



Pacific Scientific Energetic Materials Co.

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

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Pressure Cartridge  
TRADE NAME(S) / SYNONYM(S): F-22's, F-22 fire extinguisher cartridge  
PRODUCT NUMBER(S): 2-502310-1 [30903946-1]  
2-502310-2 [30903947-1]  
2-502310-3 [30903948-1]  
2-101301-(1-3) (in-house, w/o protective features)  
MSDS NUMBER / SPECIFYING LETTER: 00226 B  
REVISION DATE: 29 May 2001  
SHIPPING REFERENCE NUMBER: US DOT Competent Authority: EX-9810110  
MANUFACTURER: Danaher Corporation - TELEPHONE NUMBERS:  
Pacific Scientific Energetic Materials Co. (520) 796-1100 [6am-4pm MST]  
7073 West Willis Road, #5002 (520) 796-1243 FAX  
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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: hexanitrostilbene (HNS) / 20062-22-0  
WEIGHT PERCENTAGE: < 1 %\*  
COMPONENT NAME / CAS NUMBER: tetraamine-*cis-bis*(5-nitro-2H-tetraazolato-N<sup>2</sup>) cobalt<sup>III</sup> perchlorate (BNCP) / 178959-25-6  
WEIGHT PERCENTAGE: < 1 %\*  
COMPONENT NAME / CAS NUMBER: zirconium, metal powder [Zr] / 7440-67-7  
WEIGHT PERCENTAGE: < 0.1 %\*  
COMPONENT NAME / CAS NUMBER: potassium perchlorate (KP) / 7778-74-7  
WEIGHT PERCENTAGE: < 0.1 %\*  
COMPONENT NAME / CAS NUMBER: graphite (natural) [C] / 7782-42-5  
WEIGHT PERCENTAGE: < 0.1 %\*  
COMPONENT NAME / CAS NUMBER: difluoroethene-hexafluoropropene-tetrafluoroethene terpolymer / 25190-89-0  
WEIGHT PERCENTAGE: < 0.1 %\*

NET EXPLOSIVE WEIGHT (NEW): 347 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 zirconium, cobalt, chlorine and fluorine compounds, plus nitrogen oxides.

**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 and NTP:** Neither the product nor its hazardous components are listed

**IARC:** 2B - Limited Evidence (cobalt compound)

**NIOSH:** Potential Occupational Carcinogen (cristabolite)

**ACGIH:** A3 - Animal Carcinogen (inorganic cobalt compound, as cobalt)

**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 byproducts, 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.

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

## 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:**  $\geq 480^{\circ}\text{F}$  ( $\geq 250^{\circ}\text{C}$ ) [BNCP]

**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 zirconium, cobalt, chlorine and fluorine compounds; plus nitrogen oxides 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.

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Refer to the Department of Defense 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.

**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 if product seal ruptures.

**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:** tetraamine-*cis-bis*(5-nitro-2H-tetrazolato-N<sup>2</sup>)  
cobalt<sup>III</sup> perchlorate (BNCP)

**OSHA TWA:** 0.1 mg/m<sup>3</sup> [cobalt (Co) dust / fume]  
(0.05 mg/m<sup>3</sup> - vacated 1989 PEL)

**OSHA STEL:** not found

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ACGIH TWA: 0.02 mg/m<sup>3</sup> [as cobalt (Co), inorganic compound]

ACGIH STEL: not found

OTHER(S): NIOSH-TWA: 0.05 mg/m<sup>3</sup> [cobalt (Co) dust / fume]

IDLH: 20 mg/m<sup>3</sup> [as cobalt (Co)]

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>

ACGIH STEL: 10 mg/m<sup>3</sup>

OTHER: NIOSH-TWA: 5 mg/m<sup>3</sup>

NIOSH-STEEL: 10 mg/m<sup>3</sup>

IDLH: 50 mg/m<sup>3</sup>

COMPONENT: graphite (natural) [C]

OSHA TWA: 15 million parts / ft<sup>3</sup>  
(2.5 mg/m<sup>3</sup> [respirable fraction] - vacated 1989 PEL)

OSHA STEL: not found

ACGIH TWA: 2 mg/m<sup>3</sup> [respirable fraction]

ACGIH STEL: not found

OTHER: NIOSH-TWA: 2.5 mg/m<sup>3</sup> [respirable fraction]

IDLH: 1250 mg/m<sup>3</sup>

COMPONENTS: hexanitrostilbene (HNS)  
potassium perchlorate (KP)  
difluoroethene-hexafluoropropene-tetrafluoroethene terpolymer

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

OSHA STEL: not found

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

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

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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:	≥ 480°F (≥ 250°C) by auto-ignition [BNCP]
DESENSITIZING AGENT:	<u>CAUTION:</u> 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.

**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 zirconium, cobalt, chlorine and fluorine compounds, plus nitrogen oxides 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. If the seal ruptures, remove all other hazardous materials.

**HNS and BNCP (as a nitro compound of an aromatic hydrocarbon):** Skin absorption and inhalation are usual routes of entry for these materials. The effects of acute exposure are the reduction of oxygen-carrying power of the blood and depression of the nervous system. Chronic exposure may cause anemia, moderate cyanosis, fatigue, slight dizziness, headache, insomnia and weight loss. Prolonged chronic exposure may lead further to liver and/or kidney damage, manifesting as acute yellow atrophy and toxic hepatitis or fatty degeneration of the kidneys.

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

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BNCP (as a cobalt compound): Low toxicity by ingestion. Ingestion of soluble salts produces nausea and vomiting by local irritation; possibly can cause liver and kidney damage. Locally, cobalt has been shown to cause dermatitis and hypersensitivity of the skin. Animal carcinogen (ACGIH) and suspected human carcinogenicity. Further reports, state both confirmed and questionable carcinogen with experimental neoplastigenic and tumorigenic data.

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

potassium perchlorate and BNCP (as a 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

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

graphite: Moderately toxic by intravenous route. Experimental reproductive effects.

LD<sub>50</sub>: 440 mg/kg; intravenous; mouse

difluoroethene-hexafluoropropene-tetrafluoroethene terpolymer: ACGIH recommends that air concentrations of thermal decomposition products (fumes) of PTFE, a closely-related fluoropolymer, be controlled at 'as low as possible' levels. No toxicological information found, except references to 'polymer fume fever'.

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 little or 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.

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**14. TRANSPORT INFORMATION**

**U.S. DEPARTMENT OF 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.

**UN PROPER SHIPPING NAME / NUMBER:** Cartridges, power device, UN0276

**UN CLASSIFICATION CODE:** 1.4C

**PACKAGING GROUP:** II

**LABEL(S) REQUIRED:** EXPLOSIVE 1.4C, CARGO AIRCRAFT ONLY

**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:** For general emergency response guidance, actions, and potential hazards, refer to the "2000 Emergency Response Guidebook" or 2000ERG, **GUIDE NUMBER 114.**

**15. REGULATORY INFORMATION****U.S. REGULATIONS****FEDERAL**

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

**TSCA:** All hazardous components should be reported on the inventory.

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

**SARA - SECTION 302 TPO:** Not an Extremely Hazardous Substance.

- **SECTION 304 RQ:** See CERCLA RQ.

- **SECTION 313:** Reportable [cobalt compound]

**STATES**

**CALIFORNIA PROPOSITION 65:** The product and its hazardous components are not on their list.

**NEW JERSEY RIGHT-TO-KNOW:** The product (as EXPLOSIVES C) and the components, zirconium, potassium perchlorate, HNS and BNCP (as a cobalt compound and a perchlorate, inorganic, n.o.s.), 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.



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**PENNSYLVANIA RIGHT-TO-KNOW:** The components that are listed, zirconium, potassium perchlorate, graphite and BNCP (as a cobalt compound), are on the Hazardous Substance List. Cobalt compounds are included as Environmental Hazards. None are included as Special Hazardous Substances.

#### 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 yet determined

##### REVISION HISTORY

Initial issue: 19 November 97, ANSI Z400.1

**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 ENERGETIC MATERIALS 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.

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