

Metals

CATALOG MATERIAL CODE	MATERIAL/COMPOSITION	TYPICAL AREAS OF USE				APPLICATION GUIDELINE INFORMATION
		TUBING	MGO SHEATHS	PROT. TUBES	DRILLED WELLS	
50	ZIRCONIUM (UNS R60702) 99.2% Zr	X		X	X	Up to 400 °C [752 °F]. Zirconium has a high affinity to oxygen that results in the formation of a regenerative protective oxide layer in most media. This oxide layer gives the material chemical resistance and erosive resistance in high velocity applications. Zirconium is resistant to corrosion from most organic and inorganic acids and salts and it is totally resistant to alkalis.
59	F22 (UNS K21590) Cr 2.25%, Mo 1%			X	X	Carbon steel alloy typically used in power plant, boiler and turbine applications.
60	F11 (UNS K11572) Cr 1.25%, Mo .5%, Si			X	X	Carbon steel alloy typically used in power plant, boiler and turbine applications.
61	A105 C, Si				X	Carbon steel alloy typically used in power plant, boiler and turbine applications.
79	RA330 (UNS: N08330) Ni 35%, Cr 19%, Mn 2%, Si 1.25%, FE balance			X	X	RA330 is an austenitic heat and corrosion resisting alloy offering an exceptional combination of strength and resistance to carburization, oxidation and thermal shock. Carburization and oxidation resistance to 1148 °C [2100 °F] are enhanced by a nominal 1.25% silicon addition. RA330 alloy is used in high temperature industrial environments where good resistance to the combined effects of carburization and thermal cycling or liquid quenching are required.
91	F91 (UNS K91560) Cr 9%, Mo 1%, V			X	X	Chrome Moly alloy typically used in power plant, boiler and turbine applications.

Ceramics and Composite Materials

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		TUBING	MGO SHEATHS	PROT. TUBES	DRILLED WELLS	
12	METAL CERAMIC LT-1 (slip cast composite of chromium and aluminum oxide,) 77% chromium, 23% aluminum oxide			X		Up to 1374 °C [2500 °F] in oxidizing conditions. Main areas of usage are molten copper base alloys to 1149 °C [2100 °F], blast furnace and stack gases to 1316 °C [2400 °F], Sulfur burners to 1093 °C [2000 °F], cement kilns to 1204 °C [2200 °F], chemical process reactors to 1371 °C [2500 °F]. A ceramic primary tube is required when a noble metal thermocouple is used.
13	VESUVIUS			X		Up to 927 °C [1700 °F]. For use in aluminum and other non-ferrous metals. Not wetted by molten aluminum and other non-ferrous metals. No contamination. Resists thermal and mechanical shock. Brittle after heating. Handle carefully.
14	CERITE®-II (Cast oxide composites)			X		Up to 1093 °C [2000 °F]. For submerged use in aluminum and other non-ferrous metals. Not wetted by molten aluminum and other non-ferrous metals. No contamination. Good thermal and mechanical shock resistance.
15	CERITE®-III (Cast oxide composites)			X		Up to 1093 °C [2000 °F]. For submerged use in aluminum and other non-ferrous metals. Not wetted by molten aluminum and other non-ferrous metals. No contamination. Good thermal and mechanical shock resistance.
16	MULLITE 63% alumina			X		Up to 1510 °C [2750 °F] when supported. Has poor mechanical shock resistance, but good thermal shock resistance. For barium chloride salt baths to 1288 °C [2350 °F]. Should be vertical mounted or supported if horizontal. For high temperature applications of ceramic industry, heat treating, glass manufacture. Impervious to gases at high temperatures.
17	ALUMINA (Recrystallized 99.7% AL ₂ O ₃)			X		Up to 1889 °C [3400 °F] when supported. Has only fair resistance to thermal and mechanical shock. Essentially same applications as Mullite including induction melting, vacuum furnaces. Impervious to gases at high temperatures.
18	SILICON CARBIDE 90% silicon carbide, 9% silicon dioxide, balance aluminum oxide			X		Up to 1650 °C [3000 °F]. For an outer protection tube with Alumina® or mullite primary tube. For brick and ceramic kilns, steel soaking pits, molten non-ferrous metals. Can withstand direct flame impingement. Fair thermal shock resistance. Approximately 14% porosity.
19	HEXOLOY® SA sintered alpha, silicon carbide			X		Up to 1650 °C [3000 °F] in air. High thermal conductivity, excellent wear and abrasion resistance, high thermal shock resistance, and good mechanical strength. Superior chemical resistance in both reducing and oxidizing environments. Attacked by Halides, fused caustics, and ferrous metals.
71	RECRYSTALLIZED SILICON CARBIDE (Halsic R) 99% silicon			X		Up to 1600 °C [2912 °F] in oxidizing atmosphere, and 2000 °C [3632 °F] in a vacuum atmosphere. Used as an outer protection tube in hot stack emissions, combustion chambers, chemical reactors, and incineration of medical, municipal, and industrial waste. Can withstand direct flame impingement, has excellent thermal shock characteristics, and excellent corrosion resistance. A ceramic inner tube is required when used with noble metal thermocouples.

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