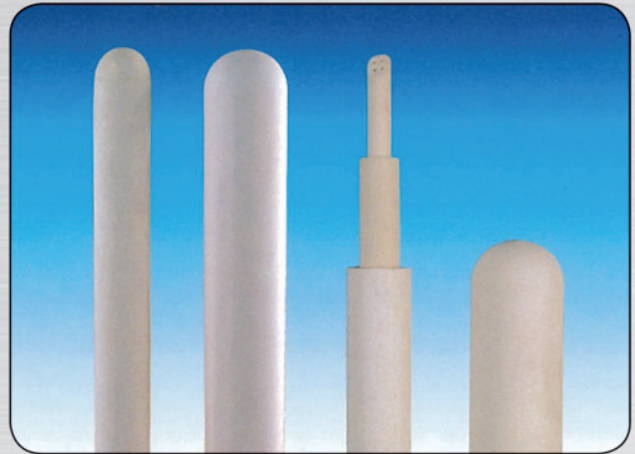


// CERAMIC TUBES AND INSULATORS

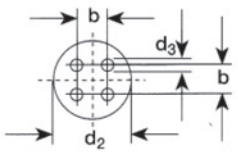
// CERAMIC TUBES AND INSULATORS FOR THERMOELEMENTS

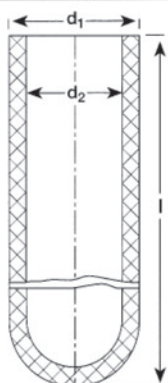


PROPERTY	UNIT	ALUMINA CERAMIC			
Typical application		Tubes for thermoelements resistant to thermal stresses	-insulating tubes for thermoelements -Protection tubes -Insulating rods	-Protection tubes -Insulation rods	-Tubes for thermoelements -Protection tubes -Insulating rods -Tubes for chemical process applications
Type to DIN EN 60672-3		C 530	C 610	C 795	C 799
Al ₂ O ₃ - content	%	78	62	95	99,7
Specific gravity	g/cm ³	2,5	2,7	3,68	3,82
Water absorption	%	8 - 12	0	0	0
Hardness	Mohs	6	8	9	9
Modulus of elasticity	GPa		100	280	300
Flexural strenght	N/mm ²	30	120	280	300
Coefficient of linear expansion					
20-100 °C	x10 ⁻⁶ /°C	3,5 - 5	5 - 6	5 - 7	5 - 7
20-300 °C		3,5 - 5	5 - 6	6 - 7,5	6 - 8
20-600 °C		4 - 6	5 - 7	6 - 8	7 - 8
20-1000 °C		4 - 7	5 - 7	7 - 9	7 - 9
Specific heat (20 - 100) °C	J/KgK	800 - 900	850 - 1050	850 - 1050	850 - 1050
Thermal conductivity	W/mK	1,4 - 2	4 - 6	16 - 28	19 - 30
Maximum thermal stress	K	350	150	140	150
Dialectric strenght	KV/mm		17	15	17
Max. Temp. use	°C	1500	1500	1550	1650
Chemical resistivity		satisfactory	good	good	very good
Thermal shock resistance		very good	medium to good	medium	medium

The maximum application temperature depends on the material. The application temperature is also influenced by the tube geometry, the diameter, the wall thickness and the method of application.

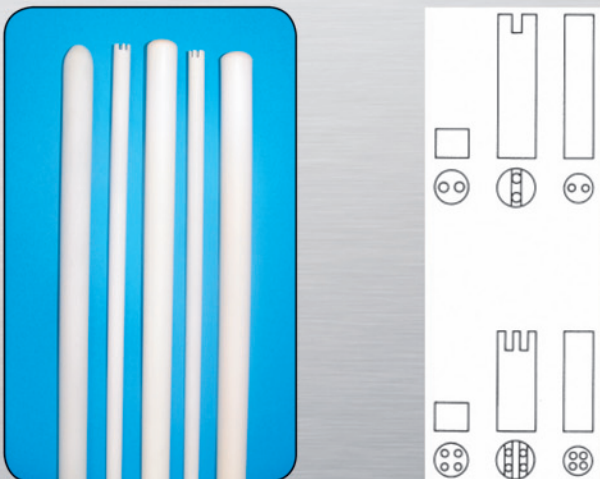
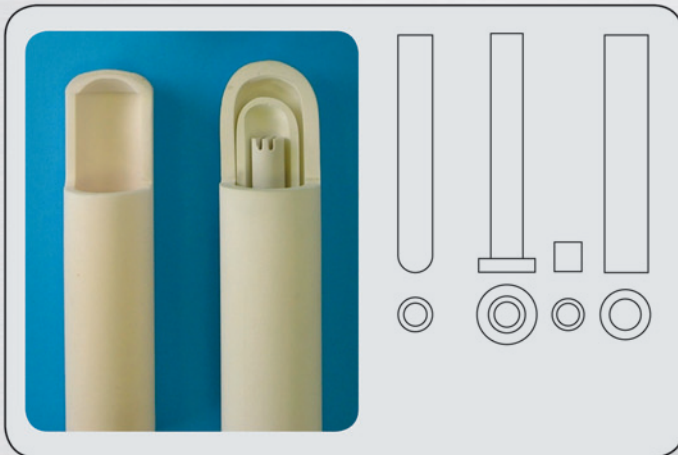
Measurements for ceramic tubes and insulators for thermoelements according to DIN 43724 and DIN 43725

 <p>Materials for insulation rods C 610 or C 799 DIN EN 60672</p>	4-bore insulation rods according to DIN 43725			Wire Ø	1-bore insulation rods according to DIN 43725			Wire Ø
	Outer Ø (d ₂) in mm	Bore Ø (d ₃) in mm	Length in mm	Ø in mm	Outer Ø (d ₁) in mm	Inner Ø in mm	Length in mm	Ø in mm
5.5	1.2	205	≤ 0.8	2.7 ± 0.2	1.7	10, 25, 50	1.0 and 1.38	
		275						
8.5	1.5	380	≤ 0.8	4.0 ± 0.3	2.0	10, 25, 50	1.38	
		560						
		770						
		1060						
		1460						
		2060						

	Ceramic tubes DIN 43724					
	DIN EN 60672	Outer Ø (d ₁) in mm	Inner Ø (d ₂) in mm	Length (L) in mm	Thermal shock resistance	Permeability
C 610	10	7	200, 270, 375, 530, 740, 1030, 1430, 2030	medium to good	gastight	1500 C
	15	11	530, 740, 1030, 1430, 2030			
	24	19	530, 740, 1030, 1430, 2030			
C 530	26	18	530, 740, 1030, 1430, 2030	very good	porous	1500 C
	C 799	8	5	200, 270, 375, 530, 740, 1030, 1430, 2030	medium	gastight
10		6	200, 270, 375, 530, 740, 1030, 1430, 2030			
15		10	530, 740, 1030, 1430, 2030			
24		18	530, 740, 1030, 1430, 2030			

In this table there are mentioned some standard dimensions for tubes and insulators.

We can produce all other lengths, up to max 2100 mm, and other diameter from 2 mm to max 50 mm.



Diameter tolerances - deflectional tolerances

without grinding to DIN 40 680, issue 1983

Nominal dimensional range for diameter or length in mm	Degree of accuracy		Nominal dimensional range for length in mm	Degree of accuracy	
	coarse Permissible deviation in mm	medium Permissible deviation in mm		coarse Permissible deflection f_a in mm	medium Permissible deflection f_a in mm
up to 4	± 0.4	± 0.15	up to 30	± 1.7	± 0.15
above 4 up to 6	± 0.6	± 0.20	above 30 up to 40	± 1.8	± 0.20
above 6 up to 8	± 0.7	± 0.25	above 40 up to 50	± 1.9	± 0.25
above 8 up to 10	± 0.8	± 0.30	above 50 up to 60	± 2.0	± 0.30
above 10 up to 13	± 1.0	± 0.35	above 60 up to 70	± 2.1	± 0.35
above 13 up to 16	± 1.2	± 0.40	above 70 up to 80	± 2.1	± 0.40
above 16 up to 20	± 1.2	± 0.45	above 80 up to 90	± 2.2	± 0.45
above 20 up to 25	± 1.5	± 0.50	above 90 up to 100	± 2.3	± 0.50
above 25 up to 30	± 1.5	± 0.55	above 100 up to 110	± 2.4	± 0.55
above 30 up to 35	± 2.0	± 0.60	above 110 up to 125	± 2.5	± 0.65
above 35 up to 40	± 2.0	± 0.65	above 125 up to 140	± 2.6	± 0.70
above 40 up to 45	± 2.0	± 0.70	above 140 up to 155	± 2.7	± 0.80
above 45 up to 50	± 2.5	± 0.80	above 155 up to 170	± 2.9	± 0.85
above 50 up to 55	± 2.5	± 0.90	above 170 up to 185	± 3.0	± 0.90
above 55 up to 60	± 2.5	± 1.00	above 185 up to 200	± 3.1	± 1.00
above 60 up to 70	± 3.0	± 1.20	above 200 up to 250	± 3.5	± 1.25
above 70 up to 80	± 3.5	± 1.40	above 250 up to 300	± 3.9	± 1.50
above 80 up to 90	± 4.0	± 1.60	above 300 up to 350	± 4.3	± 1.75
above 90 up to 100	± 4.5	± 1.80	above 350 up to 400	± 4.7	± 2.00
above 100 up to 110	± 5.0	± 2.00	above 400 up to 450	± 5.1	± 2.25
above 110 up to 125	± 5.5	± 2.20	above 450 up to 500	± 5.5	± 2.50
above 125 up to 140	± 6.0	± 2.50	above 500 up to 600	± 6.3	± 3.00
above 140 up to 155	± 6.5	± 2.80	above 600 up to 700	± 7.1	± 3.50
above 155 up to 170	± 7.0	± 3.00	above 700 up to 800	± 7.9	± 4.00
above 170 up to 185	± 7.5	± 3.40	above 800 up to 900	± 8.7	± 4.50
above 185 up to 200	± 8.0	± 3.80	above 900 up to 1000	± 9.5	± 5.00
above 200 up to 250	± 9.0	± 4.20	above 1000	± 1.5+0.8% × L	± 0.5% × L
above 250 up to 300	± 10.0	± 4.60			
above 300 up to 350	± 11.0	± 5.00			
above 350 up to 400	± 12.0	± 5.50			
above 400 up to 450	± 13.0	± 6.10			
above 450 up to 500	± 14.0	± 6.80			
above 500 up to 600	± 15.0	± 7.60			
above 600 up to 700	± 16.0	± 8.30			
above 700 up to 800	± 17.5	± 9.00			
above 800 up to 900	± 19.0	± 9.50			
above 900 up to 1000	± 20.0	± 10.00			
above 1000	± 0.02 × D	± 0.01 × D			

Manufacturing method	Degree of accuracy	
	coarse	medium
Cast and extruded for parts \varnothing 30 mm and above	application customary	
extruded for parts up to \varnothing 30 mm		application customary

Accuracy

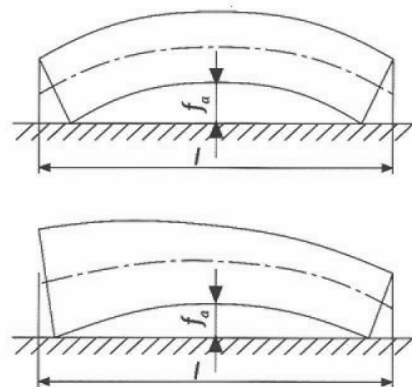
DIN VDE 0335, Type

Manufacturing method

cast, extruded
 \varnothing 30 mm and above

extruded
up to \varnothing 30 mm

	coarse			medium		
	530	610	799	530	610	799
cast, extruded \varnothing 30 mm and above	•	•	•			
extruded up to \varnothing 30 mm				•	•	•



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