

ECM Duro-Bond E-CTFE Lining

Description

Duro-Bond E-CTFE is a laminated sheet lining consisting of a layer of Ethylene Chlorotetrafluoroethylene (E-CTFE) resin laminated to a fabric or vulcanized soft rubber backing that is readily bonded to steel, concrete, or FRP substrates. ECTFE is a partially fluorinated thermoplastic resin that is melt flow processible. Duro-Bond E-CTFE sheet lining is available in thicknesses of 60 mils (1.5 mm) and 90 mils (2.3 mm).

Uses

Duro-Bond E-CTFE is used as a vessel lining material to provide chemical resistance to acids, bases, oxidizing agents, organic solvents and other corrosive media. **Duro-Bond E-CTFE** can be applied to tanks, scrubbing towers, reactors, valves, columns, agitators and other process equipment for handling corrosive materials.

When a combination of chemical, temperature, abrasion and permeation resistance is required **Duro-Bond E-CTFE** is often a cost-effective solution to severe corrosion problems.

Advantages

Duro-Bond E-CTFE fluoropolymer sheet lining exhibits outstanding chemical resistance, being virtually unaffected by many of the corrosive chemicals commonly encountered in the chemical process industry.

Duro-Bond E-CTFE is resistant to strong mineral and oxidizing acids, alkalis, metal etchants, liquid oxygen and essentially all organic solvents. Typical of the fluoropolymers, E-CTFE is attacked by metallic sodium and potassium. Rate of attack is a function of exposure time and temperature.

Duro-Bond E-CTFE sheet lining provides substrate protection by virtue of its excellent permeation resistance. The E-CTFE fluoropolymer has extremely low permeability to water vapor and various other gases. The E-CTFE fluoropolymer also exhibits low permeability to liquid chemicals. It also has excellent resistance to abrasion.

Service Temperature

E-CTFE fluorocarbon resins withstand continuous service temperatures as high as 150° C (300° F). When bonded to a substrate, the maximum recommended service temperature for **Duro-Bond FEP** sheet lining is 110° C (230° F) on a continuous basis, 120° C (250° F) on an intermittent basis.

Chemical Resistance

The information listed may be considered as a basis for recommendation, but not as a guarantee, unless sold and installed by **ELECTRO CHEMICAL MANUFACTURING** For resistance of **Duro-Bond E-CTFE** to chemicals not listed, contact contact us at 330-313-6372, knightmaterials.com, or info@knightmaterials.com.

Electro Chemical Manufacturing Duro-Bond E-CTFE Lining

Key to Rating:

R = Recommend
NR = Not Recommended
- = No Available Data

<u>Chemical</u>	<u>70°F</u>	<u>150°F</u>	<u>225°F</u>
Acetic Acid, 50%	R	R	R
Acetic Acid, 80%	R	R	-
Acetic Acid, Glacial	R	NR	-
Acetic Anhydride	R	-	-
Acetone	R	R	NR
Acetyl Chloride	R	R	-
Acetylene	R	R	-
Acetyl Nitrile	R	R	-
Acrylonitrile	R	-	-
Adipic Acid	R	R	-
Alcohol, Amyl	R	R	R
Alcohol, Benzyl	R	R	R
Alcohol, Butyl	R	R	R
Alcohol, Diacetone	R	R	NR
Alcohol, Ethyl	R	R	R
Alcohol, Hexyl	R	-	-
Alcohol, Isopropyl	R	R	R
Alcohol, Methyl	R	R	R
Alcohol, Propyl	R	R	R
Allyl Chloride	R	R	R
Alum	R	R	R
Alum, Ammonium	R	R	R
Alum, Chrome	R	R	-
Alum, Potassium	R	R	R
Aluminum Chloride	R	R	R
Aluminum Fluoride	R	R	R
Aluminum Hydroxide	R	R	R
Aluminum Nitrate	R	R	R
Aluminum Oxychloride	R	R	-
Aluminum Sulfate	R	R	R
Ammonia, Gas	R	R	R
Ammonia, Aqua, 10%	R	R	R
Ammonium Acetate	R	R	-
Ammonium Bifluoride	R	R	R
Ammonium Bisulfide	R	R	R
Ammonium Carbonate	R	R	R
Ammonium Chloride	R	R	R
Ammonium Dichromate	R	-	-
Ammonium Fluoride, 25%	R	R	R
Ammonium Hydroxide	R	R	R
Ammonium Metaphosphate	R	R	R
Ammonium Nitrate	R	R	R
Ammonium Persulfate	R	R	-
Ammonium Phosphate	R	R	R
Ammonium Sulfate	R	R	R

<u>Chemical</u>	<u>70°F</u>	<u>150°F</u>	<u>225°F</u>
Ammonium Sulfide	R	R	R
Amyl Acetate	R	R	NR
Amyl Chloride	R	R	R
Aniline	R	NR	NR
Anthraquinone	R	R	-
Anthraquinone Sulfonic Acid	R	R	-
Antimony Trichloride	R	-	-
Aqua Regia	R	R	R
Arsenic Acid	R	R	R
Barium Carbonate	R	R	R
Barium Chloride	R	R	R
Barium Hydroxide	R	R	R
Barium Nitrate	R	-	-
Barium Sulfate	R	R	R
Barium Sulfide	R	R	R
Benzaldehyde, 10%	R	R	NR
Benzaldehyde, Above 10%	R	NR	NR
Benzene, Benzol - R up to 176 oF	R	R	NR
Benzene Sulfonic Acid, 10%	R	R	NR
Benzoic Acid	R	R	R
Bismuth Carbonate	R	-	-
Black Liquor	R	R	R
Bleach	R	R	R
Boric Acid	R	R	R
Bromic Acid	R	R	R
Bromine, Liquid	R	R	-
Bromine, Vapor 25%	R	R	NR
Bromine, Water	R	R	R
Bromobenzene	R	NR	NR
Bromotoluene	R	R	NR
Butadiene	R	R	R
Butane	R	R	R
Butyl Acetate	R	R	NR
Butyl Cellosolve	R	-	-
Butylene	R	R	R
Butyl Phenol	R	R	R
Butyl Stearate	R	-	-
Butyric Acid	R	R	-
Cadmium Cyanide	R	R	R
Calcium Bisulfide	R	R	R
Calcium Bisulfite	R	R	R
Calcium Carbonate	R	R	R
Calcium Chlorate	R	R	R
Calcium Chloride	R	R	R
Calcium Hydroxide	R	R	R
Calcium Hypochlorite	R	R	R
Calcium Nitrate	R	R	R
Calcium Oxide	R	R	R
Calcium Sulfate	R	R	R
Caprylic Acid	R	R	R
Carbon Dioxide, Wet or Dry	R	R	R
Carbon Disulfide	R	-	-

Electro Chemical Manufacturing Duro-Bond E-CTFE Lining

Carbon Monoxide	R	R	-	Ethyl Acrylate	R	R	NR
Carbon Tetrachloride	R	R	R	Ethyl Chloride	R	R	R
Carbonic Acid	R	R	R	Ethyl Chloroacetate	R	-	-
Castor Oil	R	R	R	Ethyl Ether	R	R	-
Cellosolve	R	R	R	Ethylene Bromide	R	R	R
Cellosolve Acetate	R	-	-	Ethylene Chloride	R	R	R
Chloracetic Acid	R	R	R	Ethylene Chlorohydrin	R	NR	NR
Chemical	70°F	150°F	225°F	Chemical	70°F	150°F	225°F
Chloral Hydrate	R	R	-	Ethylene Diamine	R	NR	NR
Chloramine	R	-	-	Ethylene Dichloride	R	NR	NR
Chlorine Gas, Dry	R	R	NR	Ethylene Glycol	R	R	R
Chlorine Gas, Wet	R	R	R	Ethylene Oxide	R	R	R
Chlorine, Liquid	R	R	R	Fatty Acids	R	R	R
Chlorine Water, Saturated	R	R	R	Ferric Chloride	R	R	R
Chloracetic Acid	R	R	R	Ferric Nitrate	R	R	R
Chlorobenzene - R up to 100°F	R	NR	NR	Ferric Sulfate	R	R	R
Chlorobenzyl Chloride	R	NR	NR	Ferrous Chloride	R	R	R
Chloroform	R	R	R	Ferrous Nitrate	R	R	R
Chlorosulfonic Acid	R	-	-	Ferrous Sulfate	R	R	R
Chromic Acid, 501/o	R	R	R	Fluorine Gas, Wet	R	-	-
Citric Acid	R	R	R	Fluoboric Acid	R	-	-
Coconut Oil	R	R	R	Fluosilicic Acid	R	R	R
Copper Carbonate	R	R	-	Formaldehyde, 37%			
Copper Chloride	R	R	R	Containing up to 15% Methanol	R	R	-
Copper Cyanide	R	R	R	Formaldehyde, 50%	R	-	-
Copper Fluoride	R	R	R	Formic Acid, 90%	R	R	NR
Copper Nitrate	R	R	R	Freon	R	R	-
Copper Sulfate	R	R	R	Gallic Acid	R	R	-
Cottonseed Oil	R	R	R	Gasoline	R	R	R
Cresol	R	R	NR	Glucose	R	R	R
Cresylic Acid, 50%	R	R	NR	Glycerine	R	R	R
Croton Aldehyde	R	NR	NR	Glycolic Acid	R	R	-
Cupric Fluoride	R	R	R	Glycols	R	R	R
Cupric Sulfate	R	R	R	Heptane	R	R	R
Cuprous Chloride	R	R	R	Hexane	R	R	R
Cyclohexane	R	R	R	Hydrobromic Acid, 50%	R	R	R
Cyclohexanol - R up to 175°F.	R	R	NR	Hydrochloric Acid, 38%	R	R	R
Cyclohexanone	R	NR	NR	Hydrocyanic Acid, 1 0%	R	R	R
Detergents	R	R	R	Hydrofluoric Acid, 50%	R	R	R
Dextrin	R	R	R	Hydrofluosilicic Acid	R	R	R
Dextrose	R	R	R	Hydrogen	R	R	R
Dichlorobenzene	R	NR	NR	Hydrogen Cyanide	R	R	R
Dichloroethylene	R	NR	NR	Hydrogen Peroxide, 90%	R	R	-
Diesel Fuel	R	R	R	Hydrogen Phosphide	R	R	-
Diethylamine	R	NR	NR	Hydrogen Sulfide, Dry	R	R	R
Diethyl Cellosolve	R	R	R	Hydrogen Sulfide, Aqueous Sol.	R	R	-
Diethyl Ether	R	-	-	Hydroquinone	R	R	R
Diglycolic Acid	R	-	-	Hypochlorous Acid	R	R	R
Dimethylamine	R	NR	NR	Iodine	R	R	R
Dimethyl Hydrazine	R	NR	NR	Isopropyl Ether	R	-	-
Diocyl Phthalate	R	NR	NR	Isooctane	R	-	-
Dioxane	R	R	NR	Jet Fuel	R	R	R
Disodium Phosphate	R	R	R	Kerosene	R	R	R
Divinylbenzene	R	NR	-	Lactic Acid, 25%	R	R	-
Ethyl Acetate	R	R	-	Lactic Acid, 80%	R	-	-
Ethyl Acetoacetate	R	-	-	Lard Oil	R	R	R

Electro Chemical Manufacturing Duro-Bond E-CTFE Lining

Lauric Acid	R	R	R	Nitrous Oxide	R	-	-
Lauryl Chloride	R	R	R	Oils, Vegetable	R	R	R
Lead Acetate	R	R	R	Oleic Acid	R	R	R
Lead Chloride	R	R	R	Oleum	R	NR	NR
Lead Nitrate	R	R	R	Oxalic Acid	R	R	NR
Lead Sulfate	R	R	R	Oxygen, Gas	R	R	R
Lemon Oil	R	R	R	Ozone	R	R	R
Chemical	70°F	150°F	225°F	Chemical	70°F	150°F	225°F
Linoleic Acid	R	R	R	Palmitic Acid	R	R	R
Linoleic Oil	R	R	R	Paraffin	R	R	-
Linseed Oil	R	R	R	Perchloric Acid, 70%	R	R	-
Lithium Bromide	R	R	-	Perphosphate	R	-	-
Lubricating Oil	R	R	R	Petroleum Oils	R	R	-
Magnesium Carbonate	R	R	R	Phenol, 10%	R	R	NR
Magnesium Chloride	R	R	R	Phenylthydrazine	R	-	-
Magnesium Hydroxide	R	R	R	Phosphoric Acid, 85%	R	R	R
Magnesium Nitrate	R	R	R	Phosphorus Yellow	R	-	-
Magnesium Sulfate	R	R	R	Phosphorus Pentoxide	R	R	R
Maleic Acid	R	R	R	Phosphorus Trichloride	R	R	R
Malic Acid	R	R	R	Photographic Solutions	R	R	-
Mercuric Chloride	R	R	R	Picric Acid	R	-	-
Mercuric Cyanide	R	R	R	Plating Solutions	R	R	-
Mercuric Sulfate	R	R	R	Potassium Aluminum Sulfate	R	R	R
Mercurous Nitrate	R	R	R	Potassium Bichromate	R	R	R
Mercury	R	R	R	Potassium Bisulfate	R	R	R
Methane	R	R	R	Potassium Borate	R	R	-
Methoxyethyl Oleate	R	-	-	Potassium Bromide	R	R	R
Methylamine	R	NR	NR	Potassium Carbonate	R	R	R
Methyl Bromide	R	R	R	Potassium Chlorate	R	R	R
Methyl Cellosolve	R	R	R	Potassium Chloride	R	R	R
Methyl Chloride	R	R	R	Potassium Chromate	R	R	R
Methyl Chloroform	R	R	NR	Potassium Cyanide	R	R	R
Methyl Ethyl Ketone	R	R	NR	Potassium Dichromate	R	R	R
Methyl Isobutyl Ketone	R	R	NR	Potassium Ferricyanide	R	R	R
Methyl Methacrylate	R	-	-	Potassium Ferrocyanide	R	R	R
1-Methyl-2-Pyrrolidinone	R	R	NR	Potassium Hydroxide	R	R	-
Methyl Sulfate	R	R	R	Potassium Iodide	R	R	R
Methyl Sulfuric Acid	R	R	-	Potassium Nitrate	R	R	R
Methylene Bromide	R	NR	NR	Potassium Perchlorate	R	-	-
Methylene Chloride	R	NR	NR	Potassium Permanganate, 25%	R	R	R
Methylene Iodine	R	NR	NR	Potassium Persulfate	R	R	-
Mineral Oil	R	R	R	Potassium Sulfate	R	R	R
Naphtha	R	R	R	Propane	R	R	R
Naphthalene	R	R	-	Propyl Acetate - R up to 122OF	R	NR	NR
Natural Gas	R	R	-	Propylene Oxide	NR	NR	NR
Nickel Acetate	R	-	-	Pyridine	NR	NR	NR
Nickel Chloride	R	R	R	Pyrogallia Acid	R	R	-
Nickel Nitrate	R	R	R	Salicylic Acid	R	R	-
Nickel Sulfate	R	R	R	Salicylaldehyde	R	NR	NR
Nicotine	R	R	-	Silicic Acid	R	-	-
Nicotinic Acid	R	R	R	Silicone Oil	R	-	-
Nitric Acid, 40%	R	R	R	Silver Cyanide	R	R	R
Nitric Acid, 50%	R	R	NR	Silver Nitrate	R	R	R
Nitric Acid, 100%	R	R	NR	Silver Sulfate	R	R	R
Nitrobenzene - R up to 100OF	R	NR	NR	Sodium Acetate	R	R	R
Nitrous Acid, 10%	R	R	R	Sodium Benzoate	R	R	R

Electro Chemical Manufacturing Duro-Bond E-CTFE Lining

	R	R	R		R	R	R
Sodium Bicarbonate	R	R	R	Sulfur Dioxide, Dry	R	R	R
Sodium Bichromate	R	R	-	Sulfur Dioxide, Wet	R	R	-
Sodium Bisulfate	R	R	R	Sulfuric Acid, 80%	R	R	R
Sodium Bisulfite	R	R	R	Chemical	70°F	150°F	225°F
Sodium Bromide	R	R	R	Sulfuric Acid, 90%	R	R	-
Sodium Carbonate	R	R	R	Sulfuric Acid, 98%	R	R	-
Sodium Chlorate	R	R	R	Sulfuric Acid, 100%	R	-	-
Chemical	70°F	150°F	225°F	Sulfurous Acid	R	R	R
Sodium Chloride	R	R	R	Tall Oil	R	R	R
Sodium Cyanide	R	R	R	Tannic Acid	R	R	R
Sodium Dichromate	R	R	-	Tanning Liquor	R	R	R
Sodium Fluoride	R	R	R	Tartaric Acid	R	R	R
Sodium Hydroxide, 50%	R	R	R	Tetraethyl Lead	R	R	R
Sodium Hydroxide, 70%	R	R	-	Tetrahydrofurane	NR	NR	NR
Sodium Hypochlorite	R	R	R	Tetrahydrofuran	NR	NR	NR
Sodium Iodide	R	R	-	Thionyl Chloride	R	R	-
Sodium Metaphosphate	R	R	R	Toluene	R	R	NR
Sodium Nitrate	R	R	R	Tributyl Phosphate	R	NR	NR
Sodium Nitrite	R	R	R	Trichloroacetic Acid	R	R	NR
Sodium Perchlorate	R	-	-	Trichloroethylene	R	R	R
Sodium Peroxide	R	R	R	Triethanolamine	R	NR	NR
Sodium Phosphate	R	R	R	Triethylamine	R	R	NR
Sodium Silicate	R	R	R	Trisodium Phosphate	R	R	R
Sodium Sulfate	R	R	R	Turpentine	R	R	R
Sodium Sulfide	R	R	R	Urea	R	R	R
Sodium Sulfite	R	R	R	Urine	R	R	-
Sodium Thiosulfate	R	R	R	Vaseline	R	R	-
Stannic Chloride	R	R	R	Vinagar	R	R	R
Stannous Chloride	R	R	R	Vinyl Acetate	R	R	R
Starch	R	R	-	Water	R	R	R
Stearic Acid	R	R	-	Xylene	R	R	-
Succinic Acid	R	R	R	Zinc Chloride	R	R	R
Sulfate Liquor	R	-	-	Zinc Nitrate	R	R	R
Sulfite Liquor	R	-	-	Zinc Sulfate	R	R	R
Sulfur Chloride	R	-	-				

Physical Properties

The normal physical properties of the E-CTFE sheeting are shown in the following table.

Chemical characterization	Thermoplastic fluorocarbon polymer
Color	Clear to translucent, depending on thickness
Odor	None
Melting point	240°C
Upper Service Temperature	160°C
Density (23°C)	1.69 g/cm ³
Tensile Strength (N/mm ²)	42 -48
Elongation at Break	200%
Solubility in water	Insoluble
Explosion limits	None
Hardness Durometer	D 75
Water absorption	< 0.03
Oxygen Index (%)	> 30
Flammability	V-0
Thermal Expansion Coefficient	5 - 8 x 10 ⁻⁵

23 -150°C (mm/mm/°C)

Application

The method of application is as follows:

1. The surface to be lined is properly cleaned and grit blasted to a white metal finish to provide a suitable surface for bonding. (See [Electro Chemical Manufacturing Technical Bulletin #1](#), "Specification for Welded Steel Tanks, Stacks, Ducts or Other Fabricated Equipment for Protective Linings and/or Coatings".)
2. The Duro-Bond E-CTFE laminate is cut into panels to cover the entire area to be lined with a minimum amount of joints to be welded.
3. The panels are then cemented into position and the seams welded with Duro-Bond ECTFE rod and E-CTFE cap strip using a thermoplastic welding gun with nitrogen gas as the inert atmosphere.

Method of Testing

All lined surfaces are visually inspected for surface defects. Any special dimensional tolerances required after lining are also checked.

All lined areas are then spark tested for pinhole leaks using a dielectric spark tester adjusted to 10,000 volts. The tester is moved constantly and quickly over the lining surface to prevent a burn through.

Repair Procedures

Duro-Bond E-CTFE sheet lining can be shop or field repaired. The repairs to defective or damaged areas in the sheet lining are accomplished by cutting out the faulty area, grinding or grit blasting the substrate surface, preparing a piece of sheet of the same dimension, cementing it into position and subsequently welding the joints as described under Application. The repaired area is then inspected and spark tested to insure lining integrity.

Additional Information

For additional technical or safety information, contact us at 330-313-6372, knightmaterials.com, or info@knightmaterials.com.

Knight Material Technologies, LLC
5385 Orchard View Dr. SE
East Canton, OH 44730

The data provided herein falls within the normal range of product properties, but they should not be used to establish specification limits nor used alone as the basis of design. Electro Chemical Manufacturing assumes no obligation or liability for any advice furnished by it or for results obtained with respect to these products. All such data and advice is provided gratis and Buyer assumes sole responsibility for results obtained in reliance thereon.