

**UTEC® – Chemical Resistance**

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The Ultra High Molecular Weight Polyethylene (UHMWPE) – UTEC® is extremely resistant to a wide variety of Substances. The material is almost totally inert, therefore it is used in the most corrosive or aggressive environments at moderate temperatures. Even at high temperatures, it is resistant to several solvents, except aromatic, halogenated hydrocarbons and strong oxidizing materials, such as nitric acid.

The results of innumerable laboratorial tests and the references of international literature are summarized in the following table. The classifications are attributed for continuous and extended expositions at 23 and 60°C, and they do not have to be considered for cyclical or eventual contact.

It has been observed that is very hard to reproduce the real conditions which a product is submitted, either in laboratory or by analogy to similar situations. Thus, the classification table must be used as a parameter to predict the probable behavior of UTEC® with each Substance. Compatibility tests between a product sample and the chemical environment are strongly recommended to verify satisfactory part performance, at the same conditions, for a period of time equal to the life time expected, at each new application. Even the substances classified with X (high attack or absorption) frequently show good practical results.

**Classification:**

A – No effect: Can be used with the product without problems.

B – Moderate effect: Can be used, but a compatibility test should be carried through.

X - High attack or absorption. The material may show swelling or degradation. In general, it can still be used, but with a limited life time. Compatibility test must be carried through.

Note: The information contained herewith is merely informative, expressed in good faith, and represent the truth regarding current knowledge. They do not imply in any result or performance warrant or guarantee. The data herewith shall not be used as specification parameters.

A-No effect, B-Moderate effect, X- High attack or absorption

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| Substance                            | 23°C | 60°C | Substance                  | 23°C | 60°C |
|--------------------------------------|------|------|----------------------------|------|------|
| Acetaldehyde 100%                    | A    | B    | Aspirin®                   | A    |      |
| Acetaldehyde 40%                     | A    | B    | Babaçu palm oil            | A    | A    |
| Acetic acid 10%                      | A    | A    | Barium carbonate           | A    | A    |
| Acetic acid 100%                     | A    | B    | Barium chloride            | A    | A    |
| Acetic acid 60%                      | A    | A    | Barium hydroxide           | A    | A    |
| Acetic anhydride                     | A    | B    | Barium sulphate            | A    | A    |
| Acetone                              | A    | A    | Barium sulphide            | A    | A    |
| Acetophenone                         | A    |      | Battery acid               | A    | A    |
| Acrylic emulsions                    | A    | A    | Beer                       | A    | A    |
| Acrylonitrile                        | A    | A    | Beeswax                    | A    | B    |
| Adipic acid                          | A    | A    | Benzaldehyde               | B    | X    |
| Aluminium oxalate                    | A    | A    | Benzene                    | B    | X    |
| Alum                                 | A    | A    | Benzoic acid               | A    | A    |
| Aluminium acetate                    | A    | A    | Benzyl alcohol             | A    | A    |
| Aluminium chloride                   | A    | A    | Bismuth carbonate          | A    | A    |
| Aluminium fluoride                   | A    | A    | Borax (sodium tetraborate) | A    | A    |
| Aluminium hydroxide                  | A    | A    | Boric acid                 | A    | A    |
| Aluminium sulphate                   | A    | A    | Boron trifluoride          | A    | A    |
| Ammonia ferrous citrate              | A    | A    | Bromic acid                | X    |      |
| Ammonia, gaseous                     | A    | A    | Bromic acid, aqueous 50%   | A    | A    |
| Ammonium bicarbonate                 | A    | A    | Bromine vapour             | X    |      |
| Ammonium bromide                     | A    | A    | Bromine water              | A    |      |
| Ammonium carbonate                   | A    | A    | Buta 1,3-dien              | B    | X    |
| Ammonium chloride sat.               | A    | A    | Butane                     | A    |      |
| Ammonium fluoride 20%                | A    | A    | Butane-diol                | A    | A    |
| Ammonium hydrosulphide               | A    | A    | Butter                     | A    |      |
| Ammonium hydroxide                   | A    | A    | Butyl acetate              | A    | B    |
| Ammonium metaphosphate sat.          | A    | A    | Butyl alcohol              | A    | A    |
| Ammonium nitrate                     | A    | A    | Butyl aldehyde             | B    | X    |
| Ammonium persulphate sat.            | A    | A    | Butyric acid               | A    | B    |
| Ammonium phosphate                   | A    | A    | Calcium bromide            | A    | A    |
| Ammonium sulphate sat.               | A    | A    | Calcium carbonate          | A    | A    |
| Ammonium sulphide sat.               | A    | A    | Calcium chlorate           | A    | A    |
| Ammonium thiocyanate sat.            | A    | A    | Calcium chloride           | A    | A    |
| Amonium oxalate                      | A    | A    | Calcium hydroxide          | A    | A    |
| Amyl acetate 100%                    | A    | A    | Calcium hypochlorite       | A    | A    |
| Amyl alcohol                         | A    | A    | Calcium nitrate            | A    | A    |
| Amyl chloride 100%                   | B    | X    | Calcium phosphate          | A    | A    |
| Aniline 100%                         | A    | A    | Calcium sulphate           | A    | A    |
| Aniline sulphate                     | A    | B    | Calcium sulphide           | B    | B    |
| Anisol 100%                          | B    | B    | Camphor oil                | X    |      |
| Antimony pentachloride               | A    | A    | Carbon disulphide          | B    | X    |
| Antimony trichloride                 | A    | A    | Carbon dioxide             | A    | A    |
| Aqua regia (HCl + HNO <sub>3</sub> ) | X    |      | Carbon monoxide            | A    | A    |
| Arsenious acid 100%                  | A    | A    | Carbon tetrachloride       | B    | X    |

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| Substance                        | 23°C | 60°C |
|----------------------------------|------|------|
| Carbonic acid                    | A    | A    |
| Carnaúba wax                     | A    | A    |
| Carrot juice                     | A    | A    |
| Castor oil                       | A    | A    |
| Cetyl alcohol                    | A    | A    |
| Chloric acid, aqueous 10%        | A    | A    |
| Chlorine water 2%                | A    | A    |
| Chlorine water sat.              | A    | B    |
| Chlorine, gaseous, dry           | B    | X    |
| Chlorine, gaseous, moist         | B    | X    |
| Chlorine, liquid                 | X    |      |
| Chloroacetic acid                | A    | A    |
| Chlorobenzene                    | B    | X    |
| Chloroform                       | X    | X    |
| Chlorosulphuric acid             | X    |      |
| Chrome alum sat.                 | A    | A    |
| Chromic acid 50%                 | B    | X    |
| Citrate caffenin                 | A    | A    |
| Citric acid                      | A    | A    |
| Citronella oil                   | B    | X    |
| Clove oleoresin                  | A    | B    |
| Coconut oil                      | A    | B    |
| Cod liver oil                    | A    | B    |
| Coffee                           | A    | A    |
| Combustible oils                 | A    | X    |
| Copper chloride sat              | A    | A    |
| Copper cyanide                   | A    |      |
| Copper fluoride sat.             | A    | A    |
| Copper nitrate 30%               | A    | A    |
| Copper sulphate sat.             | A    | A    |
| Coprous chloride sat.            | A    | A    |
| Corn oil                         | A    | B    |
| Cottonseed oil                   | A    | A    |
| Creosol, aqueous                 | A    | A    |
| Creosol 100%                     | A    | B    |
| Cresylic acid (creosote)         | A    | A    |
| Copper oxid                      | A    | A    |
| Cyclohexane                      | A    | A    |
| Cyclohexanol                     | A    | A    |
| Cyclohexanone                    | A    | B    |
| Deca hydronaphthaline - Dekalin® | A    | B    |
| Distilled (drinks)               | A    | A    |
| Detergents                       | A    | A    |
| Detergents, synthetic            | A    | A    |
| Dextrin (starch gum), aqueous    | A    | A    |

| Substance                       | 23°C | 60°C |
|---------------------------------|------|------|
| Dextrose                        | A    | A    |
| Diazo salts                     | A    | A    |
| Di-butylphthalate               | A    | B    |
| Dichlorethylene                 | X    | X    |
| Dichlorobenzene                 | B    | X    |
| Diethanolamine                  | A    |      |
| Diethyl ether                   | A    | B    |
| 2-Di-ethylhexylphthalate (DOP)  | A    | B    |
| Diglycolic acid, 30%            | A    | A    |
| Dimethylamine                   | A    | B    |
| Diocetyl phthalate              | A    | B    |
| Emulsifying agents              | A    | A    |
| Emulsions (photographic)        | A    | A    |
| Ethanol amine                   | A    |      |
| 2-Ethyl-hexanol                 | A    | B    |
| Ethyl acetate                   | A    | B    |
| Ethyl alcohol, 96%              | A    | A    |
| Ethyl butyrate                  | B    | B    |
| Ethyl chloride (chloroethane)   | B    |      |
| Ethyl ether                     | B    | B    |
| Ethylene glycol                 | A    | A    |
| Ethylene oxide                  | A    | A    |
| Fatty acids                     | A    | A    |
| Fermentation mash               | A    | A    |
| Ferric chloride                 | A    | A    |
| Ferric cyan potassium sat.      | A    | A    |
| Ferric cyan sodium sat.         | A    | A    |
| Ferric sulphate                 | A    | A    |
| Ferrous chloride sat.           | A    | A    |
| Ferrous sulphate                | A    | A    |
| Fixing bath (photographic)      | A    |      |
| Fluoridric acid, aqueous 40-75% | A    | A    |
| Fluorine, gaseous               | X    |      |
| Fluoroboric acid                | A    | B    |
| Fluorosilicic acid              | A    | A    |
| Formaldehyde                    | A    | A    |
| Formic acid 20-100%             | A    | A    |
| Fructose (fruit sugar) sat.     | A    | A    |
| Fuit juice                      | A    | A    |
| Furfural 100%                   | B    | X    |
| Gallic acid                     | A    | A    |
| Gasoline                        | A    | B    |
| Gear oil                        | A    | B    |
| Gelatine                        | A    | A    |
| Glucose                         | A    | A    |

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|--------------------------------------|------|------|--------------------------------------|------|------|
| Glue                                 | A    | A    | Methyl chloride                      | B    |      |
| Glycerin                             | A    | A    | Methyl ethyl ketone                  | A    | B    |
| Glycine                              | A    | A    | Methylene chloride 100%              | X    | X    |
| Glycol                               | A    | A    | Milk                                 | A    | A    |
| Glycolic acid, up to 70%             | A    | A    | Mint oil                             | B    | X    |
| Heptane                              | A    | B    | Molasses                             | A    | A    |
| Hexachlorobenzene                    | A    | A    | Naphthalene 100%                     | A    | B    |
| Hexane                               | A    | B    | Natural gas                          | A    |      |
| Hexanol                              | A    | A    | Nickel chloride sat.                 | A    | A    |
| Hydrogen                             | A    | A    | Nickel nitrate                       | A    | A    |
| Hydrogen Bromide 10%                 | A    | A    | Nicotonic acid                       | A    |      |
| Hydrogen chloride gas, dry and moist | A    | A    | Nikel sulphate                       | A    | A    |
| Hydrogen peroxide 10%                | B    | X    | Nitric acid (at boiling temperature) | X    | X    |
| Hydrogen peroxide 30%                | B    | X    | Nitric acid 0-30%                    | A    | A    |
| Hydrogen phosphite                   | A    | A    | Nitric acid 30-50%                   | B    | X    |
| Hydrogen sulphide                    | A    | A    | Nitric acid 95%                      | X    | X    |
| Hydroquinone                         | A    | A    | Nitrobenzene                         | A    | B    |
| Iodine-potassium iodine              | A    | A    | Nitroglycerin                        | B    | X    |
| Iron(III) nitrate sat.               | A    | A    | Oleic acid                           | A    | B    |
| Isobutyl alcohol 100%                | A    | A    | Oleum                                | X    | X    |
| Isopropyl alcohol 100%               | A    | A    | Olive oil                            | A    | A    |
| Kerosene                             | A    | B    | Oxalic acid                          | A    | A    |
| Ketchup                              | A    | A    | Oxygen 100%                          | A    | A    |
| Ketones                              | A    | B    | Ozone, 50ppm                         | B    | X    |
| Lactic acid 10-90%                   | A    | A    | Paraffin oil                         | A    | B    |
| Lanoline 100%                        | A    | A    | Perchloric acid, 20%                 | A    | A    |
| Lard                                 | A    | A    | Petrolatum                           | A    | A    |
| Lauric acid                          | A    | A    | Petroleum ether                      | A    | B    |
| Lead acetate sat.                    | A    | A    | Phenol                               | A    | A    |
| Linseed oil                          | A    | A    | Photographic solutions               | A    | A    |
| Lubrificative oil                    | A    | B    | Phosgene, liquid 100%                | X    |      |
| Magnesium carbonate sat.             | A    | A    | Phosphoric acid (50%)                | A    | A    |
| Magnesium chloride sat.              | A    | A    | Phosphorus pentaoxide 100%           | A    | A    |
| Magnesium hydroxide sat.             | A    | A    | Phosphorus trichloride 100%          | A    | B    |
| Magnesium nitrate sat.               | A    | A    | Photographic developer               | A    | A    |
| Magnesium sulphate sat.              | A    | A    | Picric acid, 1%                      | A    |      |
| Magnesium sulphide sat.              | A    | A    | Pine oil                             | A    |      |
| Maleic acid, up to 100%              | A    | A    | Pyridine                             | A    | B    |
| Margarine                            | A    | A    | Potassium hydroxide, 50%             | A    | A    |
| Meat extracts                        | A    | A    | Potassium bicarbonate sat.           | A    | A    |
| Mercury chloride                     | A    | A    | Potassium borate 1%                  | A    | A    |
| Mercury cyanide sat.                 | A    | A    | Potassium bromate, up to 10%         | A    | A    |
| Mercury nitrate                      | A    | A    | Potassium bromide sat.               | A    | A    |
| Methanol 100%                        | A    | A    | Potassium carbonate sat.             | A    | A    |
| Methyl bromide                       | X    |      | Potassium chlorate sat.              | A    | A    |
|                                      |      |      | Potassium chloride sat.              | A    | A    |

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| Substance                        | 23°C | 60°C |
|----------------------------------|------|------|
| Potassium chromate 40%           | A    | A    |
| Potassium cyanide sat.           | A    | A    |
| Potassium dichromate             | A    | A    |
| Potassium fluoride               | A    | A    |
| Potassium nitrate sat.           | A    | A    |
| Potassium perborate sat.         | A    | A    |
| Potassium perchlorate, up to 10% | A    | B    |
| Potassium permanganate, 6%       | A    | A    |
| Potassium sulphate               | A    | A    |
| Potassium sulphide sat.          | A    | A    |
| Potassium sulphite sat.          | A    | A    |
| Propane, gaseous                 | A    |      |
| Propanol                         | A    | A    |
| Propargyl alcohol, 7%            | A    | A    |
| Propylene dichloride 100%        | X    |      |
| Propylene glycol                 | A    | A    |
| Prussic acid                     | A    | A    |
| Resorcinol                       | A    | A    |
| Salicylic acid                   | A    | A    |
| Sea water                        | A    | A    |
| Selenic acid                     | A    | A    |
| Silicic acid                     | A    | A    |
| Silicone oil                     | A    | A    |
| Silver nitrate (sol.)            | A    | A    |
| Soap solution                    | A    | A    |
| Sodium acetate sat.              | A    | A    |
| Sodium benzoate 35%              | A    | A    |
| Sodium bicarbonate sat.          | A    | A    |
| Sodium bisulphate sat.           | A    | A    |
| Sodium bisulphite sat.           | A    | A    |
| Sodium borate                    | A    | A    |
| Sodium carbonate                 | A    | A    |
| Sodium chlorate sat.             | A    | A    |
| Sodium chloride sat.             | A    | A    |
| Sodium cyanide                   | A    | A    |
| Sodium dichromate                | A    | A    |
| Sodium fluoride sat.             | A    | A    |
| Sodium hydroxide                 | A    | A    |
| Sodium hypochlorite 20%          | B    | X    |
| Sodium nitrate                   | A    | A    |
| Sodium nitrite                   | A    | A    |
| Sodium phosphate                 | A    | A    |
| Sodium silicate                  | A    | A    |
| Sodium sulphate sat.             | A    | A    |
| Sodium sulphide sat.             | A    | A    |

| Substance                | 23°C | 60°C |
|--------------------------|------|------|
| Sodium sulphite          | A    | A    |
| Soy oil                  | A    | A    |
| Stearic acid 100%        | A    | A    |
| Succinic acid, 50%       | A    | A    |
| Sugar syrup              | A    | A    |
| Sulfamic acid            | A    | A    |
| Sulfonic acid (Benzene)  | A    | A    |
| Sulphur                  | A    | A    |
| Sulphur dioxide, dry     | A    | A    |
| Sulphur dioxide, moist   | A    | A    |
| Sulphur trioxide, dry    | X    |      |
| Sulphuric acid 0-50%     | A    | A    |
| Sulphuric acid 80%       | A    | A    |
| Sulphuric acid 98%       | B    | X    |
| Sulphurous acid          | A    | A    |
| Surfactants              | A    | A    |
| Tallow                   | A    | A    |
| Tannic acid 10%          | A    | A    |
| Tartaric acid 10%        | A    | A    |
| Tetraethyl lead 100%     | A    |      |
| Tetrahydrofuran          | B    | X    |
| Tetralin® 100%           | A    | X    |
| Toluene 100%             | B    | X    |
| Transformer oil          | A    | B    |
| Trichloroacetic acid 50% | A    | A    |
| Trichloroethylene 100%   | X    | X    |
| Triethanolamine 100%     | A    | B    |
| Trisodium phosphate      | A    | A    |
| Turpentine               | B    | B    |
| Urea                     | A    | A    |
| Vanilla                  | A    | A    |
| Wine                     | A    |      |
| Wine vinegar             | A    | A    |
| Xylene                   | B    | X    |
| Zinc chloride sat.       | A    | A    |
| Zinc oxide               | A    | A    |
| Zinc sulphate sat.       | A    | A    |

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