



Pacific Scientific Energetic Materials Co.

<<<<< MATERIAL SAFETY DATA SHEET >>>>>

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Firex Cartridge Assembly  
TRADE NAME(S) / SYNONYM(S): fire extinguisher cartridge; CCU-90 / A  
NATIONAL STOCK NUMBER (NSN): [1377-01-185-2622 (refer to: 2-102220-1)]  
PRODUCT NUMBER(S): 30903824-1  
MSDS NUMBER / SPECIFYING LETTER: 00015 J  
REVISION DATE: 12 October 99  
SHIPPING REFERENCE NUMBER: DOT Competent Authorities:  
EX-9012168 (reference product number: 30903824-1)  
EX-8810342 (MILITARY - reference NSN)  
EX-8710959 (MILITARY - reference NSN)

**MANUFACTURER:**  
Danaher Corporation -  
Pacific Scientific Energetic Materials Co.  
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2. COMPOSITION / INFORMATION ON INGREDIENTS

**HAZARDOUS INGREDIENTS** (\* - below required reporting levels per OSHA, 29 CFR § 1900.1200)

**COMPONENT NAME / CAS NUMBER:** cyclonite (RDX) / 121-82-4  
**WEIGHT PERCENTAGE:** < 1 %\*

**COMPONENT NAME / CAS NUMBER:** zirconium, metal powder / 7440-67-7  
**WEIGHT PERCENTAGE:** < 1 %\*

**COMPONENT NAME / CAS NUMBER:** potassium nitrate [KNO<sub>3</sub>] / 7757-79-1  
**WEIGHT PERCENTAGE:** < 1 %\*

**COMPONENT NAME / CAS NUMBER:** silicon, amorphous powder / 7440-21-3  
**WEIGHT PERCENTAGE:** < 0.1 %\*

**COMPONENT NAME / CAS NUMBER:** boron, amorphous powder / 7440-42-8  
**WEIGHT PERCENTAGE:** < 0.1 %\*

**COMPONENT NAME / CAS NUMBER:** potassium perchlorate (KP) / 7778-74-7  
**WEIGHT PERCENTAGE:** < 0.1 %\*

**COMPONENT NAME / CAS NUMBER:** (red) iron<sup>III</sup> oxide [Fe<sub>2</sub>O<sub>3</sub>] / 1309-37-1  
**WEIGHT PERCENTAGE:** < 0.1 %\*

**COMPONENT NAME / CAS NUMBER:** diatomaceous earth / 68855-54-9  
**WEIGHT PERCENTAGE:** < 0.1 %\*

NET EXPLOSIVE WEIGHT (NEW): 200 mg

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### 3. HAZARDS IDENTIFICATION

#### EMERGENCY OVERVIEW

**WARNING: Explosive Product !** Do not attempt to manually fight fires. Product may be sensitive to shock, impact, friction, electrostatic discharge, high pressure or high temperature. Product may ignite and explode if exposed to any of these conditions, releasing toxic fumes, heat, shock waves and container fragments.

#### POTENTIAL HEALTH EFFECTS (ACUTE AND CHRONIC)

**EYES:** The product is sealed preventing exposure to the hazardous ingredients inside. If product seal ruptures exposing hazardous ingredients inside, discard product avoiding contact with the eyes. Exposure to ignition products may cause eye irritation.

**SKIN:** The product is sealed preventing exposure to the hazardous ingredients inside. If product seal ruptures, discard product avoiding contact with the skin. Poses little or no immediate hazard. Exposure to ignition products may cause skin irritation.

**INHALATION:** The product is sealed preventing exposure to the hazardous ingredients inside. Exposure to ignition products may cause respiratory irritation. Ignition products will contain boron, zirconium and iron compounds, plus nitrogen oxides and potassium chloride dust.

**INGESTION:** Not a hazard in normal industrial use. If product seal ruptures, discard product using proper protection. Some ingredients are highly poisonous by ingestion.

**MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE:** Pre-existing pulmonary diseases such as emphysema, asthma, etc. may be aggravated by overexposure to ignition products.

#### CARCINOGENICITY (CANCER) LISTING STATUS

**OSHA, NTP and NIOSH:** Neither the product nor any components listed

**IARC:** 3 - Human Limited Evidence (iron<sup>III</sup> oxide)

**AGCIH:** A4 - Inadequate Evidence (iron<sup>III</sup> oxide, cyclonite)

**REFER TO SECTION 11, TOXICOLOGICAL INFORMATION, FOR ADDITIONAL DATA.**

### 4. FIRST AID MEASURES

**EYES:** If exposed to container fragmentation, bandage eyes and transport. If exposed to ignition products, remove contact lenses immediately, flush with water for at least 15 minutes, occasionally lifting upper and lower eyelids. Seek medical attention if needed.

**SKIN:** Wash off any residue with soap and warm water. Seek medical attention if irritation develops.

**INHALATION:** Remove to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, administer oxygen. Seek immediate medical attention.

**INGESTION:** Seek immediate medical attention.

**NOTE TO PHYSICIAN:** Supportive care. Product ignition produces small quantities of boron, zirconium and iron compounds, plus nitrogen oxides and potassium chloride dust. Treatment based on judgement of the physician in response to reactions of the patient.

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## 5. FIRE FIGHTING MEASURES

### FLAMMABLE PROPERTIES

**FLASH POINT:** not applicable

**METHOD USED:** not applicable

**LOWER FLAMMABLE LIMIT:** self-oxidizing

**UPPER FLAMMABLE LIMIT:** self-oxidizing

**AUTOIGNITION TEMPERATURE:** > 400°F (> 205°C) [RDX]

**FIRE AND EXPLOSION HAZARD:** WARNING - Explosive Product ! Product may be sensitive to shock, impact, friction, electrostatic discharge, high pressure or high temperature. Must not be confined if burning. Product may deflagrate or detonate if exposed releasing toxic fumes, heat, shock waves and container fragments.

**EXTINGUISHING MEDIA:** Permanently-installed, automatic water sprinkler / deluge system is recommended.

**FIRE FIGHTING INSTRUCTIONS:** Do not attempt to manually fight fires. In case of fire, personnel should immediately evacuate the area, using as much protective cover as possible and activate deluge and alarm systems.

**HAZARDOUS COMBUSTION PRODUCTS:** Extreme heat and toxic gases containing boron, zirconium and iron compounds, plus nitrogen oxides and potassium chloride dust may be emitted during ignition.

## 6. ACCIDENTAL RELEASE MEASURES

**SMALL SPILL:** If product seal ruptures, barricade area, eliminate ignition sources, use a soft bristle brush and a conductive rubber pan or rubber shovel to clean-up spills. Use conductive containers and ground all containers when transferring the spilled material. Refer to Section 9 for the proper desensitizing agent to wet and desensitize the spilled material.

### LARGE SPILL

**SOIL SPILL:** Remove all contaminated soil to dispose of as hazardous waste.

**AIR RELEASE:** Not applicable

**WATER SPILL:** Flush with copious amounts of water. Collect water to dispose of as hazardous waste.

**OCCUPATIONAL SPILL:** If product seal ruptures, barricade area and eliminate ignition sources. Refer to SMALL SPILL above.

## 7. HANDLING AND STORAGE

**HANDLING:** Handling and use of explosives and related dangerous materials must be limited to personnel who are specifically authorized and trained in this area. Refer to the Department of Defense (DOD) Contractors Safety Manual number DOD4145.26M, including sources listed within, and any other appropriate information for detailed instructions regarding proper handling, storage, use and disposal of explosives and related dangerous material.

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**STORAGE:** Store in approved storage magazines only. Storage and handling must conform to appropriate quantity / distance requirements, barricading, grounding and personnel material limits. Keep product cool and dry in storage.

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### PERSONAL PROTECTIVE EQUIPMENT (PPE)

**EYE PROTECTION:** Industrial safety glasses or goggles must be worn when handling any type of explosive product.

### SKIN PROTECTION

**GLOVES:** Impervious, static-dissipative gloves are recommended when exposure to hazardous ingredients or ignition products is possible.

**CLOTHING:** High cotton-content clothing and underclothing, as well as conductive shoes or legstat(s), wristat(s) and a static-dissipative coat, are recommended to avoid static electricity build-up.

**EMERGENCY WASH FACILITY:** Eye washing capability is required.

**RESPIRATORY PROTECTION:** Appropriate NIOSH / MSHA-approved respiratory protection is recommended if exposed to particulate matter, and, for protection against toxic gaseous ignition products, but should not be necessary with normal handling.

**OTHER PROTECTION:** None indicated

**ENGINEERING CONTROLS:** Effective shielding is recommended for personnel when handling these devices. Humidity control (i.e. higher relative humidity, > 60% as recommended by DOD) reduces or prevents static electricity build-up. Explosion-proof equipment is required when operating with exposed explosive materials.

### VENTILATION

**LOCAL:** Not required.

**SPECIAL:** Explosion-proof electrical is required, where applicable.

**MECHANICAL:** General-coverage, moderate-flow, is recommended for particulate and ignition product removal.

### EXPOSURE GUIDELINES:

**COMPONENT:** cyclonite (cyclotrimethylenetrinitramine, RDX)

**OSHA TWA:** not found

**OSHA STEL:** not found

**ACGIH TWA:** 0.5 mg/m<sup>3</sup> (skin)

**ACGIH STEL:** not found

**OTHER:** **NIOSH-TWA:** 1.5 mg/m<sup>3</sup>

**NIOSH-STEL:** 3 mg/m<sup>3</sup> (skin)

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**COMPONENT:** zirconium, metal powder [Zr]

**OSHA TWA:** 5 mg/m<sup>3</sup>  
**OSHA STEL:** not found  
**ACGIH TWA:** 5 mg/m<sup>3</sup> (as zirconium, Zr)  
**ACGIH STEL:** 10 mg/m<sup>3</sup> (as zirconium, Zr)  
**OTHER:** **NIOSH-TWA:** 5 mg/m<sup>3</sup>  
**NIOSH-STEL:** 10 mg/m<sup>3</sup>  
**IDLH:** 50 mg/m<sup>3</sup> (as zirconium, Zr)

**COMPONENT:** diatomaceous earth

**OSHA TWA:** 0.8 mg/m<sup>3</sup> (based on % silica)  
**OSHA STEL:** not found  
**ACGIH TWA:** 10 mg/m<sup>3</sup> [inhalable particulate],  
3 mg/m<sup>3</sup> [respirable particulate] (PNOC)  
**ACGIH STEL:** not found  
**OTHER:** **NIOSH-TWA:** 6 mg/m<sup>3</sup> (as silica, amorphous)  
**IDLH:** 3000 mg/m<sup>3</sup>

**COMPONENT:** (red) iron<sup>III</sup> oxide [Fe<sub>2</sub>O<sub>3</sub>]

**OSHA TWA:** 10 mg/m<sup>3</sup> (as iron, Fe, dust & fume)  
**OSHA STEL:** not found  
**ACGIH TWA:** 5 mg/m<sup>3</sup> (as iron, Fe, dust & fume)  
**ACGIH STEL:** not found  
**OTHER:** **NIOSH-TWA:** 5 mg/m<sup>3</sup> (as iron, Fe, dust & fume)  
**IDLH:** 2500 mg/m<sup>3</sup> (as iron, Fe, dust & fume)

**COMPONENT:** silicon, amorphous powder [Si]

**OSHA TWA:** 15 mg/m<sup>3</sup> [total dust]  
5 mg/m<sup>3</sup> [respirable fraction]  
**OSHA STEL:** not found  
**ACGIH TWA:** 10 mg/m<sup>3</sup>  
**ACGIH STEL:** not found  
**OTHER:** **NIOSH-TWA:** 10 mg/m<sup>3</sup> [total dust],  
5 mg/m<sup>3</sup> [respirable dust fraction]

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**COMPONENTS:** potassium nitrate [KNO<sub>3</sub>]  
boron, amorphous powder [B]  
potassium perchlorate [KClO<sub>4</sub>]

**OSHA TWA:** 15 mg/m<sup>3</sup> [total dust],  
5 mg/m<sup>3</sup> [respirable fraction] (PNOR)

**OSHA STEL:** not found

**ACGIH TWA:** 10 mg/m<sup>3</sup> [inhalable particulate],  
3 mg/m<sup>3</sup> [respirable particulate] (PNOC)

**ACGIH STEL:** not found

**OTHER:** none found

## 9. PHYSICAL AND CHEMICAL PROPERTIES

**APPEARANCE:** metallic ordnance hardware

**ODOR:** odorless

**PHYSICAL STATE:** solid

**pH @ 25°C:** not determined

**VAPOR PRESSURE:** not applicable, sealed product

**VAPOR DENSITY:** not applicable, sealed product

**BOILING POINT:** not applicable

**MELTING POINT:** not applicable

**SOLUBILITY IN H<sub>2</sub>O:** negligible

**SPECIFIC GRAVITY (H<sub>2</sub>O=1):** greater than 1

**BULK DENSITY:** greater than 1; identical to specific gravity

**CHEMICAL FAMILY:** not applicable

**MOLECULAR WEIGHT:** not applicable

**MOLECULAR FORMULA:** not applicable

**VISCOSITY:** not applicable

**EVAPORATION RATE:** not applicable, sealed product

**DECOMPOSITION TEMP:** > 400°F (> 205°C) by auto-ignition [RDX]

**DESENSITIZING AGENT:** CAUTION: The product may only be desensitized if large volumes of water or mineral oil come in contact with the explosive components inside. Sealed units should be shunted and disposed of in accordance with Section 13.

**VOC CONTENT:** none

## 10. STABILITY AND REACTIVITY

**CHEMICAL STABILITY:** This explosive product is stable if handled properly. Avoid conditions listed below.

**CONDITIONS TO AVOID:** Shock, impact, friction, electrostatic discharge, high pressure, high temperature, open flame and chemical or physical contamination.

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**INCOMPATIBILITY WITH OTHER MATERIALS:** The product is sealed preventing exposure to the hazardous ingredients inside. If the seal ruptures, remove all other hazardous materials.

**HAZARDOUS DECOMPOSITION PRODUCTS:** Extreme heat and toxic gases containing boron, zirconium and iron compounds, plus nitrogen oxides and potassium chloride dust may be emitted during ignition.

**HAZARDOUS POLYMERIZATION:** Will not occur.

## 11. TOXICOLOGICAL INFORMATION

**HEALTH HAZARDS/TOXICOLOGY:** The product is sealed preventing exposure to the hazardous ingredients inside. Potential effects from exposure, though, are as follows:

cyclonite (cyclotrimethylenetrinitramine, RDX): Poison by ingestion and intravenous routes. Critical effects have been noted on the central nervous system, liver and blood.

LD<sub>50</sub>: 500 mg/kg; oral; mouse

LD<sub>50</sub>: 100 mg/kg; oral; rat

LD<sub>50</sub>: 18 mg/kg; intravenous; rat

potassium nitrate: Poison by intravenous route. Moderately toxic by ingestion, gastroenteritis with significant ingestion. Chronic exposure can cause anemia, nephritis and methemoglobinemia. Experimental teratogen, experimental reproductive effects and mutation data reported.

LD<sub>50</sub>: 1901 mg/kg; oral; rabbit

boron: Poison by ingestion. Reproductive system effects including testicular atrophy, reduced sperm count and sterility have occurred in mice, rats and dogs at daily feeding rates of 45 mg/kg of body weight of boron-based product equivalents. Mutagenic effects have been noted in bacteria exposed to 17,000 ppm/24 hours. Abnormalities (fused skeletons, organ variations and non-viable fetuses) have been seen in fetuses of rabbits given doses by stomach tube of 75 mg/kg and 225 mg/kg daily during the 7th and 19th day of gestation.

LD<sub>50</sub>: 300 mg/kg; oral; mammal (B)

(red) iron<sup>III</sup> oxide: When heated to vaporization, iron oxide will emit iron oxide fume, which is a cause of 'metal fume fever'. Heavy iron oxide dust inhalation can cause benign pneumoconiosis. A poison by subcutaneous route.

LD<sub>50</sub>: 5400 mg/kg; intraperitoneal; mouse

zirconium: Inhalation may lead to lung granulomas. Fine zirconium powder readily generates respirable dust, which is retained in the lungs. Fine powder imbeds in skin, eyes and other exposed tissues.

LD<sub>50</sub>: no data found

silicon: Identified as a nuisance dust with low order of toxicity. Chronic exposure may lead to chronic bronchitis.

LD<sub>50</sub>: no data found

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potassium perchlorate: Severe irritant to skin, eyes and mucous membranes. Implicated in aplastic anemia. Absorption can cause methemoglobinemia and kidney injury. An experimental teratogen.

LD<sub>50</sub>: no data found

diatomaceous earth: Chronic exposure to amorphous silicas may cause pneumoconiosis.

LD<sub>50</sub>: no data found

## 12. ECOLOGICAL INFORMATION

The product is sealed preventing exposure to the hazardous ingredients inside. If the seal ruptures, the small amount of hazardous ingredients inside should have no ecological impact.

## 13. DISPOSAL CONSIDERATIONS

**RCRA HAZARDOUS WASTE CODES (product as manufactured):**

D003 - reactive characteristic

**WASTE DISPOSAL METHOD:** Explosives or related dangerous material should be destroyed by open burning/open detonation in an approved incinerator, or by another approved method such as chemical treatment / destruction. Contaminated property must not be buried.

REGULATIONS GOVERNING TREATMENT, STORAGE AND DISPOSAL OF HAZARDOUS WASTE IS SUBJECT TO CHANGE AND REINTERPRETATION. SINCE THE OWNER OF THE WASTE IS RESPONSIBLE FOR PROPER DISPOSAL, CHECK WITH FEDERAL, STATE AND LOCAL ENVIRONMENTAL AGENCIES IF IN DOUBT OF THE REQUIREMENTS OF APPLICABLE LAWS, RULES AND REGULATIONS. TREATMENT, STORAGE AND DISPOSAL MUST BE IN ACCORDANCE WITH ALL APPLICABLE FEDERAL, STATE AND LOCAL LAWS, RULES AND REGULATIONS.

## 14. TRANSPORT INFORMATION

### **U.S. DEPARTMENT OF TRANSPORTATION INFORMATION**

For general emergency response guidance, actions and potential hazards, refer to the "1996 North American Emergency Response Guidebook", **GUIDE NUMBER 114**.

**UN PROPER SHIPPING NAME / NUMBER:** Cartridge, power device, UN0323  
**UN CLASSIFICATION CODE:** 1.4S  
**PACKAGING GROUP:** II  
**LABEL(S) REQUIRED:** EXPLOSIVE 1.4S

**APPLICABLE PACKAGING SECTION:** 49 CFR § 173.62 non-bulk [PI-134], plus special provision 110 per 49 CFR § 172.102

**DOT REPORTABLE QUANTITY (RQ):** 100 lbs. (45.4 kg) per 49 CFR § 172.101, Appendix (D003 reactivity)

**OTHER TRANSPORTATION INFORMATION:** This product is regulated as a US DOT Hazardous Material. Applicable regulations are found in title 49 of the Code of Federal Regulations. An authorized carrier in full compliance with these regulations must be used to transport this product. This product may not be mailed through the US Postal system.



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## 15. REGULATORY INFORMATION

### U.S. REGULATIONS

#### FEDERAL

**OSHA:** Regulated under 29 CFR § 1910.1200

**TSCA:** All hazardous components are reported on the inventory.

**CERCLA RQ:** 100 lbs. (45.4 kg) [D003 reactivity]

**SARA - SECTION 302 TPQ:** Not an Extremely Hazardous Substance  
**- SECTION 304 RQ:** See CERCLA RQ.  
**- SECTION 313:** Not regulated

#### STATES

**CALIFORNIA PROPOSITION 65:** Neither the product nor its components are on their list.

**NEW JERSEY RIGHT-TO-KNOW:** The product (as EXPLOSIVES C) and all of the components, cyclonite, potassium nitrate, zirconium, iron<sup>III</sup> oxide (fume), potassium perchlorate, silicon and diatomaceous earth, are on the Right-to-Know Hazardous Substance List (rev. 3/93), which consists of both the Workplace Hazardous Substance List and the Environmental Hazardous Substance List. Zirconium and potassium perchlorate are on the Special Health Hazard Substance List.

**PENNSYLVANIA RIGHT-TO-KNOW:** The components that are listed, cyclonite, potassium nitrate, zirconium, iron<sup>III</sup> oxide, potassium perchlorate and diatomaceous earth, are on the Hazardous Substance List. None are included as Special Hazardous Substances or as Environmental Hazards.

### INTERNATIONAL REGULATIONS

To be determined

## 16. OTHER INFORMATION

### HMIS RATINGS (Sealed product rating):

HEALTH: 1      FLAMMABILITY: 0      REACTIVITY: 4  
PERSONAL PROTECTION: A + X

**CERCLA or NFPA RATINGS (SCALE 0-4):** not included

### REVISION HISTORY

Initial issue: August 91 [old format]

**PREPARED BY:** J. Geving - Environmental, Health & Safety

THE INFORMATION, RECOMMENDATIONS AND SUGGESTIONS IN THIS DATA SHEET ARE BASED ON AVAILABLE DATA BELIEVED TO BE ACCURATE AND RELIABLE. IT IS THE RESPONSIBILITY OF THE USER TO DETERMINE THE SUITABILITY FOR USE OF THIS PRODUCT OR USE IN COMBINATION WITH ANY OTHER DEVICE, MATERIAL OR PROCESS. NO WARRANTY, EITHER EXPRESSED OR IMPLIED, IS MADE CONCERNING THE EFFECTS OF USE OR THE RESULTS TO BE OBTAINED, NOR DOES PACIFIC SCIENTIFIC COMPANY ASSUME ANY LIABILITY ARISING OUT OF USE, STORAGE, HANDLING OR DISPOSAL OF THE PRODUCT REFERRED TO HEREIN. TO PROMOTE SAFE USE OF THIS PRODUCT, THE USER SHOULD NOTIFY HIS EMPLOYEES, AGENTS, CONTRACTORS AND CLIENTS OF THE PRODUCT HAZARDS AND SAFETY INFORMATION AFTER BECOMING FAMILIAR WITH THIS DATA.