NOTICE:

Prices and availability are subject to change without notice. Please contact Marlin Manufacturing before ordering for updated pricing.

PROTECTING TUBES
LT-1 METAL-CERAMIC

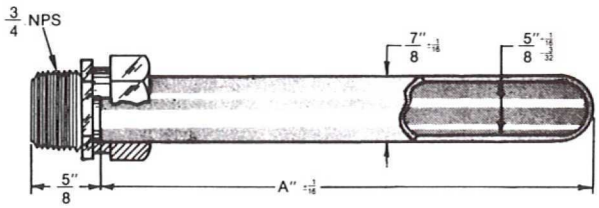
* Superior oxidation resistance to 2200° F
* Thermal conductivity comparable to that of stainless steel
* Good resistance to wetting by most molten metals

LT-1 is hard, abrasion-resistant and dense—is a slip-cast composite of two compatible high temperature materials, chromium and aluminum oxide. LT-1 has excellent oxidation resistance and also resists wetting by many metals and alloys, as well as basic furnace slags. The chromium-metal phase takes on a very tightly bonded layer of chromium oxide which, together with the naturally inert nature of the alumina, provides this material with its remarkable resistance to oxidizing atmospheres over 2200° F, good corrosion resistance, and the ability to resist wetting by molten metals. High thermal conductivity and the resultant excellent sensitivity to temperature changes accounts in part for its demand in the high temperature pyrometry field as a thermocouple protection tube.

LT-1 has good strength at temperatures where many high-temperature metals melt. Above about 2800°F, it begins to soften and becomes plastic. LT-1 thermocouple protection tubes have, however, been used successfully for dip immersion at a temperature of 3000° F. In use or service care must be taken to avoid conditions of extreme thermal shock, extreme thermal gradients, mechanical shock, and impact. Although LT-1 is superior to ceramics in all of these properties, it is less resistant to shock and impact than the metallic alloys. Therefore, a standard thermocouple protection tube should be preheated to about 900°F before immersion in molten metal at 2000° F or higher. Whenever practical the following preheat procedure can also be used: Hold the tube immediately above the molten metal for approximately one minute before immersing. In tests conducted this procedure proved to be adequate to prevent thermal shock failure.

LT-1 exhibits good resistance to wear under conditions of sliding friction as well as resistance to abrasion at high temperatures. The hardness of this material (Rockwell C 37) is more indicative of the crushing strength of the material than its true hardness because the individual particles have a greater hardness than the combined body.

LT-1 is less porous than most compacts. There is no significant passage of gases through the body at high temperature, except under high vacuum. For the usual industrial application, it is sufficiently impermeable.



Part Number	TUBE LENGTH (Dimension "A") Inches	Price Per Tube
LT-1	9	$82.
	12	94.
	18	141.
	24	187.
	30	249.
	36	293.
	48	583.

DISCOUNT SCHEDULE	
Quantity	Factor
1-9	NET
10-49	.90
50-74	.85
75-99	.80
100+	.75

TOLERANCES AND SPECIFICATIONS:

I.D. Size - Will pass a 33/64 inch diameter × 2 inch long probe through the full length of the tube.
Straightness - Tube to be straight within 3/16 inch per foot of length as measured chord to arc.
Note - For use with B & S Wire Gage 8 or smaller. A ceramic primary tube is required when noble metal thermocouple is used.

CONNECTING FITTINGS:

Standard 3/4" conduit fitting, malleable iron with 3/4" N.P.S. thread. Thermocouple Protecting Tubes can be supplied without fitting. Specify with suffix "0" eg. LT-1-12-0 and add $5.00 to tube cost.

TYPICAL PHYSICAL PROPERTIES

PROPERTY	UNITS	VALUE	LENGTH (INCHES)	WEIGHT PER TUBE (POUNDS)
Thermal Conductivity	BTU-ft/ft²-hr° F	17	9	.56
Coefficient of Thermal Expansion	in/in/° F	5 × 10_⁶	12	.75
Density	gm/cc	5.8	18	1.20
Flexural Strength	psi	45,000	24	1.75
Compressive Strength	psi	110,000	30	2.00
Hardness	Rc	34	36	2.60
Chemical Composition	Weight %	Cr-77 Al_2O_3—23	48	3.50

RECOMMENDED APPLICATIONS

1. Molten copper and brass to 2100° F intermittent and continuous immersions.
2. Corrosive SO_2 and SO_3 gas (to 2200° F) and SO_3 and HF gas (to 2000° F).
3. Open hearth furnace checker chambers to 2200° F.
4. Steel mill soaking pits to 2200° F.
5. Pelletizing chamber of Taconite refining operation to 2100° F.
6. Molten zinc to 1600° F.
7. Molten lead to 650° F.
8. Basic steels and slags to 3000° F (intermittent) and 2200° F (continuous in open hearth and general foundry practices.
9. Calcining kilns to 2200° F.
10. Barium titanate (barium oxide service) to 2200° F.
11. Magnesium oxide calcining kilns.
12. Fluid bed cement process with severe corrosion and temperature to 2200° F (fluid method of producing builders cement).
13. Gas and ethylene cracking atmosphere.
14. Atmosphere directly upon burning sodium (1800-2200° F).
15. Oil fired furnace chambers.
16. Atmosphere directly above molten glass in an open hearth glass furnace.
17. Molten silver solder.
18. Molten tin.
19. Borax flux.
20. Copper matte.
21. Boiling sulphuric acid — 97%.
22. Blast furnace stove dome and bustle pipes.

NON-RECOMMENDED APPLICATIONS

1. Molten aluminum.
2. Cryolite.
3. Tin (stannous) chloride (750° F).
4. Acid slag.
5. Carbide slag.
6. Molten glass.
7. Boiling sulphuric acid — 10%.
8. Carburizing atmospheres.
9. Nitriding atmospheres.
10. Barium chloride salt bath.
11. Sodium Nitrate — nitrate salt bath.

Since 1952 Marlin
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