

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

1. Product and Company Identification

Product name: Kalrez® 'O' rings
Synonyms: None
Item Numbers: Size dependent - see Edwards Product Catalog for details.

European Contact Details

Edwards, Manor Royal, Crawley
West Sussex, RH10 9LW, England
E-mail: info@edwardsvacuum.com

General enquiries

UK : +44 (0)1293 528844
France : +(33) 1 47 98 24 01
Germany : +(49) 6420-82-410
Italy : +(39) 0248-4471

US Contact Details

Edwards, Three Highwood Drive, Suite 3-10E,
Highwood Office Park, Tewksbury, MA 01876

General enquiries

+(1) 978-658-5410
Toll Free: 1-800-848-9800

24 h Emergency telephone number:

Chemtrec: 1-800-424-9300

2. Hazards Identification

EMERGENCY OVERVIEW

These products when properly handled according to good working and hygienic practices are not dangerous to human health and the environment.

If heated to temperatures above 400 °C/752 °F, toxic gases (including hydrogen fluoride) can be evolved.

For short and long term exposure effects see Section 11 Toxicological data.

Eye Effects: Exposure to dust or particulate fumes evolved after overheating may cause eye irritation.

Skin Effects: Contact with dust from the product may cause skin irritation.

Ingestion/Oral Effects: None under normal conditions of use.

Inhalation Effects: None under normal conditions of use.
Inhalation of fumes from overheating or burning product, or from smoking tobacco or cigarettes contaminated with the product may cause polymer fume fever, a flu-like illness with chills and fever. Symptoms may not occur for several hours after exposure, and go away in 24-48 hours even in the absence of treatment.
The results of inhalation of low concentrations of HF (hydrogen fluoride) evolved from overheated product can initially include symptoms of choking, coughing, and severe eye, nose and throat irritation. This can possibly be followed after a symptomless period of 1 to 2 days by fever, chills, difficulty in breathing, cyanosis, and pulmonary oedema. Acute or chronic overexposure to HF can injure the liver and kidneys.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: None known for the product as supplied.

| NFPA Hazard codes | | HMIS Hazard codes | | Rating System |
|-------------------|---|-------------------|---|---------------------|
| Health | 0 | Health | 0 | 0 = No Hazard |
| Flammability | 0 | Flammability | 0 | 1 = Slight Hazard |
| Instability | 0 | Reactivity | 0 | 2 = Moderate Hazard |
| | | | | 3 = Serious Hazard |
| | | | | 4 = Severe Hazard |

3. Composition/Information on Ingredients

| Ingredient | % Weight | CAS No | Hazard class* | Risk phrase* |
|----------------------------|----------|---------------|----------------|----------------|
| Perfluoroelastomer | 55-97 | Not allocated | Not applicable | Not applicable |
| Perfluoroalkylpolyether | < 8 | Not allocated | Not applicable | Not applicable |
| Accelerators and curatives | < 6 | Not allocated | Not applicable | Not applicable |
| Magnesium oxide | 0 - 5 | 1309-48-4 | Not applicable | Not applicable |
| Carbon black | 0 - 45 | 1333-86-4 | Not applicable | Not applicable |
| Fillers may include: | | | | |
| Polyamide fibres | 0 - 20 | Not allocated | Not applicable | Not applicable |
| Polytetrafluoroethylene | 0 - 20 | 9002-84-0 | Not applicable | Not applicable |
| Amorphous silica | 0 - 10 | 7631-86-9 | Not applicable | Not applicable |
| Fumed silica | 0 - 10 | 69012-64-2 | Not applicable | Not applicable |
| Microcrystalline silica | 0 - 15 | 14808-60-7 | Not applicable | Not applicable |
| Blanc fixe | 0 - 30 | 7727-43-7 | Not applicable | Not applicable |

*Hazard class & Risk phrase. These columns are only completed for ingredients which are classified as hazardous under EU Directive No 1272/2008 (as amended) and are present in sufficient concentration to make the overall substance hazardous. In all other situations, the column will be completed as "Not applicable".

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

4. First Aid Measures

- Eyes:** No effects requiring first aid are expected during normal use. However, if small particles enter the eye, flush with water for at least 15 minutes. If irritation persists seek medical attention. In case of eye contact with thermally degraded product, immediately flush the eyes with cold running water and seek immediate medical assistance.
- Skin:** No effects requiring first aid are expected during normal use. In case of skin contact with molten/thermally degraded product, immediately flush the affected area with cold running water and seek immediate medical assistance.
- Ingestion/Oral:** No effects requiring first aid are expected during normal use. If hot/thermally degraded product is ingested, do not induce vomiting. Seek immediate medical assistance.
- Inhalation:** No effects requiring first aid are expected during normal use. If exposed to fumes evolved from hot/thermally degraded product, remove to fresh air and seek immediate medical assistance. If breathing problems occur, a qualified individual should administer oxygen or artificial respiration as indicated.
- Other Information:** In all cases of exposure to thermally degraded product, seek immediate medical advice, indicating that hydrogen fluoride is a decomposition product.

5. Fire Fighting Measures

- Extinguishing Media:** Water, dry powder, foam, carbon dioxide.
- Fire and Explosion Hazard:** When exposed to temperatures above 204 °C/399 °F, the product can liberate fume particles, carbon monoxide and carbon dioxide.
When exposed to temperatures above 400 °C/752 °F, the product degrades to produce toxic and corrosive gases including carbonyl fluoride, hydrogen fluoride and other fluorinated gases.
- Special Protective Equipment for Fire Fighters:** Fire fighters should wear NIOSH approved self-contained breathing apparatus (SCBA) and full turnout gear. When temperatures exceed 400 °C/752 °F and ventilation is inadequate to maintain concentrations below exposure limits, a positive pressure air supplied respirator must be used (Air purifying respirators may not provide adequate protection).
Use acid resistant protective clothing (capable of resisting hydrofluoric acid), to handle residue from a fire involving the product, or cooled parts which may contain thermally degraded product. Wear neoprene gloves when handling refuse from a fire.

For Flammability Properties - see Section 9.

6. Accidental Release Measures

No specific actions are required for the product as supplied. Collect the spilled items and re-use or dispose of (See Section 13).

See Section 5 (Fire Fighting Measures) for handling of overheated/degraded product.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

7. Handling and Storage

Handling: Avoid contact with eyes, skin and clothing. Avoid breathing vapours and dust. See Section 5 (Fire Fighting Measures), for information on handling of overheated/degraded material.

Storage: Store in original packaging or in closed containers. Store away from food, drink and tobacco products.

8. Exposure Controls/Personal Protection

Exposure Limits:

| Ingredient | ACGIH - TLV - | OSHA - PEL | Occupational Exposure Limits EH40 (UK) * |
|-------------------------|---|---|--|
| 'O' rings as supplied | No data available | No data available | No data available |
| Ingredients: | | | |
| Polytetrafluoroethylene | No data available | No data available | 10 mg/m ³ , 8 Hr TWA, total dust 5 mg/m ³ , 8 Hr TWA, respirable dust |
| Amorphous silica | No data available | 80 mg/m ³ / % SiO ₂ - 8 Hr TWA | 3 mg/m ³ , 8 and 12 Hr TWA, respirable dust |
| Fumed silica | No data available | No data available | 1 mg/m ³ , 8 and 12 Hr TWA, respirable dust |
| Microcrystalline silica | 0.025 mg/m ³ , respirable dust, 8 Hr TWA, A2 | Total dust, (30 mg/m ³ / % SiO ₂ + 2), 8 Hr TWA Respirable dust, (10 mg/m ³ / % SiO ₂ + 2), 8 Hr TWA | 0.1 mg/m ³ , 8 Hr TWA, respirable dust 0.05 mg/m ³ , 12 Hr TWA, respirable dust |
| Blanc fixe | 10 mg/m ³ , total dust, 8 Hr TWA | 15 mg/m ³ , total dust, 8 Hr TWA 5 mg/m ³ , respirable dust, 8 Hr TWA | 10 mg/m ³ , 8 and 12 Hr TWA, total dust 5 mg/m ³ , 8 and 12 Hr TWA, respirable dust |
| Magnesium oxide | 10 mg/m ³ , 8 Hr TWA, A4 | 15 mg/m ³ , 8 Hr TWA, total dust | None established |
| Carbon black | 3.5 mg/m ³ , 8 Hr TWA, A4 | 3.5 mg/m ³ , 8 Hr TWA | 0.5 mg/m ³ , 8 and 12 Hr TWA |

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

| Ingredient | ACGIH - TLV - | OSHA - PEL | Occupational Exposure Limits EH40 (UK) * |
|--------------------------------------|--|------------------------------|--|
| Degraded product: | | | |
| Hydrogen fluoride (HF) | 0.5 ppm, 8 Hr TWA, as Fluorine 2 ppm (ceiling limit value), as Fluorine | 3 ppm, 8 Hr TWA, as Fluorine | 3 ppm, 15 min TWA |
| Carbonylfluoride (COF ₂) | No data available | No data available | No data available |

* The values in this column are Acceptable Exposure Limits (AEL) given by the manufacturer. Where governmental imposed occupational exposure limits which are lower than the AEL are in force, such limits shall take precedence.

Personal Protection:

Engineering Measures: None required under normal conditions of use. Provide local ventilation where there is the possibility of overheating of the product, to maintain concentrations below the exposure limits.

Respiratory Protection: Wear a NIOSH approved respirator if there is potential for exposure to airborne dusts, mists or vapours. For protection required where the product has been overheated/degraded, refer to Section 5.

Hand/Skin Protection: None required under normal conditions of use. Wear skin protection adequate to protect against contact with thermally degraded products (refer to Section 5).

Eye/Face Protection: Wear safety goggles for normal use. Where the possibility exists for eye and face contact due to splashing or spraying of molten material, wear overall chemical splash goggles and face shield. A full face mask respirator provides protection from eye irritation.

Hygiene Measures: Wash hands before breaks and immediately after handling the products.

Other/General Protection: Keep the product away from food, drink and tobacco products. Clean clothing which has been contaminated with overheated product before re-use.

9. Physical and Chemical Properties

| | | | | |
|----------------------------|---|------------------------|-------------------|-------|
| Appearance and Odour | Black or grey elastomer. Mild aromatic odour. | Boiling point | No data available | °C/°F |
| pH (as supplied) | No data available | Freezing Point | No data available | °C/°F |
| Solubility in Water | Insoluble | Auto Ignition | Not applicable | °C/°F |
| Volatile Content by Volume | No data available | Flash Point | Not applicable | °C/°F |
| Specific Gravity | No data available | | | |
| Vapour Pressure (mbar) | No data available | Vapour Pressure (Torr) | No data available | |

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ[®]

10. Stability and Reactivity

| | |
|-------------------------------|--|
| Stability: | Stable at normal temperatures and storage conditions. |
| Material/Conditions to Avoid: | Alkali metals and interhalogen compounds. Temperatures higher than 204 °C/399 °F. |
| Hazardous Decomposition: | When exposed to temperatures above 204 °C/399 °F, carbon monoxide and carbon dioxide are evolved. When exposed to temperatures above 400 °C/599 °F, hydrogen fluoride and perfluoroolefins are evolved. |
| Hazardous Polymerisation: | Will not occur. |

11. Toxicological Information

For a comprehensive description for the various toxicological (health) effects which may arise if the user comes into contact with the substance or preparation refer to Section 2 Hazards Identification.

Animal data:

| | |
|-------------|---|
| LD50 value: | Amorphous silica: > 10,000 mg/kg (oral, rats). Blance fixe: > 5000 mg/kg (oral, rats). Magnesium oxide: 230 mg/kg (oral, dogs). |
| LC50 value: | Magnesium oxide: >173 mg/m ³ (inhalation, 2 Hr, cats). |

Other animal information:

Perfluoroalkylpolyether:

Inhalation 4 hour ALC: > 19.54 mg/L in rats Skin absorption ALD: > 17,000 mg/kg in rabbits.
Oral ALD: > 25,000 mg/kg in rats.

In animal tests the compound was a mild skin and eye irritant. A single inhalation exposure produced non-specific effects such as respiratory irritation. Exposure to thermal decomposition products produced irritation, irregular respiration, tremors and increased liver weight.

Carbon black:

Oral ALD, rat: > 25,100 mg/kg in rats.

Repeated inhalation exposure of animals to Carbon black caused inflammation of the respiratory tract, lungs and emphysema. Repeated exposure to high doses of Carbon black by ingestion or skin contact caused no significant toxicological effects.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ[®]

Amorphous silica:

Oral ALD, rat: > 10,000 mg/kg in rats.

Animal testing indicates Amorphous silica is a mild eye irritant. It is negligible to slight skin irritant when tested as a 50% aqueous paste. The dust is not expected to be a skin irritant. Animal testing indicates Amorphous Silica is not a skin sensitiser. Single, repeated and long-term exposure by ingestion to Amorphous Silica caused no significant toxicological effects. Single exposure by inhalation to Amorphous Silica caused no significant toxicological effects.

Crystalline silica:

Oral ALD: > 11,000 mg/kg in male rats.

Crystalline Silica is not a skin irritant or a skin sensitiser in animals, but is a mild eye irritant. Single doses of 50 mg of Crystalline Silica administered by intratracheal instillation have resulted in pulmonary fibrosis at 60 and 120 days post exposure in rats. Repeated and chronic exposures as low as 0.7 mg instillation and 12 mg/m³ by inhalation resulted in pulmonary fibrosis, inflammation, oedema and emphysema in animals exposed to Crystalline silica.

Blanc fixe

The compound is untested for skin or eye irritancy, and is untested for animal sensitisation. Toxic effects in animals occurring from repeated inhalation exposures are lung changes.

Magnesium oxide

The compound is a mild skin irritant and an eye irritant.

Carcinogenicity:

The following component ingredients are listed as carcinogens: Microcrystalline silica, Carbon black. (See Section 15 for more information).

12. Ecological Information

No information is available. Toxicity is expected to be low based on the product's insolubility in water.

13. Disposal Considerations

The uncontaminated/undegraded product can be sent to landfill, however where possible you should recycle the product.

Alternatively (because of its high fuel value), incinerate the product with energy recovery; the incinerator used must be capable of scrubbing out the acidic products of combustion.

Treatment, storage, transportation, and disposal of the product must be in accordance with all applicable local and national regulations.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

14. Transport Information

This product is not regulated as dangerous under transport regulations.

| PARAMETER | EUROPEAN | CANADIAN TDG | UNITED STATES DOT |
|-----------------------|----------------|----------------|-------------------|
| Proper Shipping Name | Not applicable | Not applicable | Not applicable |
| Hazard Class | Not applicable | Not applicable | Not applicable |
| Identification Number | Not applicable | Not applicable | Not applicable |
| Shipping Label | Not applicable | Not applicable | Not applicable |

15. Regulatory Information

European Regulatory Information

This product has been classified in accordance with EU Regulation No 1272/2008 (as amended) on the Classification, Labelling and Packaging of Substances and Mixtures.

Classified as dangerous to supply : No.

Risk Phrases : Not applicable.

Safety Phrases : Not applicable.

Symbols : None.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

United States Regulatory Information

Product is a manufactured article not subject to TSCA listing.

SARA TITLE III - SECTION 313 SUPPLIER NOTIFICATION:

This product constitutes an "article" and, as such is exempt from SARA 313 reporting requirements (40 CFR Part 372.38, Paragraph B).

California Proposition 65: Release of ingredients contained in this product to the environment is not anticipated.

The following components of the products are listed as carcinogens:

| Material | IARC | NTP | ACGIH |
|-------------------------|------|-----|-------|
| Microcrystalline silica | 1 | X | A2 |
| Carbon black | 2B | | |

States Right-To-Know information:

No substances on the state hazardous substances list, for the states indicated below, are used in the manufacture of products on this Material Safety Data Sheet, with the exceptions indicated.

SUBSTANCES ON THE PENNSYLVANIA HAZARDOUS SUBSTANCES LIST PRESENT AT A CONCENTRATION OF 1% OR MORE (0.01% FOR SPECIALHAZARDOUS SUBSTANCES) - Carbon black. Some products may contain: magnesium oxide, amorphous silica, polytetrafluoroethylene, crystalline silica, barium sulphate.

WARNING - SUBSTANCES KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER, BIRTH DEFECTS OR OTHER REPRODUCTIVE HARM - Carbon Black, Crystalline Silica.

SUBSTANCES ON THE NEW JERSEY WORKPLACE HAZARDOUS SUBSTANCE LIST PRESENT AT A CONCENTRATION OF 1% OR MORE (0.1% FOR SUBSTANCES IDENTIFIED AS CARCINOGENS, MUTAGENS OR TERATOGENS) - Carbon black. Some products may contain: magnesium oxide, amorphous silica, crystalline silica, barium compounds.

Canadian Regulatory Information

WHMIS Classification: Product is a manufactured article not subject to WHMIS regulations.

Product is a manufactured item not subject to DSL listing.

MATERIAL SAFETY DATA SHEET

PRODUCT NAME : 'O' RINGS - KALREZ®

16. Other Information

This MSDS is compiled in accordance with ANSI Z400.1 and Regulation (EC) No 1907/2006 concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals (REACH).

Sources of information for this data sheet:

- DuPont Performance Elastomers L.L.C. "KALREZ FLUOROELASTOMER SEMIFINISHED PARTS AND SHAPES IN SYNONYM LIST KRZ042" Material Safety Data Sheet, KRZ042 Revised 15-FEB-2007.

Glossary:

ACGIH - American Conference of Governmental Industrial Hygienists; **ALC** - Average Lethal Concentration; **ALD** - Average Lethal Dose; **ANSI** - American National Standards Institute; **Canadian TDG** - Canadian Transportation of Dangerous Goods; **CAS** - Chemical Abstracts Service; **Chemtrec** - Chemical Transportation Emergency Center (US); **DSL** - Domestic Substances List; **EH40 (UK)** - HSE Guidance Note EH40 Occupational exposure limits; **HMIS** - Hazardous Material Information Service; **IARC** - International Agency for Research on Cancer; **LC** - Lethal Concentration; **LD** - Lethal Dose; **NFPA** - National Fire Protection Association; **NIOSH** - National Institute for Occupational Safety and Health; **NTP** - National Toxicology Program; **OSHA** - Occupational Safety and Health Administration, US department of Labour; **PEL** - Permissible exposure limit; **SARA (Title III)** - Superfund Amendments and Reauthorization Act; **SARA 313** - Superfund Amendments and Reauthorization Act, Section 313; **SCBA** - Self-Contained Breathing Apparatus; **STEL** - Short Term Exposure Limit; **TLV** - Threshold Limit Value; **TSCA** - Toxic Substances Control Act Public Law 94-469; **TWA** - Time Weighted Average; **US DOT** - US Department of Transportation; **WHMIS** - Workplace Hazardous Materials Information System.

Revisions:

Oct 2010 - Data Sheet reviewed and updated to reflect the latest regulatory and supplier safety information.

Although the information and recommendations in this data sheet are to the best of our knowledge correct, it is recommended that you make your own determination of the material's suitability for your purpose before you use it. The information contained in this data sheet has been reproduced from the manufacturers data; the accuracy of this information is the responsibility of the manufacturer. Edwards accept no responsibility for damage of any nature resulting from the use of, or the reliance upon, this data sheet.