

# CERAMIC PROTECTION TUBES

Alumina, Mullite and Hexoloy SE protection tubes are used at high temperatures that have a small slope of temperature change. Any thermocouple type can be used in these ceramic tubes; however, Platinum-Rhodium and Chromel-Alumel are used most often due to their high operating temperature range. "Alumina" is an Aluminum Oxide ceramic (99.7% Al<sub>2</sub>O<sub>3</sub>). "Mullite" is a compound of Alumina and Silica (Silicon Carbide). "Hexoloy" is a sintered alpha Silicon Carbide. Alumina tubes can be used at 3400°F (1870°C), Mullite tubes can be used at 3100°F (1700°C) and Hexoloy will not slump at 3000°F (1648°C) even under load. Alumina and Mullite tubes are somewhat gas tight, sensitive to thermal shock, and can crack if one end of the tube is heated at a different rate than the other. If the tubes are exposed to a significant sharp decline or rise in temperature, they may crack. Hexoloy has excellent thermal shock resistance, universal corrosion resistance and exceptional wear with high strength and extreme hardness for severe environment applications. It is not gas tight.

Platinum-Rhodium thermocouples should always be protected in ceramic protection tubes. Alumina should be used rather than Mullite for all atmospheres, except oxidizing, where Mullite can be used. The Silicon from the Mullite can contaminate the Platinum-Rhodium thermocouple.

We recommend that the user preheat the entire tube to ≈ 900°F before installing it into a hot process environment.

#1	DESCRIPTION					
5D	Ceramic protection tubes - Add a W here for a brass cap and stainless steel chain attached to threaded protection tubes only (Example: 5DW)					
	#2	MATERIAL				
	A	Alumina	G	Alumina/Mullite 60/40		
	M	Mullite	X	Other, specify		
	H	Hexoloy SE Silicon Carbide				
	#3	ATTACHING DEVICE (See illustrations to the right and below)				
	O	No fitting				
	P	Open both ends, no fitting				
	C	Collar (See collar OD dimensions below in option #4)				
	B*	Hex bushing (Std for option #4 selections: 14, 38, 76 & 12)				
	S*	Carbon steel sleeve (Std for option #4 selections: 34 & 10)				
	X*	Other, specify				
	#4	TUBE SIZE				
		Tube ID x OD		NPT*		Collar OD
		Alumina Mullite	Hexoloy	Hex Bushing	CS Sleeve	Alumina Mullite Hexoloy
	14**	1/4" x 3/8"	1/4" x 3/8"	3/4"	1/2"	5/8" 5/8"
	38**	3/8" x 1/2"	3/8" x 5/8"	3/4"	1/2"	3/4" 1"
	76	7/16" x 11/16"	N/A	3/4"	3/4"	1" N/A
	12	1/2" x 3/4"	1/2" x 3/4"	3/4"	3/4"	1-1/8" 1-1/8"
	34***	3/4" x 1"	3/4" x 1-1/4"	1"	1"	1-3/8" 1-3/4"
	10***	1" x 1-1/4"	1" x 1-1/2"	1-1/4"	1-1/4"	1-3/4" 2"
	X	Other, Specify				
	#5	OVERALL LENGTH (L)				
	A	6"				
	B	12" (Standard)				
	C	18"				
	D	24" (Standard)				
	E	30"				
	F	36"				
	L_ "	Other, specify				
	#6	TAGGING OPTIONS				
	1	Tag # is indelibly marked on well or attaching device (Standard)				
	X	Other				
	M	MTR				

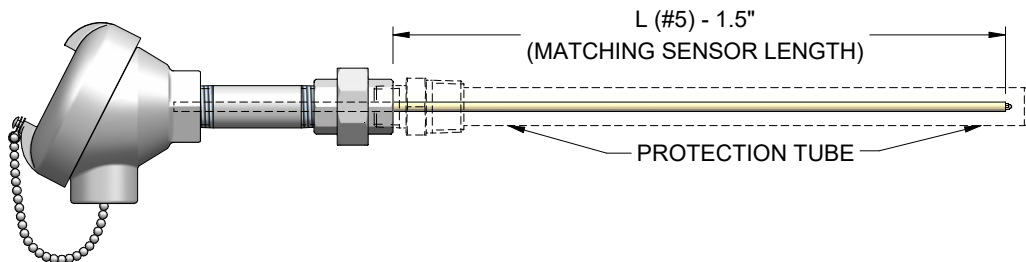
\* NPT process connection thread sizes are shown in option #4 and can be used to attach to process equipment, flanges, and/or threaded bushings. (Use X in symbol number 3 and describe flanges and nonstandard bushings).

\*\* Standard Attaching Device selection in #3 is Hex Bushing (B).

\*\*\* Standard Attaching Device selection in #3 is Carbon Steel Sleeve (S).

## MATCHING SENSOR LENGTHS

### ATTACHING DEVICE B



**Note:** Do NOT use spring-loaded sensors in ceramic protection tubes.

5D	A	B	12	B	1
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