of the supplier of the safety data sheet

Manufacturer/supplier:	DOMO Caproleuna GmbH Bau 3101 – Am Haupttor D-06237 Leuna
National Contact :	Ullrich Naujoks
E-mail (expert):	msds@domo.org
Information: (Monday-Friday, 7:00–16:00)	Business Unit Cumol-Phenol-Cyclohexanone Fon + 49 (0) 3461 / 43-24 29 Fax + 49 (0) 3461 / 43-22 26

1.4 Emergency telephone number

Europe	+44 1235 239670	[Carechem 24]
Middle East/Africa	+44 1235 239671	[Carechem 24]
North/South America	+1 215 207 0061	[Carechem 24]
East/South East Asia	+65 3158 1195	[Carechem 24]

*country specfic emergency telephone numbers in section 16

SECTION 2: *Hazards identification*

2.1 Classification of the substance or mixture (CLP)

Hazard classes/categories	Hazard statement
Flammable liquid category 3	H226
Acute inhalation toxicity, category 4	H332
Acute toxicity (oral), category 4	H302
Acute toxicity (dermal), category 4	H312
Skin irritation, category 2	H315
Eye damage, category 1	H318

2.2 Label elements

Labeling (CLP)

Pictograms:

Signal word: **Danger**

Hazard statements

H226	Flammable liquid and vapour.
H318	Causes serious eye damage.
H302	Harmful if swallowed.
H312	Harmful in contact with skin.
H332	Harmful if inhaled.
H315	Causes skin irritation

Safety precautions

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ventilating/lighting equipment.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/fume/gas/mist/vapours/spray
P264	Wash with soap thoroughly after handling
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well-ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P310	Immediately call a POISON CENTER or doctor/physician.
P338	Remove contact lenses, if present and easy to do. Continue rinsing.
P301 + P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.

P302 + P352	IF ON SKIN: Wash with plenty of soap and water.
P303+P361+P352	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower and soap.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P332 + P313	If skin irritation occurs: Get medical advice/attention.
P362 + P364	Take off contaminated clothing and wash it before reuse.
P370+P378	In case of fire: Use ABC powder/CO_2/foam for extinction.
P403+P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/container acc. to Item 13.

2.3 Other hazards

No CMR substance.

SECTION 3: *Composition/information on ingredients*

3.1 Substances

Chemical Characterisation

Cyclohexanone

CAS No.:	108-94-1
EC No. (EINECS):	203-631-1
Index No.:	606-010-00-7
Harmonized system code:	29142200
REACH Reg. No.:	01-2119453616-35-XXXX
Purity:	99.95 %
Formula:	$C_6H_{10}O$
Stabilizers:	none
Dangerous contaminations:	none

SECTION 4: *First-aid measures*

4.1 Description of first-aid measures

General Remarks

Never administer any substance by mouth to an unconscious person.
Remove contaminated clothing immediately.
Symptoms of poisoning may only become evident after several hours; therefore, medical supervision is necessary for at least 48 hours after an accident.

After inhalation

Allow fresh air, artificial respiration if necessary, warmth, rest. If trouble persists, consult doctor. If the injured is unconscious, lay and transport him/her in coma position. Get medical help.

After skin contact
Provide preventive skin protection against dermatitis. Remove contaminated clothing and wash prior to reusing.
Wash off substance using water and soap. Rinse with plenty of water.

After eye contact
Remove contact lenses, if present. Rinse eyes immediately for at least 15 minutes under running water with the lids wide open. Seek medical advice.

After swallowing
Rinse mouth. Drink plenty of water. Avoid vomiting due to danger of aspiration. Get medical advice immediately.

4.2 Most important symptoms and effects, both acute and delayed

Symptoms
Narcotising effect
Headache, dizziness and nausea

Risks
Possible susceptibility to eczema

4.3 Indication of any immediate medical attention and special treatment needed

In case of ingestion caution advised when vomiting and during stomach evacuation (danger of aspiration). Preferably provide for quick bowel passage. Allow patient to drink repeatedly plenty of water with added charcoal and sodium sulphate. In case of inhalation, allow fresh air; use Auxiloson spray as soon as possible. Continue symptomatic treatment, in particular checking the acid-base-balance. Check alkali reserve. (*source: Merkblätter Gefährliche Arbeitsstoffe, 2008 ecomed SICHERHEIT, Verlagsgruppe Hüthig Jehle Rehm GmbH, Merkblatt C 036)*

Self-protection of first aid personnel
Ensure personal protection of the first aid helper, remove contaminated clothing.

Notes for the physician (symptoms, risks, treatment)
Show the physician the label of the original product package.

SECTION 5: *Firefighting measures*

5.1 Extinguishing media

Suitable extinguishing media
ABC powder, CO_2, foam

Extinguishing media which must not be used for safety reasons
full water jet

5.2 Special hazards arising from substance or mixture

When heated or in case of fire may be liberated: carbon monoxide (CO).
The vapours generated are heavier than air and form explosive mixtures with the oxygen of the air.
If burned completely, CO_2 and water are formed.

5.3 Advice for firefighters

Stay in danger zone is only permitted with self-contained breathing apparatus and flame retardant full protective clothing.

5.4 Additional information

Product is not or only slightly soluble in water. Density < 1.0 g/cm^3.
Fire class: B
Cool affected containers by means of water fog.

SECTION 6: *Accidental release measures*

6.1 Personal precautions, protective equipment and emergency procedures

Avoid skin contact and inhalation of vapours.

6.2 Environmental protection

Prevent the substance or contaminated firefighting water from running off into the soil, waterways or ground water.

6.3 Methods and material for containment and cleaning up

Use solvent-resistant containers (steel, glass).
For large amounts: Pump off product.
For smaller amounts/residuals: Absorb spill with binding agent for chemicals. Dispose of water containing the product duly in biological sewage treatment plants. Cyclohexanone is biologically degradable.

Additional information
Implement measures to prevent electrostatic charging. The product dissolves grease, resins, lacquer and rubber.

6.4 Reference to other sections

Not applicable

SECTION 7: *Handling and storage*

7.1 Precautions for safe handling

Instructions for safe handling

Protective measures
When handling the liquid, eye and skin protection must be ensured. Use breathing apparatus with filter A if vapours occur.

Technical measures
Ensure protection against explosions and fire. Implement measures to prevent electrostatic charging.
Use solvent-resistant sealing material, such as Teflon and/or Sigraflex. Have fire extinguisher ready.

Environmental protection measures
Use exhaust filters, install collecting devices under production and loading stations. Collect leaked out material by means of chemical binding agents and dispose of properly.

Specific requirements or handling procedures
Handle in accordance with good industrial hygiene and safety practice.

Hints concerning fire and explosion prevention
All electrical installations must comply with the necessary degree of protection in accordance with the classification of the hazardous area.
There must be no sources of ignition within the protected zone.

Additional information
Temperature class: T2 (ignition temperature >300 °C).

7.2 Conditions for safe storage, including any incompatibilities

Technical measures and storage conditions
Store only in closed, easily accessible systems, preferably at temperatures under 35 °C. Since the product tends to auto-oxidise, keep under nitrogen to prevent contact with atmospheric oxygen. Implement measures to prevent electrostatic charging.

Packing material
The product may be stored and transported in steel or stainless steel containers, small quantities in sheet metal and glass containers. Do not use packaging material made of galvanised sheet steel.

Storeroom and container requirements
Storage space and linked pump rooms must have adequate ventilation. Keep containers closed and under inert gas (nitrogen). If possible, use light impermeable containers. Internal container walls must be free from grease, oil and paint coating. The substance corrodes the following material: synthetic material such as PVC, polystyrol and rubber.

Hints for storage together with other products
Cyclohexanone is miscible with all organic solvents. Regarding the fire and explosion hazard posed by the product, the legal requirements for handling combustible liquids shall be observed during storage.

Additional storage information
Storage temperature: < 35 °C
Storage stability: When stored under inert gas, product quality will remain stable up to 3 months.
Maximum duration of safe storage: 3 months

7.3 Specific end use(s)

For industrial use

No.	Usage description
1	Production/import of cyclohexanone
2	Distribution of cyclohexanone
3	Formulation
4	Use as intermediate
5	Use as laboratory chemical
6	Use in coatings and paints
9	Use in biocide products

For professional use

No.	Usage description
5	Use as laboratory chemical
7	Use in coatings and lacquer
10	Use in biocide products

For consumer use

No.	Usage description
8	Use in adhesives and sealants, coatings, paints, ink and toner
11	Use in biocide products

For exposure scenarios for the different uses see Annex 1.

SECTION 8: *Exposure controls/personal protection*

8.1 Control parameters

Workplace exposure limits/air exposure limits

Type (country of origin)	Workplace exposure limit		recommended control procedure	Maximum limit	Source	Remark
	long term	short term				
AGW (DE)	80 mg/m³	=1=		Cat 1; H	TRGS 900 [1)]	Y
STEL value	81,6 mg/m3;20 ppm					Indicative value
TWA-value	40,8 mg/m3; 10 ppm					Indicative value

[1)] as of 2004 DFG

Biological exposure limits
No data available

DNEL/DMEL and PNEC parameters

DNEL/DMEL		Exposure path	Exposure frequency	Critical component
Workers industry professional	Consumer			
contrary to intended purpose	10 mg/kg bw/day	oral	short term (acute) long term (repeated)	cyclohexanone
contrary to intended purpose	1,5 mg/kg bw/day			
100 mg/kg bw/day	30 mg/kg bw/day	dermal	short term (acute) long term (repeated)	
4 mg/kg bw/day	1 mg/kg bw/day			
100 mg/m³	50 mg/m³	inhalation	short term (acute) long term (repeated)	
40 mg/m³	10 mg/m³			

Exposure path	PNEC	Assessment factor	Remark
Water	0.0329 mg/l	1000	Clamydomonas reinhardii EC50 (72 h) = 32.9 mg/l
Soil (fresh water)	0.0951 mg/kg soil dry weight	-	Extrapolation method: Partition coefficient PNEC soil derived from PNEC water

8.2 Exposure controls

Suitable technical control devices
See exposure scenarios in Annex.

Individual protective measures: Personal Protective Equipment

General Protection and Hygiene Measures
Preventative skin protection recommended (skin protective ointment), remove contaminated clothing, see also 7.1.1

Respiratory protection
If vapours/aerosols are present ensure adequate ventilation. Recommended filter type: Filter A

Skin protection

Full contact:	Glove material: Butyl rubber Glove thickness: 0.7 mm Penetration time > 480 min
Splash contact:	Glove material: Viton (R) Glove thickness: 0.7 mm Penetration time > 120 min

Eye protection
Tightly fitting protective goggles

Body protection
Body-covering workwear

Further Notes
Select the personal protective equipment depending on the concentration and amount of hazardous substances at the respective working place.

Consumer and environmental exposure controls
See exposure scenarios in Annex.

SECTION 9: *Physical and chemical properties*

9.1 Information on basic physical and chemical properties

Appearance and odour

Physical state:	liquid
Colour:	colourless
Odour:	characteristic ketone odour

Physical properties

	Unit	Value	Method	Remark
Melting point/range	°C	- 31	ISO 7060	
Boiling point/range	°C	154	DIN 53171	1013 hPa
Flash point	°C	44		1013 hPa
Ignition temperature	°C	420	DIN 51794	1013 hPa
Ignition sensibility				flammable
Oxidizing properties				no
Vapour pressure	hPa	4.2		20 °C
Self-ignition				no
Explosion limits lower (LEL) upper (UEL)	 vol% vol%	 1.3 9.4		

Chemical Properties

	Unit	Value	Method	Remark
pH (20 °C)		approx. 6.6	DIN 19268	60g/l; 20 °C
Density	kg/m^3	946	DIN 51757	20 °C
Water solubility	g/l	86		20 °C
Dyn. Viscosity	mPa*s	2.22	DIN 53015	20°C

9.2 Other information

	Unit	Value	Method	Remark
Partition coefficient n-octanol/water (logPow)		0.86	OECD Guideline 107	25 °C

SECTION 10: *Stability and reactivity*

10.1 Reactivity

Product tends to auto-oxidate in air.

10.2 Chemical stability

No decomposition when used properly.

10.3 Possibility of hazardous reactions

No dangerous reaction known. Product tends to auto-oxidate in air.

10.4 Conditions to avoid

High temperatures and oxygen supply. Oxidation.

10.5 Incompatible materials

Carboxylic acids and oxygen, causing the formation of carboxylic acids.

10.6 Hazardous decomposition products

In case of thermal decomposition release of CO, H_2, H_2O, CH_4 and carbon residues.

SECTION 11: *Toxicological information*

11.1 Information on toxicological effects

Acute toxicity

Toxicity	Effective dose	Species	Method	Remark
oral	LD50 1,890–2,650 mg/kg	Rat	watery solution	Experimental determination
dermal	LD50 794–3,160 mg/kg	Rabbit		Experimental determination
by inhalation	LC50 > 6.2 mg/l air (significance level 1 %)	Rat	vapour inhalation by entire body	Experimental determination

Specific symptoms

After swallowing:	Gastro-intestinal disorder Small quantities: headache, nausea, dizziness. Larger quantities: narcosis, coma.
After skin contact:	Degreasing, possibly secondary inflammation, danger of skin resorption (H)
After inhalation:	Mucous membrane irritation, increased eye and nose secretion, accelerated respiration, tongue fur formation
After eye contact:	irritation, risk of corneal haze

Skin corrosion/irritation
Species: rabbit
Evaluation: skin irritation (method: OECD Guideline 404)

Serious eye damage/irritation
Severe irritation (method: OECD Guideline 405/acute irritation to eyes; in vitro test)

Respiratory or skin sensitisation
After skin contact: Sensitization not ruled out.

Germ cell mutagenicity
Based on available data, the classification criteria are not met.

Carcinogenicity
Based on available data, the classification criteria are not met.

Reproductive toxicity
Based on available data, the classification criteria are not met.

STOT SE
Based on available data, the classification criteria are not met.

STOT RE
Based on available data, the classification criteria are not met.

Aspiration hazard
Based on available data, the classification criteria are not met.

11.2 Other information

Toxicity in case of repeated exposure (sub-acute, sub-chronic, chronic)

Toxicity	Effective dose	Species	Exposure duration	Specific effects	Affected organs	Method
sub-chronic oral	NOAEL: 143 mg/kg bw/day	Rat	3 months	decreased feed intake	No data available	OECD Guideline 408
chronic oral	NOAEL: 462 mg/kg bw/day	rat/ mouse	2 years		slight liver modification in case of high dose	Compara-ble to OECD Guideline 453

Toxicokinetics, metabolism and distribution

Data on non-human toxicity
Method: animal test/rat
Dose: 400-1,600 ppm (6 h)
Method of administration: by inhalation
Results:
- Absorption: respiratory tracts
- Distribution: bloodstream
- Metabolism: cyclohexanol
- Excretion/elimination: urine

Data on human toxicity
Method: humans (voluntary persons)
Dose: 101-406 mg/m3 (8 h)
Administration: by inhalation
Results:
- Absorption: respiratory tracts
- Distribution: bloodstream
- Metabolism: 1,2-Cyclohexandiol,1,4-Cyclohexandiol
- Excretion/elimination: urine

SECTION 12: *Ecological information*

12.1 Toxicity

Acute ecotoxicity

Aquatic Toxicity	**Species**	**Effective dose**	**Exposure duration**	**Method**
Fish toxicity	Pimephales promelas	LC50: 527-732 mg/l	96 h	OECD 203 (1996)
Daphnia toxicity	Daphnia magna	EC50: 820 mg/l	24 h	Equivalent or similar to DIN 38412 part 11
Algae toxicity	Chlamydomonas reinhardtii	EC50: 32.9 mg/l	72 h	Acute toxicity test with green algae

Acutely harmful to algae.

Long term ecotoxicity
No data available

12.2. Persistence and degradability

Abiotic degradability
Hydrolysis of cyclohexanone is not expected.

Physical and photochemical elimination

Medium	Half-life	Remark	Method	Evaluation
Air	DT50: 2.5 days	Experimental determination	Phototransforma-tion	After evaporation or in case of contact with air slow photochemical degradation.

Biodegradability

	Degradation rate	Time	Method	Remark
Water	> 90 %	28 days	OECD 301F test	Experimental determination
Sediment	No data available			

Good biological degradability.

12.3 Bioaccumulation potential

log $P_{O/W}$ see 9.

No significant accumulation in organisms expected.

Bioconcentration factor (BCF):
No data available

12.4 Mobility in soil

Adsorption/Desorption

Transport	Adsorption coefficient/ Henry constant	Method	Evaluation	Remark
Soil	Koc 15.15	SRC PCKOCWIN v1.66	No adsorption in soil expected.	determined by calculation
Water-air	1.21 Pa m^3/mol at 25 °C	Measuring procedure		Experimental determination

12.5 Results of PBT and vPvB assessment

Based on the available data for biotic and abiotic degradation, bioaccumulation and toxicity cyclohexanone is not categorized as PBT or vPvB.

12.6 Other adverse effects

Do not allow to enter into waterways, drains or soil.

Additional Ecological Notes
Do not release untreated into natural waters.

SECTION 13: *Disposal considerations*

13.1 Waste treatment methods

Product may be re-used after work-up.

Waste key number
For unused product: 070108*
For uncleaned packaging: 150110*

Disposal
Product and packaging waste must not be disposed of together with domestic waste. Do not allow to enter drains.
Disposal in accordance with applicable legal regulations observing national and regional regulations. Recycle product residues if possible, otherwise take to hazardous waste incineration.

SECTION 14: *Transport information*

	ADR/RID	IMDG
14.1 UN Number	1915	1915
14.2 UN proper shipping name	CYCLOHEXANON	CYCLOHEXANONE
14.3 Transport hazard classes	3 	3 
14.4 Packaging group	III	III
14.5 Environmental hazards	no	no
14.6 Special precautions for the user	see remark	see remark
Additional information	Risk No.: 30 Tunnel restriction code: D/E	EmS: F-E, S-D Lowest flash point: 44°C c.c.

Remark
Use solvent-resistant sealing material, such as Teflon and/or Sigraflex.

ICAO/IATA and ADN: Not tested.

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

Not applicable

SECTION 15: *Regulatory information*

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

National regulations – Germany

Make sure to comply with work restrictions pursuant to the Youth Employment Protection Act and the regulation on legal protection of working mothers (EC 92/85/EEC).

Storage class (TRGS 510)
3 = Flammable liquids

Water hazard class (acc. to AwSV)
WHC 1 = slightly hazardous to water

TA Luft (Technical instructions on air quality control)
No. 5.2.5

Störfallverordnung (Industrial Emergencies Regulation)
Annex 1, List of Substances, column 1, No. 1.2.5 (P5a-c; flammable liquids)

15.2 Chemical safety assessment

For this substance a chemical safety assessment has been carried out.

SECTION 16: *Other information*

Wording of H and P phrases (number and complete text)
see Item 2

Training hints
Hazardous Material Regulations (GefStoffV), handling of combustible liquids.

Recommended restrictions for use
See exposure scenarios in Annex 1.

Additional information
This material safety data sheet contains data in accordance with German legislation, e. g. indicated limit values.
The recipient alone is responsible for ascertaining the relevant national limit values.

The above details are based on our present status of know-how. The information is intended to describe our product in terms of safety requirements and thus shall not guarantee certain properties. It does not justify a contractual legal relationship.

Data sources
REACH Registration Dossier and Stoffsicherheitsbericht Cyclohexanone. Caprolactam-REACH Consortium, 2015.

Emergency telephone numbers (country specific)

Global/english speaking countries	**+44 1865 407333**
Country	**Emergency telephone number**
France	+33 1 72 11 00 03
Germany	+49 89 220 61012
	0800 000 7801 (toll-free, access from Germany only)
Spain	+34 91 114 2520
Italy	+39 02 3604 2884
Netherlands	+31 10 713 8195
Turkey	+90 212 375 5231
Norway	+47 2103 4452
Greece	+30 21 1198 3182
Portugal	+351 30880 4750
Denmark	+45 8988 2286
Sweden	+46 8 566 42573
Poland	+48 22 307 3690
Czech Republic	+420 228 882 830
Finland	+358 9 7479 0199
Bahrain/Middle East	+973 1619 8321
Africa/South Africa	+27 21 300 2732
United States	+1 866 928 0789 (toll-free)
Canada	+1 800 579 7421 (toll-free)
United States and Canada	+1 202 464 2554
Mexico	+52 55 5004 8763
Brazil	+55 11 3197 5891
Chile	+56 2 2582 9336
Colombia	+57 1 508 7337
Argentina	+54 11 5984 3690
Sri Lanka	+65 3158 1195
Taiwan	+886 2 8793 3212
Japan	+81 3 4578 9341
Indonesia	007 803 011 0293 (toll-free; access only from Indonesia)
Malaysia	+60 3 6207 4347
Thailand	001 800 120 666 751 (toll-free; access only from Thailand)
India	+65 3158 1198

	000 800 100 7479 (toll-free; access only from India)
Pakistan	+65 3158 1329
Bangladesh	+65 3158 1200
Philippines	+63 2 8231 2149
Vietnam	+84 28 4458 2388
South Korea	+82 2 3479 8401
Singapore	+65 3165 2217
Australia	+61 2 8014 4558
	18000 74234 (toll-free; access only from Australia)
New Zealand	+64 9 929 1483
	0800 446 881 (toll-free; access only from New Zealand)

General revision

Section 1.4/section 16: Update of emergency telephone numbers (regional and country specific)