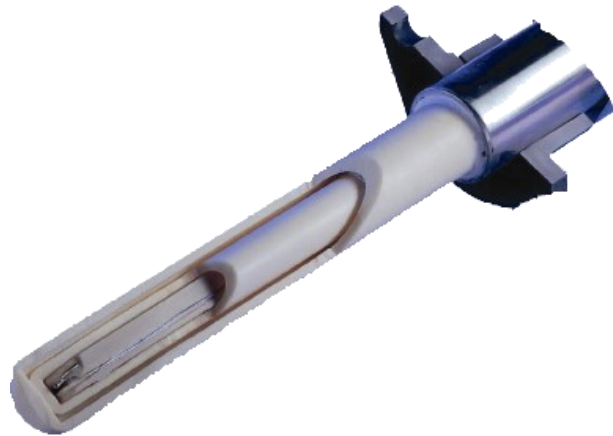


Ceramic tubes and insulation rods For thermocouples



General

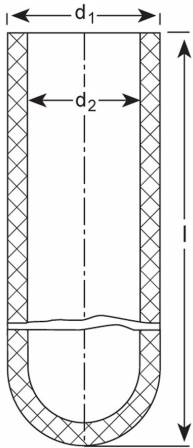
Ceramic tubes are used when conditions exclude the use of metal, either for chemical reasons or because of excessive temperatures. Their main applications are between 1000 and 1800°C. They may be in direct contact with the medium or may be used as a gas-tight inner sheath to separate the thermocouple from the actual metal protection tube.

Ceramic tubes

Alsint 99.7		Pythagoras		Sillimantín 60
Type C799 according to DIN EN 60672 Al ₂ O ₂ content 99.7		Type C610 according to DIN EN 60672 Al ₂ O ₃ content 60% Alkali content 3%		Type C530 according to DIN EN 60672 Al ₂ O ₃ content 73-75%
Outer x Inner diameter (mm)		Outer x Inner diameter (mm)		Outer x Inner diameter (mm)
0,8x0,3	12,0x8,0	0,8x0,3	14,0x10,0	15x10
1,3x0,7	12,7x8,9	1,3x0,7	15,0x10,0	20x15
1,6x1,0	14,0x10,0	1,6x1,0	15,0x11,0	22x17
1,8x1,2	15,0x10,0	1,8x1,2	16,0x12,0	24x19
2,0x1,0	17,0x12,0	2,0x1,0	17,0x12,0	26x18
2,7x1,7	17,0x13,0	2,7x1,7	17,0x13,0	28x22
3,0x2,0	17,5x11,1	3,0x2,0	17,5x11,1	30x23
4,0x2,0	20,0x15,0	4,0x2,0	20,0x15,0	
5,0x3,0	24,0x18,0	5,0x3,0	24,0x19,0	
6,0x4,0	25,4x19,1	6,0x4,0	25,4x19,1	
8,0x5,0	26,0x20,0	8,0x5,0	26,0x18,0	
9,0x6,0	28,0x22,0	9,0x6,0	26,0x20,0	
9,6x6,4	30,0x23,0	10,0x6,0	28,0x22,0	
10,0x6,0		10,0x7,0	30,0x23,0	
10,0x7,0		12,0x8,0		

Silicon Carbide		Halsic-R		Halsic-I
Fine and coarse structure, SIC content ca 70 and 90%, clay bound		According to DIN EN 12212 Recrystallized SIC, SIC content > 99%		According to DIN EN 12212 reaction bound, SI infiltrated SIC, SIC content 90%, SI free content ca 10%
Outer x Inner diameter (mm)		Outer x Inner diameter (mm)		Outer x Inner diameter (mm)
17x12	30x23	20x10	34x24	20x13
20x12	33x28	22x12	35x25	22x15
20x15	35x27	25x15	38x25	25x18
22x17	40x32	30x15	40x30	27x20
24x19	45x25	30x20	45x35	30x20
26x18	45x35	32x22	50x38	45x35
26x20	50x25			

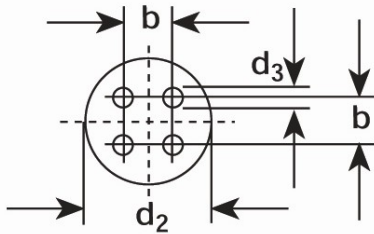
Standard Ceramic Tubes



Standard ceramic sheath tubes					
DIN EN 60672	Outer (d1) mm	Inner (d2) mm	Length (mm)	Thermal shock	Continuous temp.
C610	10	7	200, 270, 375, 530, 740, 1030	Medium to good	1500°C
	15	11	530, 740, 1030, 1430, 2030		
	24	19	530, 740, 1030, 1430		
C530	26	18	530, 740, 1030, 1430	Very good	1600°C
C799	10	6	200, 270, 375, 530	Medium	1600°C
	15	10	530, 740, 1030		
	24	18	530, 740, 1030, 1430		

Standard Insulation rods 2 & 4 bore

Measurements for ceramic sheath tubes and insulation components for thermoelements according to DIN 43724 and DIN 43725



4-bore insulation rods				1-bore insulation rods			
Outer Ø (d2)	Bore Ø (d3)	Length (mm)	Wire Ø (mm)	Outer Ø (d2)	Bore Ø (d3)	Length (mm)	Wire Ø (mm)
5.5	1.2	205, 275, 380, 560, 770	≤ 0.8	2.7 ± 0.3	1.7	5, 10, 25, 50	1.0 - 1.38
8.5	1.5	1060, 1460, 2060	≤ 0.8	4.0 ± 0.3	2.0		1.38
				6.0 ± 0.3	4.0		3.0

Design:

Unglazed. Admissible tolerance of the wall thickness is in compliance with DIN 40680 Part 1, degree of accuracy: Coarse. Admissible deflection is in compliance with DIN 40680 Part 2, degree of accuracy: Fine, with the following specifications: A straight rod, diameter 0.8 x (d1-2s), must be able to be inserted to the bottom of the sheath tube. The rounded bottom of the sheath tube uniformly becomes the cylindrical section of the sheath tube.

Thermal shock resistance:

The sheath tube is inserted with the closed end into a 40 mm internal diameter tube furnace at constant rate (Table 1). The furnace is heated to the maximum permissible continuous temperature of the sheath tube. The sheath tube must not come in contact with the tube furnace, therefore a vertical setup of the tube furnace is recommended. After a minimum of 20 minutes holding time, the sheath tube is removed at the same rate and is hung freely in order to cool in calm air.

Dimensional stability:





The sheath tube is horizontally clamped into the tube furnace used for thermal shock resistance testing and is then heated to the maximum permissible continuous temperature. This procedure lasts for 30 minutes.

Gastightness:

The sheath tube is exposed to an inner overpressure of 2 bar, and then submersed in water for one minute. *Note: The tests should be conducted in the above mentioned order. The thermal shock resistance tests and dimensional stability tests can be conducted simultaneously*










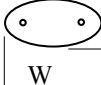
Table 1	
Diameter D1 (mm)	Insertion rate (cm/min)
10	100
15	50
24 - 26	1

Insulation rods 2 & 4 bore

Alsint 99.7 type C799		Pythagoras type C610	
2-bore rods 	4-bore rods 	2-bore rods 	4-bore rods 
OdxB (Ø)	OdxB (Ø)	OdxB (Ø)	OdxB (Ø)
1.2x0.2 up to 16.3x 4.6	1.5x0.3 up to 16.9x 4.6	1.1x0.3 up to 18.3x 4.1	1.5x0.3 up to 15.8x 4.5

Insulation rods made of Alsint 99.7 or Pythagoras are used to insulate inserted thermal wires. In accordance with DIN 43725, Pythagoras insulation rods can be heated to temperatures up to 2732°F/1500°C. For higher temperatures, we recommend Alsint 99.7 insulation rods.

Standard Multibore Insulation rods

Alsint 99.7 type C799 / Pythagoras type C610											
6-bore rods 				8-bore rods 				10-bore rods 			
Od	6xbore	Od	6xbore	Od	8xbore	Od	8-bore	Od	10-bore	Od	10xbore
1.5	0.25	1.5	0.25	4.2	0.75	4.0	0.75	5.3	0.40	5.0	0.40
4.0	0.75	4.0	1.10	4.8	0.80	4.5	0.80	5.5	0.80	5.2	0.80
4.4	1.00	4.5	1.10	6.0	0.55	5.0	0.60	5.7	0.65	5.4	0.65
5.0	1.10	5.1	1.10	6.4	1.00	6.0	1.00	6.0	0.75	5.6	0.75
6.0	1.20	6.0	1.20	7.5	0.80	7.0	0.80	7.0	1.10	6.5	1.10
8.0	1.20	7.5	1.20	12.7	2.10	12.0	2.00	8.0	0.70	7.5	0.70
5-bore with centre bore 				6-bore with centre 				7-bore with centre bore 			
Od	5-bore	Od	5-bore	Od	6-bore	Od	6-bore	Od	7-bore	Od	7-bore
2.7	0.35	2.6	0.35	2.1	0.40	2.0	0.40	2.0	0.25	1.9	0.25
4.5	0.50	4.3	0.50	4.9	0.55	4.6	0.55	3.2	0.30	3.0	0.30
9.4	1.00	8.7	1.00	5.4	1.10	5.0	1.10	17.0	4.00	16.0	3.70
5-bore with centre bore and 4 smaller bores 						7-bore with centre bore and 6 smaller bores 					
Od	C-bore	4-bore	Od	C-bore	4-bore	Od	C-bore	6-bore	Od	C-bore	6-bore
3.0	0.9	0.30	2.8	0.9	0.50	3.7	1.8	0.45	3.5	1.7	0.45
4.0	1.5	0.75	4.5	1.2	0.75	4.0	1.8	0.45	4.0	1.7	0.75
5.0	2.4	0.75	7.7	2.9	1.20	5.0	1.8	0.75	5.0	1.8	0.70
8.5	4.0	0.80	8.0	3.7	0.80	11.0	4.3	2.10	10.4	4.0	2.00
9.0	3.2	1.15	9.2	4.0	1.10	13.3	4.4	2.40	12.5	4.1	2.30
13-bore with centre bore and 12 smaller bores 						Oval 2-bore rods 					
Od	C-bore	12-bore	Od	C-bore	12-bore	W	H	2-Bore	W	H	2-bore
8.6	4.4	0.3	7.7	4.1	0.3	3.0	2.0	0.7	2.3	1.4	0.7
9.6	2.1	1.2	9.0	1.9	1.2	4.5	3.0	1.5	3.0	2.0	1.0
9.6	2.1	1.1	9.0	2.0	1.1	7.5	5.0	2.2	4.0	2.7	1.0
						11.5	7.2	3.9	4.6	3.3	1.5
						12.0	8.0	4.0	11.5	6.3	4.2



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