Trade Name: **RDX** (Cyclotrimethylenetrinitramine)

1. Product identification

1.1. **Product name**

Identification of the substance	RDX (Cyclotrimethylenetrinitramine)
Registration number (REACH)	Not applicable
CAS number	**RDX: 121-82-4**
Alternative name(s)	Cyclonite, Hexogen, Cyclotrimethylene trinitramine
EC-No.	**RDX**: 204-500-1

1.2. Recommended uses of the product: Military explosive, demolition charge, blasting applications, shaped charges, training munitions.

1.3. Safety sheet supplier's Data
SWORD Energetics,
Address: 231 Beverly Road, Greenville SC 29609
Website: www.swordenergetics.com

1.4. Emergency phone numbers +1 (833) 445-BOOM (2666)
This number is only available during the following office hours: Mon - Thu 08:00 AM - 05:00 PM, Fri 08:00 AM - 12:00 PM

2. Hazards identification

2.1. **Classification of the substance**
Classification according to Regulation (EC) No 1272/2008 (CLP)

Hazard Class	Category	Hazard Class and Category	Hazard statement
Explosives	Division 1.1	Expl. 1.1	H201: Explosive; mass explosion hazard
Acute Toxicity (Oral)	Category 3	Acute Tox. 3 (Oral)	H301: Toxic if swallowed
Acute Toxicity (Dermal)	Category 3	Acute Tox. 3 (Dermal)	H311: Toxic in contact with skin
Specific Target Organ Toxicity – Repeated Exposure	Category 2	STOT RE 2	H373: May cause damage to organs through prolonged or repeated exposure
Hazardous to Aquatic Environment – Chronic	Category 2	Aquatic Chronic 2	H411: Toxic to aquatic life with long lasting effects

2.2. **Label elements:**
Labelling according to Regulation (EC) No 1272/2008 (CLP)

Hazard pictograms:

Single Word: Danger

2. Hazards identification *Continued:*

2.2 **Hazard statements**

H201: Explosive; mass explosion hazard
H301: Toxic if swallowed
H311: Toxic in contact with skin
H373: May cause damage to organs through prolonged or repeated exposure
H411: Toxic to aquatic life with long lasting effects

Precautionary statements

P210: Keep away from heat/sparks/open flames/hot surfaces – No smoking
P280: Wear protective gloves/protective clothing/eye protection/face protection
P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor
P302 + P352: IF ON SKIN: Wash with plenty of soap and water
P370 + P380: In case of fire: Evacuate area
P501: Dispose of contents/container in accordance with local regulations

Response:

P301 + P310: IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P302 + P352: IF ON SKIN: Wash with plenty of soap and water.
P304 + P340: IF INHALED: Remove person to fresh air and keep comfortable for breathing.
P370 + P380: In case of fire: Evacuate area.
P372: Explosion risk in case of fire.
P361 + P364: Take off immediately all contaminated clothing and wash it before reuse.

Storage:

P401: Store in accordance with national regulations on explosives.
P403 + P233: Store in a well-ventilated place. Keep container tightly closed.
P405: Store locked up.
P420: Store away from other materials and incompatible substances (e.g., oxidizers, strong acids).
P411: Store at temperatures not exceeding recommended safety limits (typically cool, dry, controlled areas).

2.3. **Additional Labelling**

EUH044: Risk of explosion if heated under confinement.
EUH401: To avoid risks to human health and the environment, comply with the instructions for use *(if used in training or controlled demolition exercises)*.

2.4 **Other hazards**

May be subject to UN transport regulations as a Class 1 explosive (UN 0072).
Not readily biodegradable – poses a long-term environmental risk, particularly to aquatic life.
Fine dust may be generated during processing – inhalation or skin contact may cause irritation or toxicity.
May accumulate static charge – risk of ignition from sparks or electrostatic discharge in certain handling environments.
RDX (Cyclonite) is listed as toxic to blood, liver, and central nervous system with repeated exposure.

3. Composition/information on ingredients

3.1. **RDX (cyclotrimethylenetrinitramine) is a white crystalline nitramine explosive. It is used as a high-performance military and industrial explosive, valued for its high detonation velocity, stability under storage, and wide applicability in munitions, demolition charges, and as a base charge in detonators and boosters.**

3. Composition/information on ingredients *Continued:*

3.1 *Cont.* **Substances**

Substance name: RDX (Cyclonite, Hexogen)
EC-No: 204-500-1

Components

Substance	CAS No.	EC No.	% w/w	Classification (CLP)
RDX (Cyclonite)	121-82-4	204-500-1	~ ≥ 98%	Expl. 1.1 (H201), Acute Tox. 3 (H301, H311), STOT RE 2 (H373)

4. First aid measures

4.1. **Description of first aid measures**

General advice Seek immediate medical attention if symptoms persist or in the event of exposure to explosive material. Remove victim from exposure and keep at rest in a position comfortable for breathing. Provide the SDS to medical personnel.

If inhaled Move the person to fresh air and keep comfortable for breathing.
If breathing is difficult, administer oxygen if trained to do so.
Seek medical attention immediately.

In case of skin contact Immediately remove contaminated clothing and wash affected area thoroughly with soap and water.
If irritation or symptoms persist, seek medical advice.
Wash contaminated clothing before reuse.

In case of eye contact Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
Seek medical attention if irritation persists.

If swallowed Do **not** induce vomiting.
Rinse mouth thoroughly with water.
Never give anything by mouth to an unconscious person.
Seek immediate medical attention or contact a poison control center.

4.	**First aid measures** ***Continued:***
4.2	**Symptoms :** Shortness of breath Unconsciousness Dizziness Skin or eye irritation (upon direct contact with decomposition products) Nausea or headache (due to inhalation of dust or fumes during detonation or combustion) Frostbite (only if exposed to cryogenic handling environments) **Risks :** May cause effects on the central nervous system, resulting in lowered consciousness or seizures (primarily due to RDX exposure). Prolonged or repeated exposure may cause damage to blood, liver, or kidneys. May cause genetic defects (based on animal data involving RDX). May cause cancer (limited evidence in long-term exposure studies). Toxic to aquatic life with long-lasting effects.
4.3.	**Indication of Any Immediate Medical Attention and Special Treatment Needed** **Immediate medical attention is required** in cases of ingestion, inhalation of combustion products, or symptoms of central nervous system depression (e.g., confusion, unconsciousness, seizures). **There is no specific antidote** for RDX poisoning. Treatment should be symptomatic and supportive, with particular attention to respiratory and neurological functions. In case of **seizures,** administer standard anticonvulsant therapy as per medical protocols. For **dermal contact**, decontaminate skin thoroughly and monitor for signs of systemic toxicity. **Monitor renal and hepatic function** in cases of significant exposure.

5.	**Firefighting measures**
5.1.	**Extinguishing media** **Suitable extinguishing media:** Dry sand Earth Water spray (only to cool surrounding areas and prevent spread — avoid direct contact with RDX piles) **Unsuitable extinguishing media:** Do not use water jets or foam directly on RDX — risk of dispersal and spreading contamination Do not use carbon dioxide (CO_2) — ineffective for mass detonation risk
5.2.	**Special hazards arising from the substance or mixture** RDX is a **powerful high explosive** and presents a **mass explosion hazard** under fire conditions (Expl. 1.1). Heating may cause **violent detonation**, even in the absence of flame. Combustion may produce toxic gases including **nitrogen oxides (NO_x)**, **carbon monoxide (CO)**, **carbon dioxide (CO_2)**, and potentially **hydrogen cyanide (HCN)**. **Blast wave and fragmentation** hazard present in the event of explosion. Fire may lead to **secondary explosions** or **sympathetic detonation** of nearby explosive materials.
5.3.	**Advice for firefighters** Evacuate the area immediately; do not fight fire involving explosives unless absolutely necessary. Firefighting personnel should wear self-contained breathing apparatus (SCBA) and full protective gear. If safe, isolate fire and allow RDX to burn out under controlled conditions. Prevent extinguishing water from entering sewers or watercourses—environmental hazard.

6.	Accidental release measures
6.1.	**Personal Precautions, Protective Equipment and Emergency Procedures** Evacuate all non-essential personnel from the area immediately. Do not touch or disturb spilled material. Eliminate all ignition sources — no smoking, open flames, or sparks. Avoid contact with skin and eyes; do not inhale dust or vapors. Wear appropriate personal protective equipment (PPE) including gloves, goggles, and protective clothing. Only trained personnel should respond to explosive spills.
6.2.	**Environmental Precautions** Prevent material from entering drains, surface water, or soil.In case of large spillage, notify authorities in accordance with local regulations.Avoid contamination of water sources — toxic to aquatic life with long-lasting effects.
6.3.	**Methods and Material for Containment and Cleaning Up** **Do not use mechanical devices** that may cause friction, impact, or sparks. Gently collect spilled material using **non-sparking tools** and place it in approved, labeled, explosion-safe containers. Avoid dust generation. Do not re-use spilled material; treat as hazardous waste.
6.4.	**Reference to Other Sections** For personal protective equipment: see **Section 8**. For disposal considerations: see **Section 13**.

7.	Handling and storage
7.1.	**Precautions for safe handling** Handle in accordance with **explosives safety regulations** and only by trained personnel. Avoid impact, friction, heat, sparks, or electrostatic discharge. Keep away from sources of ignition — **no smoking**. Do not eat, drink, or smoke when handling explosive material. Avoid inhalation of dust or fumes and prevent contact with skin and eyes. Use only **non-sparking tools and explosion-proof equipment** in handling areas. Ground all equipment to prevent static discharge. Observe good industrial hygiene practices — **wash hands and exposed areas thoroughly after handling**.
7.2.	**Conditions for Safe Storage, Including Any Incompatibilities** Store in a **cool, dry, well-ventilated, and secure location** approved for explosives. Keep away from **heat, flame, and incompatible materials** (e.g., strong acids, oxidizers). Protect containers from physical damage and sunlight. Store in original packaging or approved explosive storage containers. Maintain appropriate separation from other explosive materials (as per applicable national regulations). Keep out of reach of unauthorized personnel.
7.3.	Specific End Use(s) This material is intended for use by **military, defense, and authorized demolition personnel** only. Not intended for civilian use, consumer applications, or uncontrolled environments.

8. Exposure controls/personal protection *Continued:*

8.1. **Control parameters**

Occupational Exposure Limits (OELs)

Substance	CAS-No.	Limit Value	Type	Reference
RDX (Cyclonite)	121-82-4	1.5 mg/m^3 (inhalable)	TWI (8h)	ACGIH (advisory)

Note: National or regional exposure limits may vary. Users should consult local occupational safety regulations.

8.2. **Exposure controls**

Handle material in **well-ventilated areas**.
Use **explosion-proof** exhaust ventilation and grounded equipment where applicable.
Avoid generation of dust; if mechanical handling is necessary, use dust collection systems.

8.2.2 Personal Protective Equipment (PPE)

Eye/Face Protection
Wear **safety goggles or face shield** conforming to EN 166 or equivalent.
Skin Protection
Use **chemical-resistant gloves** (e.g., nitrile or neoprene).
Wear long-sleeved clothing and **explosion-resistant workwear** when appropriate.
Respiratory Protection
Under normal handling with no dust or vapors, no respiratory protection is required.
If exposure to decomposition fumes or dust is possible, use a **NIOSH/EN 14387-approved respirator** with appropriate filter.
Thermal Hazards
Not applicable under standard storage and handling conditions.

8.2.3 **Environmental Exposure Controls**

Prevent release into soil, waterways, or sewer systems.
Use secondary containment and comply with environmental protection regulations.

9. Physical and chemical properties:

9.1. Information on basic physical and chemical properties

Appearance

Appearance	White crystalline solid
Odor	Odorless
Odor threshold	Not determined
pH	Not applicable (solid, non-aqueous)
Melting point / freezing point	RDX: 204-206°C
Boiling point	Decomposes before boiling
Flash point	Not applicable (Explosive)
Evaporation rate	Not applicable
Flammability (solid, gas)	Explosive – mass detonation risk
Upper/lower flammability limits	Not applicable
Vapor pressure	Very low (negligible at ambient temperature)
Vapor density	Not applicable
Relative density (bulk)	1.80 g/cm^3
Solubility in water	Insoluble
Partition coefficient (n-octanol/water)	Log Kow (RDX): 0.87
Auto-ignition temperature	~260 °C (RDX)
Decomposition temperature	Begins to decompose at ~170 °C
Viscosity	Not applicable
Explosive properties	Yes – Classified as Expl. 1.1
Oxidizing properties	Not classified as oxidizing, but contains oxidizing functional groups

9.2. Other Information

Explosive mass per unit: Not applicable (sold as bulk crystalline material)
Detonation velocity: ~8,750 m/s
Sensitivity to impact: Moderate (requires detonator to initiate)
Sensitivity to friction: Low, but should be handled with care
Electrostatic sensitivity: May accumulate charge — requires grounding in certain environments
Volatility: Very low
Shelf life: Typically 10+ years under proper storage conditions
Decomposition products (on burning): Nitrogen oxides (NO_x), carbon monoxide (CO), carbon dioxide (CO_2), hydrogen cyanide (HCN)
Self-accelerating decomposition temperature (SADT): Not determined – explosive, not thermally unstable under normal conditions
Oxidizing properties: Not classified as oxidizing, but contains oxidizing functional groups (RDX)

10. Stability and reactivity

10.1. **Reactivity**
The product is explosive and can detonate under certain conditions (heat, shock, friction, electrostatic discharge).
No dangerous reactions occur under normal storage and handling conditions.

10.2. **Chemical stability**
Stable under recommended storage conditions.
May decompose at elevated temperatures (**above ~170 °C**) or in the presence of flame or high-energy impact..

10.3. **Possibility of hazardous reactions**
Risk of detonation if exposed to fire, high heat, impact, or incompatible substances.
Not reactive under standard operating conditions if handled properly.

10.4. **Conditions to avoid**
Heat, open flames, sparks, electrostatic discharge
Mechanical shock, friction
Prolonged exposure to direct sunlight or temperatures above storage specifications

10.5. **Incompatible materials**
Strong oxidizers (may increase sensitivity)
Acids or strong bases (can degrade binders or generate heat)
Organic peroxides, nitrates, and metal powders (may contribute to uncontrolled reactions)

10.6. **Hazardous decomposition products**
In the event of combustion or detonation:

- **Nitrogen oxides (NO_x)**
- **Carbon monoxide (CO)**
- **Carbon dioxide (CO_2)**
- **Hydrogen cyanide (HCN)**
- **Ammonia (NH_3)** (minor traces possible)

11. Toxicological information

11.1. **Information on toxicological effects**
Acute Toxicity

Component	Route	Toxicity
RDX (Cyclonite)	Oral (rat)	$LD_{50} \approx 100$ mg/kg
	Dermal (rabbit)	$LD_{50} \approx 150$ mg/kg
	Inhalation	Not well defined; low volatility
RDX as a whole is toxic by ingestion and skin contact due to its effects on the liver, blood, and central nervous system.		

11.	**Toxicological information** ***Continued:***
11.1.	**Skin Corrosion / Irritation** May cause skin irritation on prolonged or repeated contact. **Serious Eye Damage / Irritation** May cause mechanical irritation or eye damage from dust or explosive residues. **Respiratory or Skin Sensitization** Not classified as a sensitizer, though dust or fumes may cause irritation. **Germ Cell Mutagenicity** **RDX** has shown **mutagenic effects in some in vitro studies**. Classified as **suspected of causing genetic defects (H340)**. **Carcinogenicity** Limited evidence suggests **RDX may be carcinogenic** with prolonged exposure. **Not classified by IARC**, but precautionary classification applies under CLP. **Reproductive Toxicity** RDX has shown some **developmental toxicity** in animal studies at high doses. No conclusive evidence in humans. **STOT – Single Exposure** May affect the **central nervous system**, causing symptoms such as nausea, dizziness, seizures. **STOT – Repeated Exposure** Prolonged exposure may lead to **organ damage** (liver, kidneys, CNS). **Aspiration Hazard** Not applicable (solid, not a liquid hydrocarbon).
11.2.	**Additional Information** Exposure may cause **shortness of breath**, **convulsions**, or **loss of consciousness** in severe cases. Explosive fumes from detonation may contain **toxic gases** including **CO, NO_x, and HCN**. **Information on Other Hazards** **Endocrine-disrupting properties**: RDX has **not been identified** as an endocrine disruptor under current EU criteria. **Other hazards not resulting in classification:** **Electrostatic accumulation**: Solid composition may accumulate static electricity during handling, posing ignition risk in rare circumstances. **Environmental persistence**: RDX is **not readily biodegradable** and may **persist in soil and groundwater**. **Bioaccumulation**: Low potential based on physicochemical properties (RDX log Kow ~0.87). **Chronic exposure** to low levels of RDX (e.g., from contaminated air or surfaces) may cause **subclinical neurological effects**. **Physical injury risk**: As a high explosive, physical hazards include **shockwave trauma**, **thermal burns**, and **fragmentation injury** in the event of accidental detonation.

12. Ecological information

12.1. Toxicity

RDX (Cyclonite) is **toxic to aquatic organisms**.
Acute toxicity to aquatic species (e.g., fish and invertebrates) observed at **low mg/L levels**

Species	Test	Result
Rainbow trout (Oncorhynchus mykiss)	LC_{50} (96 h)	~5.9 mg/L
Water flea (Daphnia magna)	EC_{50} (48 h)	~7.5 mg/L
Toxicity to algae	EC_{50} (72 h)	~17.8 mg/L

12.2. Persistence and degradability

RDX is not readily biodegradable.
Degradation in the environment may occur slowly via **photolysis**, **hydrolysis**, or **microbial activity**, especially in anaerobic conditions.

12.3. Bioaccumulative potential

Low potential for bioaccumulation.
RDX has a **log Kow of ~0.87**, suggesting minimal accumulation in aquatic organisms.

12.4. Mobility in soil

RDX is **mobile in soil and may leach into groundwater**, particularly in sandy or porous soils.
Poses a risk of **groundwater contamination** near storage or disposal sites.

12.5. Results of PBT and vPvB assessment

This substance does not meet the criteria for PBT or vPvB (Persistent, Bioaccumulative, and Toxic / very Persistent and very Bioaccumulative) under REACH Annex XIII.

12.6. Endocrine disrupting properties

No components of this product are currently classified as having **endocrine-disrupting properties** for environmental organisms under EU criteria.

12.7. Other adverse effects

Explosive residues can contribute to long-term contamination of military training ranges or blast sites.
Toxic combustion products (e.g., **NO_x**, **HCN**, **CO**) may cause localized environmental harm.

13.	Disposal considerations
13.1.	**Waste treatment methods** **Product Disposal:** **This material is a high explosive** and must be disposed of in accordance with **applicable national and international regulations** governing explosive substances. **Do not dispose of in general waste**, sewers, or the environment. Disposal must be carried out by **licensed explosive waste handlers** or authorized government/military personnel. Recommended method: **Controlled detonation or incineration** in licensed facilities under strict supervision. **Contaminated Packaging:** Treat all packaging as **potentially explosive**. Do not reuse containers. Dispose of packaging through an approved hazardous/explosives waste disposal contractor. **Waste Code (EU):** **16 04 03** – Waste ammunition (excluding those collected separately for reuse) **15 01 10*** – Packaging containing residues of or contaminated by hazardous substances **Additional Notes:** Handle residues with the same precautions as unused product. Ensure full traceability of disposal in line with explosives regulations.

14.	Transport information	
14.1.	**UN number**	UN 0072
14.2.	**UN proper shipping name**	Explosive, blasting, type E
14.3.	**Transport hazard class(es)**	**1.1D** – Explosives with a mass explosion hazard
14.4.	**Packing group**	**Not applicable** (Class 1 explosives are not assigned packing groups)
14.5.	**Environmental hazards**	**Yes** – Dangerous to the environment (Marine Pollutant: Yes under IMDG)
14.6.	**Special precautions for user** Handle only by trained and authorized personnel. Transport in approved, secure, and clearly marked containers.	
14.7.	**Transport in bulk according to Annex II of MARPOL and the IBC Code** **Not applicable** – Product is not transported in bulk by sea under MARPOL regulations.	

Additional Transport Details by Mode
ADR/RID (Road/Rail – EU):
- **Classification Code: 1.1D**
- **Label: Explosives 1**
- **Tunnel Restriction Code: (B1000C)**

IMDG (Sea):
- **Class: 1.1D**
- **Marine Pollutant: Yes**
- **EmS Code: F-B, S-X**

IATA (Air):
- **Forbidden on passenger aircraft**
- **Transport by cargo aircraft only, subject to strict conditions**

ICAO-TI (Technical Instructions):
- **Same classification as IATA; not permitted on passenger flights**

15 Regulatory information

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

EU Regulations:

REACH Regulation (EC) No 1907/2006 – Not registered due to military exemption (Article 2.3).

CLP Regulation (EC) No 1272/2008 – Classified as **Expl. 1.1D**, **Acute Tox. 3**, **STOT RE 2**, **Aquatic Chronic 2**.

Seveso Directive (Directive 2012/18/EU) – Subject to strict control under **Annex I, Part 1 – Explosives, including explosive articles**.

Explosives Directive (2014/28/EU) – Covered under rules for manufacture, storage, and use of explosives for civil uses.

Persistent Organic Pollutants (POPs) – Not listed.

SVHC (Substances of Very High Concern) – Not currently listed.

National Regulations (Example: Germany, France, UK):

Subject to national explosives laws and licensing for storage, transport, and handling.

Subject to military or governmental control under national defense and security regulations.

US Regulations (if exported/imported):

OSHA: Hazardous chemical under HCS.

TSCA: Not listed for commercial use.

ITAR/Export Control (22 CFR): Controlled under **US Munitions List (Category V)**.

ATF: Regulated as a **High Explosive** under 27 CFR Part 555.

15.2. **Chemical Safety Assessment**

A **Chemical Safety Assessment has not been carried out** for this product, as it is exempt under REACH Article 2(3) for defense applications.

16 Other Information

16.1. This SDS was **compiled based on known properties** of RDX (Cyclonite) as defined in military and commercial specifications.
No previous version — this is an **initial release** for regulatory reference.

16.2. **Abbreviations and Acronyms**

Abbreviation	Meaning
REACH	Registration, Evaluation, Authorization and Restriction of Chemicals
CLP	Classification, Labelling and Packaging (EC) No 1272/2008
CAS	Chemical Abstracts Service
EC Number	European Community Number
PBT	Persistent, Bioaccumulative and Toxic
vPvB	Very Persistent and Very Bioaccumulative
SDS	Safety Data Sheet
STOT	Specific Target Organ Toxicity
TWA	Time-Weighted Average
LD_{50} / LC_{50}	Median Lethal Dose / Concentration

16	Other Information *Continued*
16.3.	**Key Literature and Sources of Data** U.S. Department of Defense **MIL-DTL-398D** specifications (RDX, Type I & II) European Chemicals Agency (ECHA) substance database GESTIS substance database OECD SIDS for RDX PubChem and ChemIDplus data
16.4.	**Full Text of Hazard Statements (CLP)** **H201**: Explosive; mass explosion hazard **H301**: Toxic if swallowed **H311**: Toxic in contact with skin **H373**: May cause damage to organs through prolonged or repeated exposure **H411**: Toxic to aquatic life with long lasting effects **EUH044**: Risk of explosion if heated under confinement **EUH401**: To avoid risks to human health and the environment, comply with the instructions for use
16.5	**Training Advice** This product must be handled only by **qualified personnel** trained in **explosive safety** and **chemical hazard management**. Ensure full compliance with **site-specific explosive safety protocols** and **national security regulations**.