TEMPERATURE CONTROLS PTY LTD

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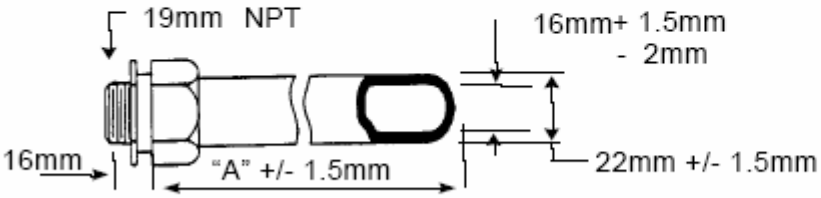
UCAR® METAL-CERAMIC THERMOCOUPLE PROTECTING TUBES GRADE LT-1

TUBE LENGTH		TUBE WITH CONNECTOR A		TUBE WITH CONNECTOR B
Inches	cm	Current Catalog #	Approx. Weight Each (g)	Approx. Weight Each (g)
9	22.9	LT19	272	450
12	30.5	LT112	363	544
18	45.7	LT118	544	725
24	61.0	LT124	816	998
3	76.2	LT130	907	1088
36	91.4	LT136	1179	1360
48	121.9	LT148	1588	1769

CONNECTOR FITTINGS:

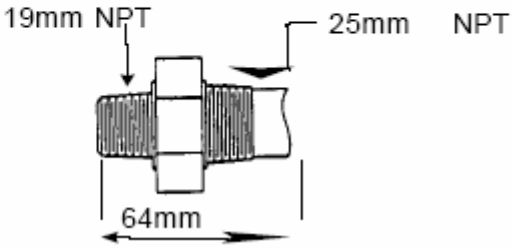
TYPE "A"

EMT connector, gland compression, zinc plated steel body with zinc plated malleable iron nut.



TYPE "B"

Cold rolled steel fitting with 35mm Hex, cemented to the tube. Provides threads for head and furnace mounting.



TUBE TOLERANCES AND SPECIFICATIONS:

I.D. Size — Will pass a 13mm diameter x 50mm long probe through the full length of the tube.

Straightness — Tube to be straight within 5mm per 300mm 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.

AVAILABILITY: Standard Sizes ----- From stock except anticipate 10 days for M.T.O. connectors B

PACKAGING: Each tube is individually boxed for shipment.

DESCRIPTION: UCAR Metal Ceramic, Grade LT-1 --- hard, abrasion-resistant and dense --- is a slip-cast composite of two compatible high temperature materials, chromium and aluminum oxide. Products made for Grade LT-1 material possess three properties of particular interest:

- Superior oxidation resistance to 1370 degrees C
- Thermal conductivity comparable to that of stainless steel
- Good resistance to wetting by most molten metals

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RECOMMENDED APPLICATIONS

1. Molten copper and brass to 1150°C Intermittent and continuous immersions.
2. Corrosive SO_2 and SO_3 gas (to 1370°C) and SO_3 and HF gas (to 1095°C).
3. Open hearth furnace checker chambers to 1345°C.
4. Steel mill soaking pits to 1370°C.
5. Pellletizing chamber of Taconite refining operation to 1150°C.
6. Molten zinc to 870°C.
7. Molten lead to 340°C.
8. Basic steels and slags to 1730°C (intermittent) and 1370°C (continuous in open hearth and general foundry practices).
9. Calcining kilns to 1200°C.
10. Barium titanate (barium oxide service) to 1200°C.
11. Magnesium oxide calcining kilns.
12. Fluid bed cement process with severe corrosion and temperature to 1315°C (fluid method of producing builders cement).
13. Gas and ethylene cracking atmosphere.
14. Atmosphere directly upon burning sodium (980-1370°C).
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 (400°C).
4. Acid slag.
5. Carbide slag.
6. Copper alloys above 1150°C.
7. Molten glass.
8. Boiling sulphuric acid – 10%.
9. Carburizing atmospheres.
10. Nitriding atmospheres.
11. Barium chloride salt bath.
12. Sodium Nitrate – nitrate salt bath.

TYPICAL PHYSICAL PROPERTIES

Property	Units	Value
Thermal Conductivity	Watt-cm/cm^2-° K	0.294
Coefficient of Thermal Expansion	cm/cm/° C	2.8 x 10^{-6}
Density	gm/cc	5.8
Flexural Strength	Mpa	310
Compressive strength	Mpa	760
Hardness	Rc	34
Chemical Composition	Weight %	Cr-77 Al_2O_3-23

By the very nature of its constituents, UCAR metal-ceramic LT-1 exhibits properties that are not found solely in either a metal or pure ceramic alone.

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 1200°C, 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 1810°C, it begins to soften and becomes plastic. LT-1 thermocouple protection tubes have, however, been used successfully for dip immersion at a temperature of 1650°C. 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 480°C before immersion in molten metal at 1095°C 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.

UCAR metal-ceramic 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.

UCAR metal-ceramic 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. For example, SO_2 and SO_3 gases have not penetrated LT-1 thermowells over a three-year period to affect thermocouple wires.