Ammonium Perchlorate

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

1.1 Product identifier

Product name:	Ammonium Perchlorate
CAS Number:	7790-98-9
EC number:	232-235-1

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

Identified use:	In manufacture of solid propellants and in pyrotechnics.

1.3 Details of the supplier of the safety data sheet

Company name:	East Harbour Group Ltd 20 Clough Road, Severalls Industrial Park Colchester, Essex, CO4 9QS United Kingdom
Telephone:	+44 (0) 333 242 0100
Email:	info@eastharbourgroup.com

1.4 Emergency telephone number

Emergency telephone:	0800 246 1274

Section 2: Hazardous identification

2.1 Classification of the substance or mixture

Classification according to Regulation (EC) No 1272/2008

Ox. Sol. 1	H271	May cause fire or explosion, strong oxidizer.

STOT RE 2	H373	May cause damage to organs through prolonged or repeated exposure

Eye Irrit. 2	H319	Causes serious eye irritation

Ammonium Perchlorate

Supplemental Hazard information (EU)
EUH044 Risk of explosion if heated under confinement

2.2 Label elements
Labelling according to Regulation (EC) No 1272/2008
The substance is classified and labelled according to the CLP regulation
Hazard Pictograms


GHS03 GHS07 GHS08

Signal word Danger

Hazard statements

H271	May cause fire or explosion; strong oxidizer.
H319	Causes serious eye irritation.
H373	May cause damage to organs through prolonged or repeated exposure.

Supplemental Hazard information (EU)

EUH044	Risk of explosion if heated under confinement

Precautionary statements

P210	Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P220	Keep away from clothing or other combustible materials.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P273	Avoid release to the environment.
P501	Dispose of contents / container in accordance with local / regional / National / international regulations.

2.3 Other hazards
Results of PBT and vPvB assessmentPBT :
Not a PBT substance
vPvB: Not a vPvB substance.

Endocrine -disrupting properties
The substance has Endocrine -disrupting properties according to Regulation (EU) 2017/2100.

Section 3: Composition/information on ingredients

3.1 Chemical characterisation **Substances**
Description Ammonium Perchlorate Identification

Ammonium Perchlorate

number(s) EC number	232-235-1
Index number	017-009-00-0
Additional information	
Molecular Formula	NH4ClO4
Molecular Weight	117.49
% Purity	99.0 % Min
CAS No	7790-98-9

SVHC The substance is not in the list of SVHC substances

Section 4: First aid measures

4.1 Description of first aid measures
General information
Immediately remove any clothing soiled by the product. In case of splashes, remove contaminated clothing and plunge it into water immediately. Risk of ignition.

After inhalation
Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist. In case of unconsciousness place patient stably in side position for transportation.

After skin contact
Immediately wash with water and soap and rinse thoroughly. If skin irritation continues, consult a doctor.

After eye contact
Flush immediately with plenty of water for at least 15 min. Contact doctor.

After swallowing
Do not induce vomiting. Call for a doctor immediately

4.2 Most important symptoms and effects, both acute and delayed
No further relevant information available.

Information for doctor
Treat symptomatically and supportively

4.3 Indication of any immediate medical attention and special treatment needed
No further relevant information available.

Section 5: Fire-fighting measures

5.1 Fire Fighting Media and Instructions:
Suitable Extinguishing Media
Water

Ammonium Perchlorate

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5.2 Special hazards arising from the substance or mixture
At high temperature (decomposition), Formation of Oxygen (in large quantity) Explosive when mixed with combustible material.

5.3 Advice for firefighters
None

Protective equipment
Firefighters should be equipped with self-contained breathing apparatus and turn-out gear.

5.4 Additional information
Cool containers / tanks with water spray. Ensure a system for the rapid emptying of containers. In case of fire nearby, remove exposed containers

Section 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Ensure adequate ventilation
Avoid contact with the skin, eyes and clothing.
Remove all potential sources of ignition.

6.2 Environmental precautions
Do not allow to enter sewers/ surface or ground water.

6.3 Methods and material for containment and cleaning up
Recovery: Recover the product. Wash the remainder with water. Recover water for later processing
Neutralisation: Dilute with water.

6.4 Reference to other sections
See Section 7 for information on safe handling.
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

Section 7: Handling and storage

7.1 Precautions for safe handling
Ensure good ventilation/exhaustion at the workplace.
Prevent formation of dust.
Information about fire and explosion protection: Keep ignition sources away -
Do not smoke.

7.2 Condition for safe storage, including any incompatibilities
Storage
Requirements to be met by storerooms and receptacles

Ammonium Perchlorate

Store in a cool, dry, well-ventilated area away from incompatible substances.

Information about storage in one common storage facility
Do not store near combustible materials. Store away from heat and ignition sources. Keep tightly closed. Provide electrical earthing and waterproof equipment. Provide an anti-corrosion protected electrical equipment in a bunded area.

Further information about storage conditions
Incompatible products: Ammonium nitrate, Organic materials, Combustible material, metallic powders, sulphur compounds or phosphorus compounds (inflammation or explosion) Packaging material:
Recommended: Metal drums with internal polyethylene coating

7.3 Specific end use(s)
In solid propellants and in pyrotechnics

Section 8: Exposure controls/personal protection

Additional information about design of technical facilities
Local exhaust ventilation required plus good work practice. Safety shower. Eye fountain.

8.1 Control parameters
Ingredients with limit values that require monitoring at the workplace
7790-98-9 ammonium perchlorate
Exposure Limit Values (dust)
Source Date Value type Value (ppm) Value (mg/m3)
Remarks ACGIH (US) 2008 TWA – 10 Inhalable particles.
ACGIH (US) 2008 TWA – 3 Respirable particles

DNELs
Workers: DNEL (Derived No Effect Level):
Inhalation - Systemic effects - Long-term: 0.28 mg/m³ [repeated dose toxicity]
Dermal - Systemic effects - Long-term: 2.16 mg/kg bw/day [repeated dose toxicity]
General population: DNEL (Derived No Effect Level):
Oral - Systemic effects - Long-term: 0.02 mg/kg bw/day [repeated dose toxicity]

PNECs
PNEC aqua (freshwater): 1 mg/L
PNEC aqua (marine water): 0.1 mg/L PNEC aqua (intermittent releases): 1 mg/L
PNEC sediment (freshwater): 4.19 mg/kg sediment dw PNEC sediment (marine water): 0.42 mg/kg sediment dw PNEC STP: 10 mg/L
Soil: No exposure of soil expected

8.2 Exposure controls
Personal protective equipment:
General protective and hygienic measures:

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Keep away from foodstuffs, beverages and feed.
Immediately remove all soiled and contaminated clothing
Wash hands before breaks and at the end of work

Respiratory protection
Low concentrations or short activity: No special protective equipment required.
High concentrations or prolonged activity: Half mask Recommended Filter type:P1,
Respiratory protection complying with EN 143

Protection of hands
Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.
Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
Selection of the glove material on consideration of the penetration times rates of diffusion and the degradation.

Material of gloves
Splash contact, intermittent and prolonged PVC gloves tested EN 374 Glove thickness: 1,2 - 1,4 mm
Penetration time of glove material. The exact break through time has to be found out by the manufacturer of the protective gloves and has to be observed.

Eye protection
Safety glasses with side shield.

Body protection
Incombustible suit, Meraclon suit, Boots, incombustible protective clothing (prohibited: textiles, leather).

Section 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

General Information	
Appearance	White crystalline powder
Form	solid
Colour	White
Odour	Characteristic
pH-value	Not applicable
Change in condition	
Melting point/Melting range	150 °C
Boiling point/Boiling range	Not applicable
Flash point	Not flammable
Flammability (solid, gaseous)	Product is not flammable

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Self-igniting	The melting point of the substance is above 150°C and exothermic decomposition may occur at temperatures beyond 150 °C.
Danger of explosion	Explosive when mixed with combustible material.
Explosion limits	Oxidising properties, Strong Oxidizer
Vapor pressure	Not applicable
Density at 20 °C	1.95 g/cm³
Relative density at 20 °C	1.90
Solubility in / Miscibility with water at 25 °C	210 g/l
Partition coefficient (n-octanol/water) at 25 °C	No Data available

9.2 Other information
No Data available

Section 10: Stability and Reactivity

10.1 Reactivity
Do not mix with organic materials, reducing agents, metal powders or powdered solution

10.2 Chemical Stability
Stable under normal conditions

10.3 Possibility of hazardous reactions
Explosive when mixed with combustible material.

10.4 Conditions to avoid
Avoid elevated temperatures over 270°C, which can cause spontaneous exothermic decomposition. Cloth fabric of any type including dust collector bags intimately contaminated with ammonium perchlorate is subject to ignition through friction or impact. Water scrubber type dust collection system is recommended. High-energy static electricity may also serve as an ignition source when contamination or combustibles are intermixed.

10.5 Incompatible materials
Sulfuric acid, powdered metals and intimate mixtures with organics.

10.6 Hazardous decomposition products
Chlorine, chlorine dioxide, oxygen, nitrogen oxides, hydrogen chloride.

Section 11: Toxicological Information

11. 1 Information on hazard classes as defined in Regulation (EC) No.1272/2008
As with any toxicant, assessing dose and exposure are required to understand potential toxicity. Ammonium perchlorate acts to reversibly and competitively inhibit iodine uptake by the thyroid gland. The half-life of ammonium perchlorate ranges from 8 to 12 hours.

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Ammonium perchlorate does not bio accumulate. Perchlorate is not metabolized and is excreted from the kidneys.
Harmful if swallowed or inhaled in large doses. In the early 1960s another salt of perchlorate, potassium perchlorate, given at 600 to 1000 mg/day for weeks of exposure as an oral therapeutic agent to treat hyperthyroidism was reported to be associated with a few cases of aplastic anemia and agranulocytosis (NRC, 2005). Since that time, there have been no known reports of aplastic anemia. There have been no reports of ammonium perchlorate associated with aplastic anemia or agranulocytosis.

Immediate (acute) effects
Oral LD50: rat; 4200 mg/kg Rat-par-LDLo = 3500 mg/kg
Oral LD50: rabbit; 1900 mg/kg
Rabbit-par-LDLo = 750 mg/kg
Inhalation LC50: No references found.
Skin sensitization: not reported to be a skin sensitizer

Delayed (subchronic and chronic) effects
Thyroid:
No long-term health effects have been reported with worker exposure to ammonium perchlorate. Perchlorate is water soluble, so exposure to ammonium perchlorate can be via water contaminated with ammonium perchlorate or inhalation in the workplace. With chronic exposure, sufficient dose, and duration, ammonium perchlorate may cause thyroidal stores of iodine to be reduced, which may lead to goiter (enlarged thyroid gland) and hypothyroidism. Occupational studies indicated no adverse health effects on workers exposed for 3 years or more to perchlorate. These studies also demonstrate that blood chemistry and hormone values are not altered with occupational exposures as high as 0.48 mg per kilogram body weight (Braverman et al., 2005; Lamm et al., 1999). In 2005, a United States National Academies of Science (NAS) Committee comprehensively reviewed the literature related to oral exposures of perchlorate and reported that “to cause declines in thyroid hormone production that would have adverse health effects, iodide uptake would most likely have to be reduced by at least 75% for months or longer” and “…the perchlorate dose required to cause hypothyroidism in adults would probably be more than 0.40 mg/kg per day, assuming a 70-kg body weight” (NAS, 2005). The NAS also identified a noobserved-effect-level of 0.007 mg/kg/day in humans, based on Greer et al. 2002, which is a dose that does not cause inhibition of iodide uptake. This is further supported by a small study in no effect on thyroid function was reported with six months of exposure up to 0.3 mg/d (Braverman et al.,2006). For workers that live in areas of the world with endemic iodine deficiency, it is important that these people receive adequate iodine in the diet or are supplemented with iodine.

Carcinogen
IARC: NO
NTO: NO
OSHA: NO

Reproductive
In 2005, the California Environmental Protection Agency’s Office of Environmental Health Hazard Assessment (OEHHA) Developmental and Reproductive Toxicology Identification (DART) Committee concluded that available scientific information on perchlorate was not sufficient for placing the substance on a list (Prop 65) list of chemicals known to the State of California to cause birth defects or other reproductive harm.

Ammonium Perchlorate

Immunology
Immunotoxicity studies in mice revealed no changes in immunologic function in response to perchlorate exposure (Keil et al. 1998, 1999).

Other Medical conditions aggravate by exposure
Excessive dust inhalation can aggravate respiratory conditions

11.2 Information on other hazards
11.2.1 Endocrine -disrupting properties
The substance has Endocrine-disrupting properties according to Regulation (EU) 2017/2100

11.2.2 Information on other hazards
No further information is available

Section 12: Ecological Information

12.1 Toxicity
Daphnia Magna Acute 48-hour LC50 490 mg/l water with sodium perchlorate Pimephales Promelas Acute 96 hour LC50 1655 mg/l water with sodium perchlorate Ceriodaphniadubia Chronic 6 day LC50 77.8 mg/l water with ammonium perchlorate Pimephalespromelas Subchronic 7 day LC50 270 mg/l water with ammonium perchlorate Latuca Sativa Subchronic 7day LC50 614 mg/kg soil Eisenia Foetida Acute 7 day LC50 4450 mg/kg soil

12.2 Persistence and degradability
Perchlorate ion is persistent but can be decomposed by naturally occurring bacteria in anoxic conditions in the presence of a suitable electron donor.

12.3 Bioaccumulative potential Bioaccumulation
Perchlorate has a half-life of approximately 8 hours and is excreted unchanged, mostly in urine. Perchlorate does not bio-accumulate (NAS, 2005).

12.4 Mobility in soil
No further relevant information available

12.6 Endocrine-disrupting properties
The substance has Endocrine -disrupting properties according to Regulation (EU) 2017/2100

12.7 Other adverse effects
No further relevant information available

Section 13: Disposal considerations

13.1 Waste treatment methods
Recommendation

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Dispose of as hazardous waste in compliance with local and national regulations. Dilute with water

Uncleaned packaging
Recommendation
Disposal must be made according to official regulations.
Clean container with water. Recover waste water for processing later.
Recommended cleansing agents: Water, if necessary together with cleansing agents.

Section 14: Transport Information

14.1 UN number

ADR, IMDG, IATA	UN1442

14.2 UN proper shipping name

ADR	1442 AMMONIUM PERCHLORATE
IMDG, IATA	AMMONIUM PERCHLORATE

14.3 Transport hazard class(es)
ADR, IMDG, IATA

Class	5.1 Oxidising substances.
Label	5.1

14.4 Packing group

ADR, IMDG, IATA	II

14.5 Environmental hazards

Marine pollutant	No

14.6 Special precautions for user

Warning	Oxidising substances.
Danger code (Kemler)	50
EMS Number	F-H,S-Q
Segregation groups	Perchlorates

14.7 Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code
Not applicable

Transport/Additional information:
ADR

Limited quantities (LQ)	1 kg
Excepted quantities (EQ)	Code: E2
Maximum net quantity per inner packaging	30 g
Maximum net quantity per outer packaging	500 g Transport

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category	2
Tunnel restriction code	E

IMDG

Limited quantities (LQ)	1 kg
Excepted quantities (EQ)	Code: E2
Maximum net quantity per inner packaging	30g Maximum net
quantity per outer packaging	500g

IATA Regulation (UN 1502)

Passengers and Cargo	Max Net Qty/Pkg - 5.0 kg
Aircraft	Packing Instructions - 558
Cargo Aircraft	Max Net Qty/Pkg - 25 kg
	Packing Instructions 562

UN "Model Regulation"
UN1442, AMMONIUM PERCHLORATE,5.1, II

Section 15: Regulatory Information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture Labelling according to Regulation (EC) No 1272/2008
The substance is classified and labelled according to the CLP regulation.

Hazard pictograms	Ref section 2
Signal word	Danger

Hazard statements
Ref section 2

Precautionary statements
Ref section 2

National regulations
Other regulations, limitations and prohibitive regulations
Substances of very high concern (SVHC) according to REACH, Article 57
The substance is not listed as SVHC.

15.2 Chemical safety assessment
Chemical Safety Assessment has been carried out and please refer to Annex I for Risk management Measures (RMM's)

Section 16: Other Information

This information is based on our present knowledge. However, this shall not Constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Abbreviations and acronyms

Ammonium Perchlorate

RID	Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
ICAO	International Civil Aviation Organisation
ADR	Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
IMDG	International Maritime Code for Dangerous Goods
IATA	International Air Transport Association
GHS	Globally Harmonised System of Classification and Labelling of Chemicals
EINECS	European Inventory of Existing Commercial Chemical Substances
CAS	Chemical Abstracts Service (division of the American Chemical Society)
DNEL	Derived No-Effect Level (REACH)
PNEC	Predicted No-Effect Concentration (REACH)
LC50	Lethal concentration, 50 percent
LD50	Lethal dose, 50 percent
Ox. Sol. 2	Oxidising Solids, Hazard Category 2
Skin Irrit.2	Skin corrosion/irritation, Hazard Category 2
Eye Irrit. 2	Serious eye damage/eye irritation, Hazard Category 2

Sources

REGULATION (EC) No 1272/2008 OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on classification, labelling and packaging of substances and mixtures, amending and repealing COMMISSION REGULATION (EU) 2020/878 of 18 June 2020amending Annex II to Regulation (EC) No 1907/2006 ECHA.