

Tube Specifications and Applications

PROTECTION TUBE CODE	TYPICAL APPLICATIONS	TUBE DESCRIPTION	COMPOSITION OR FORM	MAX. TEMP.	GENERAL COMMENTS
304	Food Preparation Petroleum Industry Chemical Processes Mixed Acids Lactic Acid Dyeing Tanks	304 Stainless Steel	Controlled amounts of Nickel, Chromium, Carbon, Manganese, Silicon, traces of Phosphorous & Sulfur, balance Iron	1600°F Oxidizing, 2300°F Non-Oxidizing	Good resistance to corrosion. For wet process applications such as steam, oil, and many chemical solutions.
316	Petroleum Industry Chemical Processes	316 Stainless Steel	12% Nickel, 17% Chromium, 2 1/2% Molybdenum, 2% Manganese max., 0.08% Carbon max., 1% Silicon max., traces of Phosphorous & Sulfur, balance Iron	1600°F Oxidizing	Good resistance to corrosion. Resists pitting corrosion. More resistant to acids than 304 SS.
446	High Temperature Hardening Nitriding Salt Baths Vitreous Enameling Non-ferrous Metals such as Tin, Lead, Zinc or Babbit Metal Smelting Low Temperature Blast Furnaces	446 Stainless Steel	27% Chromium, 0.25% Nitrogen max., 0.20% Carbon max., 1.50% Manganese max., 1.00% Silicon max., traces of Phosphorous & Sulfur, balance Iron	2000°F Oxidizing, 2300°F Non-Oxidizing	Good resistance to corrosion at high temperatures. Impervious to sulfurous atmospheres, salt bath or low temperature molten metals.
601	High Temperature Heat Treating Carburizing Nitriding Salt Baths Blast Furnace Operations Gas Generators Ceramic Kilns	Inconel 601	61% Nickel, 23% Chromium, 14% Iron, 1.35% Aluminum	2200°F Oxidizing	Excellent resistance to corrosion and oxidation at high temperature. Good mechanical strength. More resistant to sulfur than Inconel 600. Hydrogen causes embrittlement.
200	Potassium Cyanide Salt Baths 2000°F Caustics and Brines High Temperature Chemical Applications 1200°F	Pure Nickel	Drawn or Drilled, 99.5% Nickel	2200°F Oxidizing, 1000°F Reducing, 2400°F Neutral	For high temperature applications. Will withstand many chemical actions, but must not be placed in the presence of sulfur. Frequently placed in caustic and molten salt baths. Drilled tube recommended for hydrogen atmospheres.
CSP	Annealing Drawing Tempering Glass Lehrs Power Plant Preheaters Food Baking Ovens Asphalt Mixers	Low Carbon Black Steel Pipe	Controlled amounts of Carbon Manganese, Silicon and Copper, traces of Phosphorous & Sulfur, balance Iron	1250°F	For non-corrosive atmospheres and in low temperature molten metals.
CIT	Chemical Industry: • Molten Aluminum • Die Cast Metals	Cast Iron	Cast	1300°F Oxidizing, 2000°F Non-Oxidizing	To 1600°F in reducing atmospheres. Will withstand sulfuric acid and caustic solutions. For extra long life, process coated tubes are available. Cast iron tubes should be painted daily with whitening when measuring aluminum or die cast metal temperatures.
LT-1	High Temperature Heat Treating: • Molten Copper Base Alloys to 2100°F • Blast Furnace and Stack Gases to 2400°F • Sulfur Burners to 2000°F • Cement Kilns to 2200°F • Chemical Process Reactors to 2500°F	Metal-Ceramic Tubes	(Slip cast composite of Chromium and Aluminum Oxide) 77% Chromium 23% Aluminum Oxide	2500°F	Superior oxidation resistance to 2500°F. Thermal conductivity equal to that of stainless steel. Good resistance to most molten metals to 2100°F. Not usable in molten aluminum. With noble metal element, a ceramic primary tube is required.
CPT	Ceramics Industry: • Bright Annealing • Forging Furnaces • Glass Making • High Speed Salt Baths	Mullite	Al ₂ O ₃ 63.5% SiO ₂ 34.2% Fe ₂ O ₃ 0.6% TiO ₂ 0.6% CaO 0.1% MgO 0.4% Na ₂ O 0.6%	2800°F	Impervious to gases at high temperature. Possesses good thermal shock but poor mechanical shock. Often necessary to provide secondary tube protection. Should be mounted vertically. Usable in Barium Chloride salt baths to 2350°F.
CPT	Induction Melting up to 3200°F Applications for metal and ceramic industry requiring extreme temperatures	Alumina	SiO ₂ 0.1% MgO 0.1% Na ₂ O 0.1%	3400°F	Fair resistance to thermal and mechanical shock. For very high temperature processes. Impervious to gases up to 3200°F.
SPT	Brick and Ceramic Kilns Steel Soaking Pits Applications requiring resistance to cutting action of flames and gases	Silicon Carbide	90% Silicon Carbide, 9% Silicon Dioxide, balance Aluminum Oxide & Ferric Oxide	3000°F	For molten non-ferrous metals. Also is a secondary protection tube for resistance to thermal shock.