



Material Section Guide

CORRODENT	TEMP. °F	CONC. %	RECOM. MATERIAL	CORRODENT	TEMP. °F	CONC. %	RECOM. MATERIAL	CORRODENT	TEMP. °F	CONC. %	RECOM. MATERIAL
Acetic Acid	212	ALL	Monel	Copper Plating Solution (Acid)	75		304 SS	Oleic Acid			SEE FATTY ACIDS
Acetic Anhydride	300		Nickel	Copper Plating Solution (Cyanide)	180		304 SS	Oxalic Acid	212	ALL	Monel
Acetone	212	ALL	304 SS	Corn Oil	200		304 SS	Palmitic Acid			SEE FATTY ACIDS
Acetylene	400		304 SS	Creosote	200	ALL	304 SS	Phenol	212	ALL	316 SS
Alcohols	212	ALL	304 SS	Crude Oil	300		Monel	Phosphoric Acid	212	ALL	316 SS
Aluminum (Potassium or Sodium)	300	ALL	Hast. C	Ethanol			SEE ALCOHOLS	Photographic Bleaching	100	ALL	304 SS
Aluminum Chloride	212	ALL	Hast. B	Ethyl Acetate			SEE LAQUER THINNER	Potassium Compounds			SEE SODIUM COMPUINDS
Aluminum Sulfate	212	ALL	316 SS	Ethyl Chloride, Dry	500		Steel	Propane	300		Steel
Ammonia, Dry	212	ALL	304, 316 SS	Ethylene Glycol (Uninhibited)	212	ALL	304 SS	Rosin	700	100%	316 SS
Ammonium Hydroxide (Ammonia, Aqua)	212	ALL	304, 316 SS	Ethylene Oxide	75		Steel	Salt or Brine			SEE SODIUM CHLORIDE
Ammonium Chloride	300	50%	Monel	Fatty Acids	500	ALL	316 SS	Sea Water	75		Monel
Ammonium Nitrate	300	ALL	304 SS	Ferric Chloride	75	ALL	Hast. C	Soap & Detergents	212	ALL	304 SS
Ammonium Sulfate	212	ALL	316 SS	Ferric Sulfate	300	ALL	304 SS	Sodium Bicarbonate	212	20%	316 SS
Amyl Acetate	300	ALL	304 SS	Formaldehyde	212	40%	316 SS	Sodium Bisulphate	212	20%	304 SS
Aniline	75		Monel	Formic Acid	300	ALL	316 SS	Sodium Bisulphite	212	20%	304 SS
Asphalt	250		304 SS	Fluorine, Anhydrous	100		304 SS	Sodium Carbinat	212	40%	316 SS
Atmosphere (Industrial and Marine)			304 SS	Freon	300		Steel	Sodium Chloride	300	30%	Monel
Barium Compounds			SEE CALCIUM	Furfural	450		316 SS	Sodium Chromate	212	ALL	316 SS
Beer	70		304 SS	Gasoline	300		Steel	Sodium Cyanide	212	ALL	304 SS
Benzene (Benzol)	212		Steel	Glucose	300		304 SS	Sodium Hydroxide	212	30%	316 SS
Benzoic Acid	212	ALL	316 SS	Glue ph 6-8	300	ALL	304 SS	Sodium Hypochlorite	75	10%	Hast. C
Bleaching Powder	70	15%	Monel	Glycerine	212	ALL	Brass	Sodium Nitrate	212	40%	304 SS
Borax	212	ALL	Brass	Hydrobromic Acid	212	ALL	Hast. C	Sodium Nitrite	75	20%	316 SS
Bordeaux Mixture	200		304 SS	Hydrochloric Acid (37-38%)	225	ALL	Hast. B	Sodium Phosphate	212	10%	Steel
Boric Acid	400	ALL	316 SS	Hydrocyanic Acid	212	ALL	304 SS	Sodium Silicate	212	10%	Steel
Bromine	125	DRY	Monel	Hydrofluogilicic Acid	212	40%	Monel	Sodium Sulfate	212	30%	316 SS
Butane	400	ALL	Steel	Hydrofluoric Acid	212	60%	Monel	Sodium Sulfide	212	10%	316 SS
Butyl Alcohol			SEE ALCOHOLS	Hydrogen Chloride, Dry	500		304 SS	Sodium Sulfite	212	30%	304 SS
Butyric Acid	212		Hast. C	Hydrogen Fluoride, Dry	175		Steel	Sodium Thiosulfate	212	ALL	304 SS
Calcium Bisulphite	75	ALL	Hast. C	Hydrogen Peroxide	125	10-100%	304 SS	Steam			304 SS
Calcium Chloride	212	ALL	Hast. C	Kerosene	300	ALL	Steel	Stearic Acid			SEE FATTY ACIDS
Calcium Hydroxide	300	20%	Hast. C	Lacquers & Thinners	300	ALL	304 SS	Sugar Solutions			SEE GLUCOSE
Calcium Hypochlorite			SEE BLEACHING POWDER	Lactic Acid	300	ALL	316 SS	Sulfur	500		304 SS
Carbolic Acid			SEE PHENOL	Lime	212	ALL	316 SS	Sulfur Chloride	75	DRY	316 SS
Carbon Dioxide, Dry	800	ALL	Brass	Linseed Oil	75		Steel	Sulfur Dioxide	500	DRY	316 SS
Carbon Disulfide	200		304 SS	Magnesium Chloride	212	50%	Nickel	Sulfur Trioxide	500	DRY	316 SS
Carbon Tetrachloride	125	ALL	Monel	Magnesium Hydroxide (or Oxide)	75	ALL	304 SS	Sulfuric Acid	212	10-90%	Hast. B
Carbonated Beverages	212		304 SS	Magnesium Sulfate	212	40%	304 SS	Sulfuric Acid	212	90-100%	316 SS
Carbonated Water	212	ALL	304 SS	Mercuric Chloride	75	10%	Hast. C	Sulfuric Acid, Fuming	175		Hast. C
Chloracetic Acid	212	ALL	Monel	Mercury	700	100%	Steel	Sulfurous Acid	75	20%	316 SS
Chlorine, Dry	100		Monel	Methyl Chloride, Dry	75		Steel	Titanium Tetrachloride	75	ALL	316 SS
Chlorine, Moist	100	ALL	Monel	Methylene Chloride	212	ALL	304 SS	Tannic Acid	75	40%	Hast. B
Chloroform, Dry	212		Monel	Milk, fresh or sour	180		304 SS	Toluene	75		Steel
Chromic Acid	300	ALL	Hast. C	Molasses			SEE GLUCOSE	Trichloroacetic Acid	75	ALL	Hast. B
Cider	300	ALL	304 SS	Natural Gas	70		304 SS	Trichlorethylene	300	DRY	Monel
Citric Acid	212	ALL	Hast. C	Nitric Acid	75	ALL	304 SS	Turpentine	75		316 SS
Copper (10) Chloride	212	ALL	Hast. C	Nitric Acid	110	ALL	316 SS	Varnish	150		Steel
Copper (10) Nitrate	300	ALL	316 SS	Oxygen	75	ALL	Steel	Zinc Chloride	212	ALL	Hast. B
Copper (10) Sulfate	300	ALL	316 SS					Zinc Sulfate	212	ALL	316 SS

In recommending the above material, consideration has been given to providing good service life without undue cost. Where two or more materials are satisfactory, the least expensive is listed. Consult factory for information on materials or services not given.

Metallic Thermowell Materials



Summary Table - Metallic Thermowell Materials

Designation	Nominal Composition	Maximum Temp. (con't. Serv., Air)	Melting Range	Application Notes
304SS	18% Chromium 8% Nickel	900°C	1371°C-1454°C	Offers excellent resistance to many corrosive agents encountered in domestic and industrial use.
310SS	25% Chromium 20% Nickel	1148°C	1371°C-1454°C	Good resistance to oxidation at temperatures up to 1148°C. Good resistance to thermal fatigue and cyclic heating.
316SS	17% Chromium 12% Nickel 2-3% Molybdenum	898°C	1371°C-1454°C	Good resistance to a wider range of chemicals than 304SS. Withstands sulphurous acid compounds.
321SS	Similar to 304SS but Steel stabilized by Titanium addition	871°C	1371°C-1426°C	Not sensitive to inter-granular corrosion when heated within the carbide precipitation range of 482°C - 815°C. Similar in corrosion resistance to 304SS.
347SS	Similar to 304SS but contains Tantalum and is Steel stabilized by Columbium addition	871°C	1371°C-1426°C	Excellent equivalent to 304SS for 426°C - 815°C range. Superior to 321SS where service is both corrosive and at an elevated temperature.
304LSS 316LSS	Similar to 304SS and 316SS but with reduced carbon	871°C	1371°C-1454°C	Low carbon versions of 304SS and 316SS (maximum of 0.03% carbon). Because of low carbon content the effects of carbide precipitation are reduced.
Carpenter 20-Cb-3	20% Chromium 34% Nickel 2.5% Molybdenum 3.5% Copper	954°C	1426°C	Superior grade with excellent resistance to corrosive conditions.
Inconel 600	76% Nickel 15.5% Chromium	1148°C	1354°C-1412°C	Excellent material for severely corrosive environments. Resistant to oxidation at temperatures up to 1175°C.
Inconel 601	60.5% Nickel 23.0% Chromium 1.5% Aluminum	1148°C	1301°C-1367°C	Similar to Inconel 600 however higher Chromium content gives superior resistance to oxidizing, carburizing and Sulphur containing environments.
Incoloy 800	32.5% Nickel 46% Iron 21% Chromium	1093°C	1357°C-1385°C	Resistant to oxidation and carburization at elevated temperatures. It resists stress - corrosion cracking, Sulphur attack, internal oxidation, scaling and corrosion in a wide variety of industrial atmospheres.
Monel 400	66% Nickel 31% Copper	537°C	1343°C	Highly resistant to corrosion by chlorinated solvents, glass etching agents, Sulfuric and many other acids, and practically all alkalis generally free from stress-corrosion cracking. Good resistant to salt water corrosion.
Hastelloy B	61% Nickel 28% Molybdenum	1204°C	1260°C-1354°C	Good corrosion resistance to Hydrochloric, Sulfuric, Phosphoric, and Acetic acids. Excellent corrosion resistance to Hydrogen-Chloride gas.
Hastelloy C	54% Nickel 16% Molybdenum 15.5% Chromium 4% Tungsten	1204°C	1260°C-1354°C	Good corrosion resistance to many chemical environments, including Ferric and Cupric Chlorides, contaminated mineral acids, wet Chlorine gas. Oxidation resistance to 990°C.
Hastelloy X	47% Nickel 9% Molybdenum 22% Chromium 0.5% Tungsten	1204°C	1260°C-1354°C	Good high temperature strength and resistance to oxidation to 1204°C. Also good for reducing conditions.



Melting Temperatures of Metals

Approximate Melting Temperatures of Various Metals

Metal	Melting Temperature
Mercury	-38.87°C
Gallium	29.78°C
Indium	156.40°C
Tin	231.90°C
Bismuth	271.30°C
Cadmium	320.90°C
Lead	327.40°C
Zinc	419.46°C
Magnesium	650.00°C
Aluminum	660.20°C
Brass	925.00°C
Silver	960.50°C
Gold (24 Karat)	1063.00°C
Copper	1083.00°C
Cast Iron	1150.00°C
Manganese	1245.00°C
Beryllium	1350.00°C
Stainless Steel	1371.00°C
Nickel	1455.00°C
Cobalt	1495.00°C
Iron	1539.00°C
Palladium	1554.00°C
Vanadium	1735.00°C
Platinum	1773.00°C
Titanium	1820.00°C
Chromium	1890.00°C
Rhodium	1966.00°C
Niobium/Columbium	2415.00°C
Iridium	2454.00°C
Molybdenum	2625.00°C
Osmium	2700.00°C
Tantalum	2996.00°C
Rhenium	3170.00°C
Tungsten	3410.00°C